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**MODERATE SPECTRAL ATMOSPHERIC
RADIANCE AND TRANSMITTANCE
CODE (MOSART).**

Volume IV: Software Reference Manual

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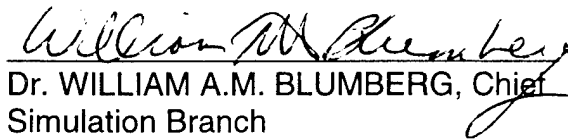
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13. ABSTRACT (Maximum 200 words) The Moderate Spectral Atmospheric Radiance and Transfer (MOSART) computer program calculates atmospheric transmission and radiation in the ultraviolet region through the microwave spectral regions (0.2 μm to infinity or 0 - 50,000 cm^{-1} . The spectral resolution is variable from a value of 2 cm^{-1} upward in increments of 1 cm^{-1} . It contains features which have been extracted from the MODTRAN code developed by the Geophysics Division (PL/GPOS) of the Air Force Phillips Laboratory and the APART code developed by Photon Research Associates (PRA). Because of the requirement that MOSART be compatible with various codes used in the SSGM (Strategic Scene Generation Model), the overall structure of this version of MOSART closely follows that of APART. However, MOSART contains all the MODTRAN atmospheric features and is easily used for that code's usual point-to-point calculations. This volume provides the user with information describing the installation of MOSART. The other volumes describe running the code (Vol. II), technical discussion (Vol. III), and the structure of MOSART (Vol. IV). To provide users with on-line assistance, this volume is available in a series of "html" files that can be viewed using the MOSART Input Builder or the MOSAIC Software.				
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1.0 INTRODUCTION

The Moderate Spectral Atmospheric Radiance and Transfer (MOSART) computer program calculates atmospheric transmission and radiation in the ultraviolet through the microwave spectral regions ($0.2 \mu\text{m}$ to infinity or $0 - 50,000 \text{ cm}^{-1}$). The spectral resolution is variable from a value of 2 cm^{-1} upward in increments of 1 cm^{-1} . It contains features which have been extracted from the MODTRAN code developed by the Geophysics Division (PL/GPOS) of the Air Force Phillips Laboratory and the APART code developed by Photon Research Associates (PRA). MODTRAN is widely used in many different atmospheric studies, both within and without the DoD. Since APART was developed to provide atmospheric calculations for infrared (IR) signature studies of both targets and backgrounds, it has many features that are desirable for large simulation models. Because of the requirement that MOSART be compatible with various codes used in the SSGM (Strategic Scene Generation Model), the overall structure of this version of MOSART closely follows that of APART. However, MOSART contains all the MODTRAN atmospheric features and is easily used for that code's usual point-to-point calculations.

This volume of the Users Manual provides the user with the information on the structure of the code. The other volumes in the Users Manual describe installation of MOSART (Vol. I), executing the code (Vol. II), and technical discussion (Vol. III).

MOSART and its utility programs are written in ANSI X3.9-1978 FORTRAN (FORTRAN 77) and are very portable programs. The source code delivered with MOSART includes:

FPTEST:	Test machine dependent operations
INSTDB:	Installs direct access binary data bases
MOSART:	Is the main MOSART program
PLTGEN:	Makes graphs of the results
ASCBIN:	Converts binary files to ASCII and vice-versa
CRFILE:	Assists in preparing the MOSART input file
MRFLTR:	Degrades the spectral output using a filter function
BBTEMP:	Converts radiance to equivalent blackbody temperatures
VISUAL:	Converts visible radiances to luminances and determines color
SGNGEN:	Creates statistical scenes
FACET:	Calculates the signature of simple geometric shapes
TERTEM:	Calculates terrain material temperatures

2.0 DATA FLOW AND SYSTEM STRUCTURE

The overview of the MOSART system architecture and the basic data flow are discussed below.

2.1 Software Architecture Overview

Version 1.40 of the MOSART code consists of 96,847 lines of code. It is comprised of a main program, 154 subroutines, 86 real functions, 9 double precision functions, 1 logical function, 6 complex functions, 13 integer functions, 3 character functions, and 59 BLOCK DATA modules. It also accesses up to 14 direct access binary data files and utilizes up to 2 scratch files. An architecture diagram is shown in Figure 1.

The MOSART code is supported by several codes. These are:

- ASCBIN provides ASCII-binary conversion and creates spectral tables. It consists of the 4,733 lines of code. It is comprised of a main program, 16 subroutines, 7 real functions, 2 integer functions, 4 double precision functions, 3 character functions, and 3 BLOCK DATA modules.
- BBTEMP converts radiance to equivalent blackbody temperatures. It consists of 7,207 lines of code. It is comprised of a main program, 14 subroutines, 9 real functions, 4 double precision functions, 2 integer functions, 3 character functions, and 5 BLOCK DATA modules.
- CRFILE creates the various input files. It consists of 9,170 lines of code. It is comprised of a main program, 34 subroutines, 13 real functions, 3 character functions, 3 integer functions, 1 double precision function, and 9 BLOCK DATA modules.
- FACET calculates the signature of simple geometric objects. It consists of 8,551 lines of code. It is comprised of a main program, 17 subroutines, 14 real functions, 6 double precision functions, 3 character functions, 2 integer functions, 2 complex functions, and 5 BLOCK DATA modules.
- FPTEST tests various machine-dependent parameters prior to installation of the other codes. It consists of 2,614 lines of code. It is comprised of a main program, 5 subroutines, 5 real functions, 4 double precision functions, 1 logical function, 1 integer function, 1 character function, and 1 BLOCK DATA module.

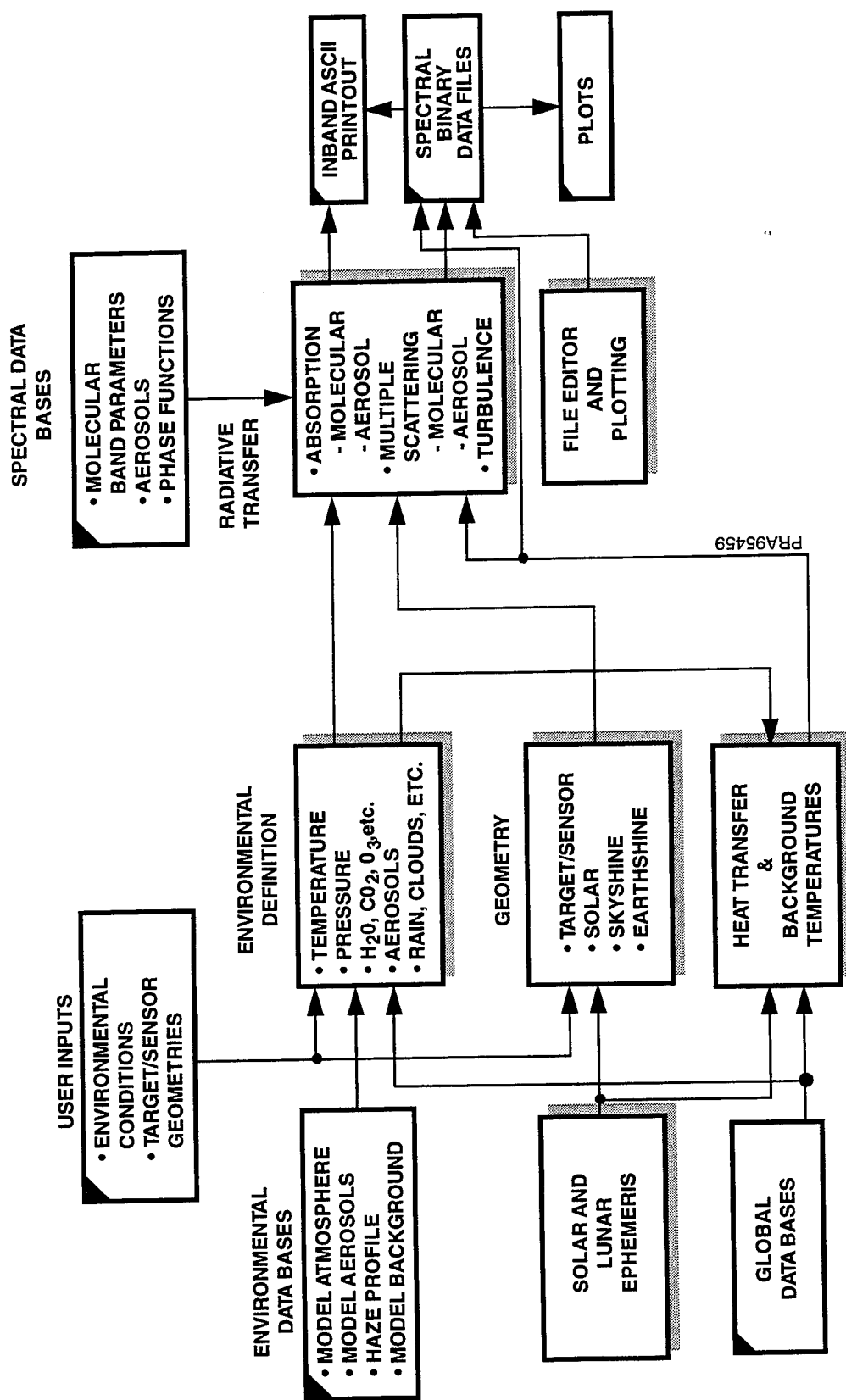


Figure 1. MOSART Architecture.

- INSTD installs the direct access binary data bases. It consists of 2,709 lines of code. It is comprised of a main program, 5 subroutines, 1 integer function, 2 character functions, and 3 BLOCK DATA modules.
- MRFLTR spectrally integrates a MOSART binary output file over a different spectral interval or with a different filter function. It consists of 27,865 lines of code. It is comprised of a main program, 63 subroutines, 15 real functions, 4 double precision functions, 11 integer functions, 3 character functions, and 14 BLOCK DATA modules.
- PLTGEN provides spectral plots using the NCAR plotting software package. It consists of 2,342 lines of code. It is comprised of a main program, 8 subroutines, 3 character functions, 1 integer function, and 2 BLOCK DATA modules.
- SCNGEN creates statistical two-dimensional scenes. It consists of 3,625 lines of code. It is comprised of a main program, 12 subroutines, 12 real functions, 4 double precision functions, 3 integer functions, and 3 character functions.
- TERTEM calculates terrain material temperatures. It consists of 10,853 lines of code. It is comprised of a main program, 16 subroutines, 20 real functions, 4 double precision functions, 4 integer functions, 3 character functions, and 8 BLOCK DATA modules.
- VISUAL converts radiance to luminance in the visible spectral region. It consists of 6,834 lines of code. It is comprised of a main program, 16 subroutines, 5 real functions, 4 double precision functions, 2 integer functions, 1 character function, and 4 BLOCK DATA modules.

2.2 Data Flow

The basic data flow is presented in Figure 2.

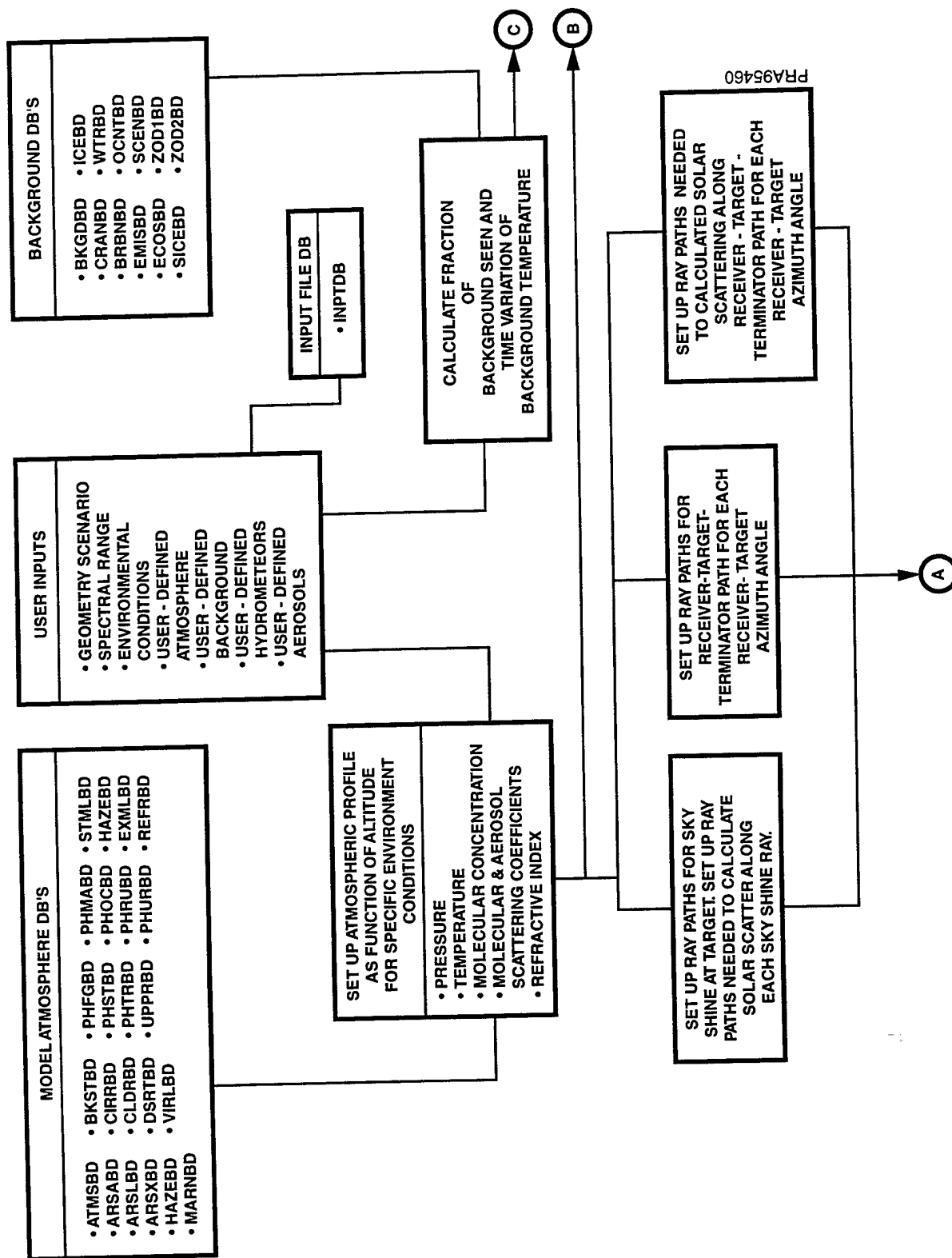
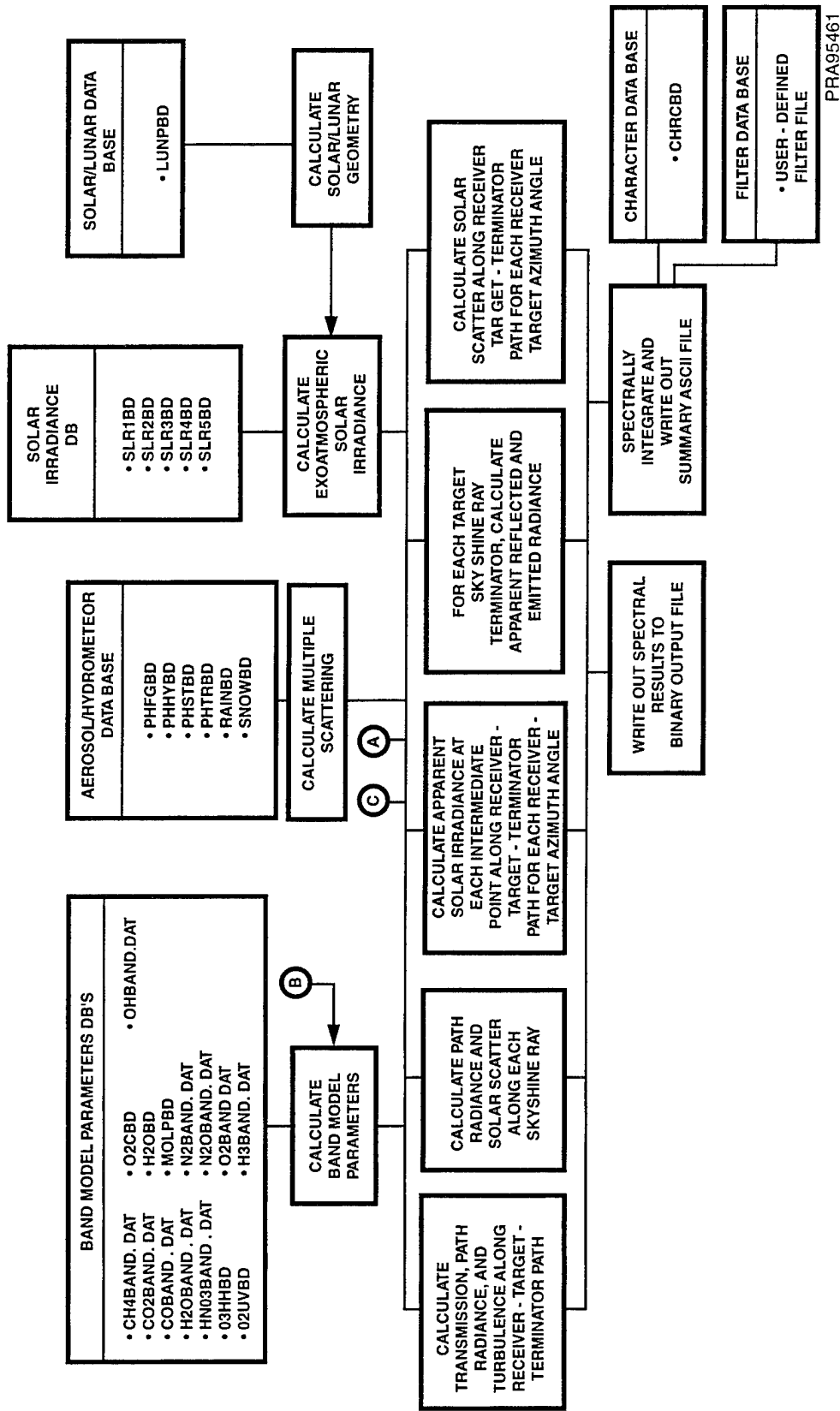


Figure 2. Basic Data Flow.



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Figure 2. Basic Data Flow (continued).

3.0 MODULE STRUCTURE DESCRIPTION

The module structure descriptions for the MOSART program and related utility codes are presented below.

3.1 MOSART

The subroutines and functions contained in the MOSART program are listed below in alphabetical order. In addition to a brief description of each routine, the Creation Date and Revision Data for each routine is provided.

REAL FUNCTION ABCCL4

Created on: Wed May 25 15:44:44 1994

Revised on: Mon Nov 7 14:33:47 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for CCl4.

REAL FUNCTION ABHNO4

Created on: Wed May 25 15:44:44 1994

Revised on: Mon Nov 7 14:33:47 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for HNO4.

REAL FUNCTION ABN2O5

Created on: Wed May 25 15:44:44 1994

Revised on: Mon Nov 7 14:33:47 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for N2O5.

REAL FUNCTION ABSCFC

Created on: Wed May 25 15:44:44 1994

Revised on: Mon Nov 7 14:33:48 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for the chloro-fluorocarbons.

REAL FUNCTION ABSCL0

Created on: Wed May 25 15:44:44 1994

Revised on: Mon Nov 7 14:33:47 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for CCl₄.

REAL FUNCTION ABSH2O

Created on: Wed Nov 18 15:40:09 1992

Revised on: Tue Mar 1 07:55:51 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the water vapor absorption coefficient.

SUBROUTINE ABSMOL

Created on: Wed Nov 18 15:40:13 1992

Revised on: Tue Nov 22 09:07:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the molecular absorption coefficients.

REAL FUNCTION ABSN2

Created on: Wed Nov 18 15:40:19 1992

Revised on: Tue Mar 1 07:55:53 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the LOWTRAN nitrogen continuum.

REAL FUNCTION ABSN2O

Created on: Wed Nov 18 15:40:22 1992

Revised on: Thu Feb 11 15:22:53 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the nitrogen oxide absorption coefficient.

REAL FUNCTION ABSNO2

Created on: Wed Nov 18 15:44:44 1992

Revised on: Tue May 24 13:18:17 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for NO2.

SUBROUTINE ABSO2

Created on: Wed Nov 18 15:40:32 1992

Revised on: Mon Aug 2 11:07:08 1993

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the Herzberg and Schumann-Runge O2 absorption coefficient.

REAL FUNCTION ABSO3

Created on: Wed Nov 18 15:40:35 1992

Revised on: Wed Jun 15 14:01:02 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the Hartley Huggins and Chappuis/Wulf O3 absorption coefficient.

REAL FUNCTION ABSSO2

Created on: Wed Nov 18 15:44:44 1992

Revised on: Tue May 24 13:18:17 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the cross-section for SO2.

SUBROUTINE AECALC

Created on: Wed Nov 18 15:58:19 1992

Revised on: Tue May 9 10:03:08 1995

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the solar absorptivity and thermal emissivity from a reflectivity curve.

SUBROUTINE AERSOL

Created on: Wed Nov 18 15:40:40 1992

Revised on: Wed Oct 26 11:04:56 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the absorption and scattering coefficients for the aerosol, normalized to unity for extinction at a wavelength of 0.55 μm .

REAL FUNCTION AH2O2

Created on: Wed Nov 18 15:40:46 1992

Revised on: Tue May 4 09:19:42 1993

Created by: Dr. William M. Cornette

This FUNCTION determines the absorption coefficient for a combination of hydrogen and deuterium peroxide.

REAL FUNCTION AIRTMP

Created on: Wed Nov 18 15:40:54 1992

Revised on: Mon May 17 17:33:13 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the local surface air temperature (K) at a particular time of day. If the user has supplied a reference temperature for a given time, temperatures for other times are calculated as differences from the user-supplied temperature.

SUBROUTINE AMMNIA

Created by: Dr. William M. Cornette

Created on: 14 October 1993

Revised on: Tue Nov 2 10:42:56 1993

This SUBROUTINE determines the band model parameters for ammonia between 3050 and 3600 wavenumbers.

REAL FUNCTION AMOLSC

Created on: Wed Nov 18 16:05:47 1992

Revised on: Thu Jun 23 12:43:46 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the scattering coefficient due to molecular scattering.

Reference: Cornette, "Suggested modification to the total volume molecular scattering coefficient in LOWTRAN," Applied Optics, Vol. 19 (1980), pp A182-3.

SUBROUTINE ASPECT

Created on: Wed Nov 18 15:41:01 1992

Revised on: Mon Nov 7 14:34:11 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the skyshine angles.

SUBROUTINE ATMPRN

Created on: Wed Nov 18 15:41:08 1992

Revised on: Tue Nov 22 09:07:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out the atmospheric parameters for the atmospheric sub-file.

DOUBLE PRECISION FUNCTION BAND

Created on: Wed Nov 18 15:41:17 1992

Revised on: Mon Nov 7 14:34:12 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the transmittance from the desired band model.

SUBROUTINE BBARSL

Created on: Tue May 4 09:14:26 1993

Revised on: Mon Nov 7 14:34:11 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the broadband (solar and thermal) coefficients for the aerosols.

REAL FUNCTION BBO3

Created on: Wed Nov 18 15:41:20 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the ozone absorption from Lacis & Hansen (1974).

SUBROUTINE BCKCHK

Created on: Wed Nov 18 15:41:24 1992

Revised on: Thu Jun 23 12:43:51 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines if the observer is looking into the sun or the moon.

SUBROUTINE BCKGND

Created on: Wed Nov 18 15:41:27 1992

Revised on: Tue Nov 22 09:07:15 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the background radiance.

SUBROUTINE BCKPRN

Created on: Wed Nov 18 15:41:32 1992

Revised on: Tue Nov 22 09:07:09 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out the atmospheric parameters.

REAL FUNCTION BDRF

Created on: Wed Nov 18 15:41:37 1992

Revised on: Tue Nov 2 10:42:28 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the incoherent bidirectional reflectance function for a rough opaque surface.

SUBROUTINE BEAUFT

Created on: Wed Nov 18 15:41:40 1992

Revised on: Thu Jun 23 12:43:35 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates ocean parameters as a function of wind speed.

Reference: Smithsonian Table 36, Beaufort Wind Scale

REAL FUNCTION BETA

Created on: Wed Nov 18 15:41:43 1992

Revised on: Thu Jun 23 12:43:46 1994

Created by: Dr. William M. Cornette

This FUNCTION computes the average backscattered fraction. The current routine uses the Cornette-Shanks phase function. The parameters and algorithms for the Henyey-Greenstein phase function are commented out with 'CHG'.

REAL FUNCTION BETAU

Created on: Wed Nov 18 15:41:46 1992

Revised on: Fri Jul 1 15:08:49 1994

Created by: Dr. William M. Cornette

This FUNCTION computes the zenith angle dependent backscattered fraction. The routine currently uses the Cornette-Shanks phase function. The parameters and algorithms for the Henyey-Greenstein phase function are commented out with 'CHG'.

SUBROUTINE BINFIL

Created on: Wed Nov 18 15:41:53 1992

Revised on: Tue Nov 22 09:07:02 1994

Created by: Dr. William M. Cornette

This SUBROUTINE OPENS the binary output files.

SUBROUTINE BMOD

Created on: Wed Nov 18 15:41:55 1992

Revised on: Mon Nov 7 14:33:46 1994

Created by: Dr. William M. Cornette

This SUBROUTINE obtains the band parameters.

SUBROUTINE BNDMLG

Created on: Wed Nov 18 15:42:02 1992

Revised on: Mon Nov 7 14:33:45 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the multiple line group (MLG) partition function.

SUBROUTINE BNDPAR

Created on: Wed Nov 18 15:42:07 1992

Revised on: Tue Nov 22 09:07:15 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the band parameters for all of the molecular types, molecular scattering, aerosol extinction, hydrometeors (clouds, fog and rain), and cirrus clouds.

SUBROUTINE BNTPTH

Created on: Wed Nov 18 15:42:12 1992

Revised on: Wed Jun 15 14:01:00 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the summing variables for the second leg of a path. The final variables for the first leg are used as the starting points for the second leg.

SUBROUTINE BRBNDR

Created on: Wed Nov 18 15:42:16 1992

Revised on: Tue Nov 22 09:07:09 1994

Created by: Dr. William M. Cornette

This SUBROUTINE directs the processing sequence for all "Broad-band" submodules.

SUBROUTINE CALCUL

Created on: Wed Nov 18 15:42:32 1992

Revised on: Tue Nov 22 09:07:01 1994

Created by: Dr. William M. Cornette

This SUBROUTINE is the driver for calculating the MOSART binary files.

SUBROUTINE CALEND

Created on: Wed Nov 18 15:42:35 1992

Revised on: Mon Apr 25 08:34:57 1994

Created by: Dr. William M. Cornette

This SUBROUTINE changes a day/month/year date to the day of the year and the decimal year, or day of the year to day/month/year and decimal year.

SUBROUTINE CHANGE

Created on: Wed Nov 18 15:58:51 1992

Revised on: Mon Apr 25 08:34:57 1994

Created by: Dr. William M. Cornette

This SUBROUTINE modifies a standard molecular concentration profile for temporal variations.

SUBROUTINE CHKRST

Created on: Wed Nov 18 15:42:38 1992

Revised on: Tue Apr 5 17:30:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines if a restart is required and if so, where it should start.

SUBROUTINE CHKVER

Created on: Wed Nov 18 15:42:41 1992

Revised on: Tue Nov 2 10:43:18 1993

Created by: Dr. William M. Cornette

Since VAX computer save different versions of the binary files, this SUBROUTINE checks to insure that the ones OPENed for summary were created at the same time. This is accomplished by comparing the heading and the title. If the file does not correspond to the source file, then it is CLOSEd.

SUBROUTINE CHTIME

Created on: Wed Nov 18 15:42:44 1992

Created by: Dr. William M. Cornette

This SUBROUTINE converts decimal time to hours, minutes, and seconds, and vice-versa.

REAL FUNCTION CIREX

Created on: Wed Nov 18 15:42:55 1992

Revised on: Thu Jun 23 12:43:34 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the extinction coefficient for a cirrus cloud.

SUBROUTINE CIRRUS

Created on: Wed Nov 18 15:42:58 1992

Revised on: Thu Jun 23 12:43:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE defines the default parameters for the cirrus cloud models.

SUBROUTINE CITIES

Created on: 13 October 1994

Revised on: Wed Apr 26 17:06:26 1995

Created by: Dr. William M. Cornette

This SUBROUTINE determines if a given latitude/longitude is located with a specific set of urban areas.

SUBROUTINE CLDALT

Created on: Wed Nov 18 15:43:02 1992

Revised on: Thu Jun 23 12:42:56 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the cloud altitudes for the low, middle, and high etage cloud layers.

SUBROUTINE CLDLYR

Created on: Wed Nov 18 15:43:11 1992

Revised on: Tue May 4 09:18:15 1993

Created by: Dr. William M. Cornette

This SUBROUTINE computes the optical properties for cloud layers; i.e., scattering optical depth and backscattering fraction.

SUBROUTINE CNSTNT

Created on: Wed Nov 18 15:43:15 1992

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the constants for the program. Some of these are provided in the commented out INTRINSIC and EXTERNAL Declarations. If your computer uses one not listed, please contact Dr. William M. Cornette.

Certain routines are available for determining appropriate numerical constants. These should be used if available.

REAL FUNCTION ADD

The following eight (8) functions are used by CNSTNT to force the storage of numbers into their standard format. Some computers (e.g., IBM PC Lahey) use a greater precision for internal register manipulation.

Created on: 15 February 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the addition of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

REAL FUNCTION SUB

Created on: 15 February 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the subtraction of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

REAL FUNCTION MUL

Created on: 23 August 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the multiplication of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

REAL FUNCTION DIV

Created on: 23 August 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the division of two REAL variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DADD

Created on: 15 February 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the addition of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DSUB

Created on: 15 February 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the subtraction of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DMUL

Created on: 23 August 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the multiplication of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

DOUBLE PRECISION FUNCTION DDIV

Created on: 23 August 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION performs the division of two DOUBLE PRECISION variables to work around the way some computers perform certain calculations in their registers with greater accuracy than they store.

INTEGER FUNCTION IBITS

Created on: 11 February 1993

Revised on: Thu Jun 23 12:43:31 1994

Created by: Dr. William M. Cornette

This FUNCTION duplicates the MIL-STD-1753 INTRINSIC FUNCTION IBITS using the MIL-STD-1753 INTRINSIC FUNCTIONs IBSET, IBCLR, and BTEST. IBM VS FUNCTIONs include the latter three, but not the FUNCTION IBITS.

SUBROUTINE COAT

Created on: Wed Nov 18 15:43:18 1992

Revised on: Tue Nov 2 10:42:53 1993

Created by: Dr. William M. Cornette

This SUBROUTINE calculates absorption and scattering efficiencies for a coated sphere. For given radii and refractive indices of inner and outer spheres, refractive index of surrounding medium, and free space wavelength, COAT calculates size parameters and relative refractive indices.

REAL FUNCTION COMFNC

Created on: Wed Nov 18 15:43:22 1992

Revised on: Mon May 17 17:33:30 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the optical depth terms for the plume data file.

SUBROUTINE CONFIG

Created on: Wed Nov 18 15:43:28 1992

Revised on: Mon Aug 2 11:06:42 1993

Created by: Dr. William M. Cornette

This SUBROUTINE provides a method for system level setting of the configuration of the computer environment.

INTEGER FUNCTION ERROR_HANDLER

Created on: 3 December 1992

Revised on: Mon Aug 2 11:06:42 1993

Created by: Dr. William M. Cornette

This FUNCTION handles floating point error conditions. It presently STOPS execution if a floating point error occurs.

SUBROUTINE COUPLE

Created on: Wed Nov 18 15:43:31 1992

Revised on: Mon Nov 7 14:33:43 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the multiple scattering components.

COMPLEX FUNCTION CPF12

Created on: Wed Nov 18 15:43:35 1992

Revised on: Tue Mar 1 07:55:48 1994

Created by: Dr. William M. Cornette

This FUNCTION computes the real (WR) and imaginary (WI) parts of the complex probability function $w(z)=\exp(-z^2)*\text{erfc}(-i*z)$ in the upper half-plane $z=x+i*y$ (i.e., for $y \geq 0.0$). Maximum relative error of WR.LT.2.0E-06, that of WI.LT.5.0E-06. This routine developed by J. Humlicek, JQSRT, Vol 21, p. 309 (1980).

REAL FUNCTION CSPHFN

Created on: Wed Nov 18 15:43:39 1992

Revised on: Thu Jun 23 12:43:33 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the Cornette-Shanks phase function. The Henyey-Greenstein function is commented out with 'CHG'.

REAL FUNCTION DBANDS

Created on: Wed Nov 18 15:43:59 1992

Revised on: Thu Jun 23 12:43:39 1994

Created by: Dr. William M. Cornette

This FUNCTION maps the surface brightness of a simple zodiacal dust band model for a set of ecliptic coordinates. Contributions from three band pairs, nominally corresponding to the three principal band pairs observed by IRAS, are added along the line-of-sight. Output is in $\text{W/cm}^2/\text{sr/cm}^{-1}$.

SUBROUTINE DBINIT

Created on: Wed Nov 18 15:44:05 1992

Revised on: Tue Nov 22 09:07:04 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the arrays used with respect to the data bases.

REAL FUNCTION DDIF

Created on: Wed Nov 18 15:44:23 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite downward diffuse flux from solar beam given individual layer downward diffuse from solar fluxes and two-stream reflection and transmission functions.

SUBROUTINE DEFALT

Created on: Wed Nov 18 15:44:19 1992

Revised on: Tue Nov 22 09:07:02 1994

Created by: Dr. William M. Cornette

This SUBROUTINE sets the default values for the undefined input parameters.

SUBROUTINE DEFBCK

Created on: Wed Nov 18 15:44:29 1992

Revised on: Tue Nov 22 09:07:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE defines the background parameters for the observer-source-background geometry scenario.

SUBROUTINE DEMSXX

Created on: Wed Nov 18 15:45:03 1992

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the emissivities EMV and EMH as a function of angle for a series of dielectric layers.

REAL FUNCTION DENAIR

Created on: Wed Nov 18 15:44:33 1992

Revised on: Tue May 2 16:38:11 1995

Created by: Dr. William M. Cornette

This FUNCTION calculates the density (g/m^3) of moist air.

REAL FUNCTION DENWTR

Created on: Wed Nov 18 15:44:42 1992

Revised on: Mon May 17 16:41:39 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the density of water as a function of temperature (gm/m^3).

REAL FUNCTION DEPOL

Created on: Fri May 26 14:38:54 1995

Revised on: Tue May 30 12:58:08 1995

Created by: Dr. William M. Cornette

This FUNCTION calculates the molecular depolarization parameter.

Reference: D.R. Bates, "Rayleigh scattering by air," Planet. Space Sci. 32, 785-790 (1984).

DOUBLE PRECISION FUNCTION DERF

Created on: Wed Nov 18 15:44:44 1992

Revised on: Fri Sep 24 13:52:46 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the error function by rational approximation. The error is less than $1.5D-07$.

SUBROUTINE DESAER

Created on: Wed Nov 18 15:44:51 1992

Revised on: Mon May 17 17:33:32 1993

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the attenuation coefficients and asymmetry parameter for the Desert aerosol based on the wind speed.

SUBROUTINE DFLT2

Created on: Wed Nov 18 15:44:54 1992

Revised on: Thu Jun 23 12:43:55 1994

Created by: Dr. William M. Cornette

This SUBROUTINE established the defaults for the model atmosphere, haze profile, aerosol types, and related parameters.

SUBROUTINE DFLT8

Created on: Wed Nov 18 15:44:56 1992

Revised on: Tue Nov 22 09:07:09 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the default conditions for the spectral inputs.

COMPLEX FUNCTION DIREFL

Created on: Wed Nov 18 15:45:00 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the Fresnel coefficients of a dielectric surface.

SUBROUTINE DIREMS

Created on: Wed Nov 18 15:45:03 1992

Revised on: Mon Nov 7 14:34:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the emissivities EMV and EMH as a function of angle for a series of dielectric layers.

SUBROUTINE DISEND

Created on: Wed Nov 23 15:44:44 1994

Revised on: Wed Nov 23 13:38:09 1994

Created by: Dr. William M. Cornette; Dr. Prabhat K. Acharya

This SUBROUTINE positions the pointer to the end of the DIS file.

SUBROUTINE DISPRN

Created on: Wed Nov 23 15:44:44 1994

Revised on: Mon Nov 28 10:08:07 1994

Created by: Dr. William M. Cornette; Dr. Prabhat K. Acharya

This SUBROUTINE write the records to the DIS file.

REAL FUNCTION DNDR

Created on: Wed Nov 18 15:45:05 1992

Revised on: Thu Jun 23 12:43:28 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the number of particles in a radius interval according to parameters of selected size distribution.

REAL FUNCTION DPLDT

Created on: Wed Nov 18 15:45:10 1992

Revised on: Tue Nov 2 10:42:50 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the partial derivative of the spectral blackbody curve (Planck function) ($\text{W}/\text{cm}^2/\text{cm}^{-1}/\text{K}$).

SUBROUTINE DRTLAY

Created on: Wed Nov 18 15:45:16 1992

Revised on: Tue Nov 22 09:07:01 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the two stream directional R and T values. Ref.: "The Two-Stream Approximation in Radiative Transfer: Including the Angle of the Incident Radiation" J.A. Coakley and P. Chylek, JAS 32 (1975) 409-418.

REAL FUNCTION DVINCR

Created on: Wed Nov 18 15:45:19 1992

Revised on: Mon Nov 7 14:34:08 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the wavenumber increment for a defined wavenumber value.

SUBROUTINE ECLGAL

Created on: Wed Nov 18 15:57:42 1992

Revised on: Mon May 17 17:33:00 1993

Created by: Dr. William M. Cornette

This SUBROUTINE transforms the ecliptic coordinates to galactic coordinates.

REAL FUNCTION EHBSLO

Created on: Wed Nov 18 15:57:53 1992

Revised on: Tue Nov 2 10:42:25 1993

This FUNCTION calculates for positive X, $\text{EXP}(-X) \cdot I_0(X)$, where I_0 is the hyperbolic (modified) Bessel function of the first kind and zeroth order.

REAL FUNCTION EMISSV

Created on: Wed Nov 18 15:57:57 1992

Revised on: Mon Nov 7 14:34:08 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the volumetric emissivity appropriate at the distance and wavelength of interest ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$).

COMPLEX FUNCTION EMTREF

Created on: Wed Nov 18 15:58:01 1992

Revised on: Mon Aug 2 13:13:34 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the effective index of refraction for a mixture of two dielectric mediums.

SUBROUTINE ENDPT

Created on: Wed Nov 18 15:58:04 1992

Revised on: Tue Nov 22 09:07:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the end point of a ray, given the slant range or the earth center angle, the initial altitude, and the direction.

SUBROUTINE EPHEML

Created on: Wed Nov 18 15:58:07 1992

Revised on: Tue Mar 1 07:55:53 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the position of the moon in the sky and the phase of the moon. Indices are set if either a lunar or a solar eclipse is possible.

SUBROUTINE EPHEMS

Created on: Wed Nov 18 15:58:10 1992

Revised on: Mon Nov 7 14:34:07 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the solar and lunar positions.

DOUBLE PRECISION FUNCTION EPHTIM

Created on: Wed Jun 15 14:01:14 1994

Revised on: Tue Jun 28 08:00:22 1994

Created by: Dr. William M. Cornette

This FUNCTION converts from Universal Time to Ephemeris Time.

SUBROUTINE EQABS

Created on: Wed Nov 18 15:58:42 1992

Revised on: Tue Nov 22 09:07:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the equivalent absorber amounts.

SUBROUTINE EQUABS

Created on: Wed Nov 18 15:58:19 1992

Revised on: Tue Nov 22 09:07:09 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the equivalent absorber amounts.

SUBROUTINE EQUACL

Created on: Wed Nov 18 15:58:45 1992

Revised on: Mon May 17 17:33:06 1993

Created by: Dr. William M. Cornette

This SUBROUTINE transforms equatorial coordinates to ecliptical coordinates.

SUBROUTINE ESFIT

Created on: Wed Nov 18 15:58:51 1992

Revised on: Mon Nov 7 14:34:07 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the exponential sum fit for the transmittance function. The Malkmus band model is used to represent the transmittance function.

REAL FUNCTION EVAPOR

Created on: Wed Nov 18 15:58:59 1992

Revised on: Mon May 17 16:41:23 1993

This FUNCTION calculates the latent heat of evaporation for water.

LOGICAL FUNCTION EVEN

Created on: Wed Nov 18 15:59:02 1992

Created by: Dr. William M. Cornette

This FUNCTION determines if an INTEGER is even or not.

REAL FUNCTION EXGALS

Created on: Wed Nov 18 15:59:06 1992

Revised on: Mon May 17 16:41:27 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the extragalactic radiance ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$).

SUBROUTINE EXOATM

Created on: Wed Nov 18 15:59:09 1992

Revised on: Tue May 24 13:18:03 1994

Created by: Dr. William M. Cornette

This SUBROUTINE loads the proper values of temperature and pressure in the arrays TUX and PUX, respectively for the upper atmosphere (i.e., above 100 km).

REAL FUNCTION EXOTMP

Created on: Mon Jul 23 11:16:11 1990

Revised on: Sun Nov 27 20:47:59 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the exoatmospheric temperature to be used to select the proper upper atmosphere profile.

SUBROUTINE FILOPN

Created on: Wed Nov 18 15:57:12 1992

Revised on: Tue Nov 22 09:07:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines if a user-specified file is to be OPENed or not. If not, the unit number is set to 0.

SUBROUTINE FILRT

Created on: Wed Nov 18 15:57:15 1992

Revised on: Tue Nov 22 09:07:03 1994

Created by: Dr. William M. Cornette

This SUBROUTINE uses a file root name to establish several filenames for input, ASCII output, and binary output.

REAL FUNCTION FILTER

Created on: Wed Nov 18 15:57:17 1992

Revised on: Thu Jun 23 12:43:44 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the filter response specified.

SUBROUTINE FLSTAT

Created on: Wed Nov 18 15:57:20 1992

Revised on: Tue Nov 22 09:07:02 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the status of the binary data files.

SUBROUTINE FLUXLW

Created on: Wed Nov 18 15:57:24 1992

Revised on: Tue Mar 1 07:55:52 1994

Created by: Dr. William M. Cornette

This SUBROUTINE computes the upward and downward diffuse fluxes in the terrestrial (longwave) band.

SUBROUTINE FRESNL

Created on: Wed Nov 18 15:57:31 1992

Revised on: Thu Jun 23 12:43:43 1994

This SUBROUTINE calculates the reflectivities and transmissivities for horizontally and vertically polarized electric fields.

REAL FUNCTION GALRAD

Created on: Wed Nov 18 15:54:51 1992

Revised on: Mon May 17 17:33:43 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the spectral mean space background due to diffuse galactic sources in $\text{W/sr/cm}^2/\text{cm}^{-1}$.

REAL FUNCTION GAM

Created on: Wed Nov 18 15:54:53 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite multiple reflection factor, given the individual layer reflection and transmission functions.

REAL FUNCTION GAMMLN

Created on: Wed Nov 18 15:55:14 1992

Revised on: Thu Feb 11 15:26:05 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the natural logarithm of the gamma function for $DX > 0$.

SUBROUTINE GBLBCK

Created on: Wed Nov 18 15:55:55 1992

Revised on: Thu Jun 23 12:42:56 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the terrain scene and altitude as a function of latitude and longitude for the global data base.

SUBROUTINE GEOM

Created on: Wed Nov 18 15:55:58 1992

Revised on: Mon Nov 7 14:34:06 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for a specified ray path through a spherically isotropic atmosphere.

SUBROUTINE GETASP

Created on: Wed Nov 18 15:56:05 1992

Revised on: Tue Nov 22 09:07:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the earth/skyshine aspect parameters.

SUBROUTINE GETATM

Created on: Wed Nov 18 15:56:13 1992

Revised on: Tue Nov 22 09:07:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the model atmosphere parameters.

SUBROUTINE GETBCK

Created on: Wed Nov 18 15:56:16 1992

Revised on: Tue Nov 22 09:07:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the terrain and background parameters.

SUBROUTINE GETCLD

Created on: Wed Nov 18 15:56:23 1992

Revised on: Tue Nov 22 09:07:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the hydrometeor (cloud, fog, rain, snow) parameters.

SUBROUTINE GETEXO

Created on: Wed Apr 3 10:28:25 1991

Revised on: Mon Nov 7 14:34:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the exoatmospheric parameters.

SUBROUTINE GETGLC

Created on: Wed Nov 18 15:56:31 1992

Revised on: Tue Mar 1 07:55:47 1994

Created by: Dr. William M. Cornette

This SUBROUTINE obtains the desired Gauss-Legendre coefficients.

SUBROUTINE GETPOS

Created on: Wed Nov 18 15:56:37 1992

Revised on: Tue Nov 22 09:07:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the source position and time.

SUBROUTINE GETSLR

Created on: Wed Nov 18 15:56:40 1992

Revised on: Tue Nov 22 09:07:08 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the solar and lunar data.

REAL FUNCTION GETVAR

Created on: Wed Nov 18 15:56:43 1992

Revised on: Mon Apr 25 08:34:50 1994

Created by: Dr. William M. Cornette

This FUNCTION reads a REAL variable contained in free format in the CHARACTER string VARIAB.

SUBROUTINE GETVEC

Created on: Wed Nov 18 15:56:47 1992

Revised on: Thu Jun 23 12:43:24 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads a REAL vector contained in free format in the CHARACTER string VARIAB.

SUBROUTINE H2OCNT

Created on: Wed Nov 18 15:53:59 1992

Revised on: Tue Mar 1 07:55:36 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the LOWTRAN self- and foreign-broadened line wings absorption coefficients.

REAL FUNCTION HAZE

Created on: Wed Nov 18 15:54:02 1992

Revised on: Mon Nov 7 14:34:04 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the aerosol extinction coefficient (km^{-1}).

REAL FUNCTION HEYMS

Created on: Wed Nov 18 15:54:09 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the liquid water content (gm/m^3) for a cirrus cloud according to Heymsfield.

REAL FUNCTION HLOWT

Created on: Wed Nov 18 15:46:44 1992

Revised on: Mon Aug 2 13:14:27 1993

Created by: Dr. William M. Cornette

This FUNCTION determines the boundary layer altitude based upon the LOWTRAN modification of the haze profile for elevated locations.

SUBROUTINE HOREQU

Created on: Wed Nov 18 15:54:24 1992

Revised on: Mon May 17 17:33:46 1993

Created by: Dr. William M. Cornette

This SUBROUTINE converts horizon coordinates to equatorial coordinates.

SUBROUTINE HORIZN

Created on: Wed Nov 18 15:54:28 1992

Revised on: Thu Jun 23 12:43:43 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the horizon and whether the desired geometry is beyond the horizon or not.

SUBROUTINE HTBLNC

Created on: Wed Nov 18 15:54:32 1992

Revised on: Thu Jun 23 12:43:23 1994

Created by: Dr. William M. Cornette

This SUBROUTINE is the layer temperature calculation algorithm.

SUBROUTINE HYDROM

Created on: Wed Nov 18 15:54:35 1992

Revised on: Mon Nov 7 14:34:04 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the equivalent absorber amounts for hydrometeors (clouds, fog, rain, snow, and cirrus/ice).

INTEGER FUNCTION IBKCNV

Created on: 8 November 1993

Revised on: Wed Apr 26 17:06:26 1995

Created by: Dr. William M. Cornette

This FUNCTION converts the ecosystem index into a MOSART terrain background scene index.

INTEGER FUNCTION IBNSRC

Created on: Wed Nov 18 15:53:01 1992

Revised on: Tue Nov 22 10:04:37 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the location of X0 in the X-array. The search is binary and starts at the location KEY. The binary division point is calculated using the gradient across the X-array for the interval.

INTEGER FUNCTION IDAERO

Created on: Wed Nov 18 15:44:44 1992

Revised on: Tue May 24 13:18:17 1994

Created by: Dr. William M. Cornette

This FUNCTION assigns a default aerosol type base upon the type of background and altitude.

INTEGER FUNCTION IGTINT

Created on: Wed Nov 18 15:53:08 1992

Revised on: Mon Apr 25 08:34:50 1994

Created by: Dr. William M. Cornette

This FUNCTION reads an INTEGER variable contained in free format in the CHARACTER string VARIAB.

SUBROUTINE IGTVEC

Created on: Wed Nov 18 15:53:12 1992

Revised on: Sat Jun 18 13:09:51 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads a INTEGER vector contained in free format in the CHARACTER string VARIAB.

COMPLEX FUNCTION INDEXI

Created on: Wed Nov 18 15:53:14 1992

Revised on: Mon May 17 16:40:57 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the complex index of refraction for ice.

COMPLEX FUNCTION INDEXW

Created on: Wed Nov 18 15:53:19 1992

Revised on: Tue Mar 1 07:55:31 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the complex index of refraction for water.

SUBROUTINE INDXBK

Created on: Wed Nov 18 15:53:22 1992

Revised on: Tue May 24 13:18:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE defines the background index.

INTEGER FUNCTION INDXSC

Created on: Wed Nov 18 15:53:25 1992

Revised on: Mon Aug 2 11:07:12 1993

Created by: Dr. William M. Cornette

This FUNCTION defines the scene label index.

SUBROUTINE INICPL

Created on: Wed Nov 18 15:53:28 1992

Revised on: Tue Nov 22 09:07:16 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the calculations for the multiple scattering coupling.

SUBROUTINE INIGEO

Created on: Wed Nov 18 15:53:35 1992

Revised on: Tue Nov 22 09:07:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the geometric parameters for the GEOM routine.

SUBROUTINE INITL

Created on: Wed Nov 18 15:53:38 1992

Revised on: Tue Nov 22 09:07:00 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the MOSART input file.

SUBROUTINE INTEG

Created on: Wed Nov 18 16:00:10 1992

Revised on: Wed Oct 26 11:04:51 1994

Created by: Dr. William M. Cornette

This SUBROUTINE integrates each variable for a band average.

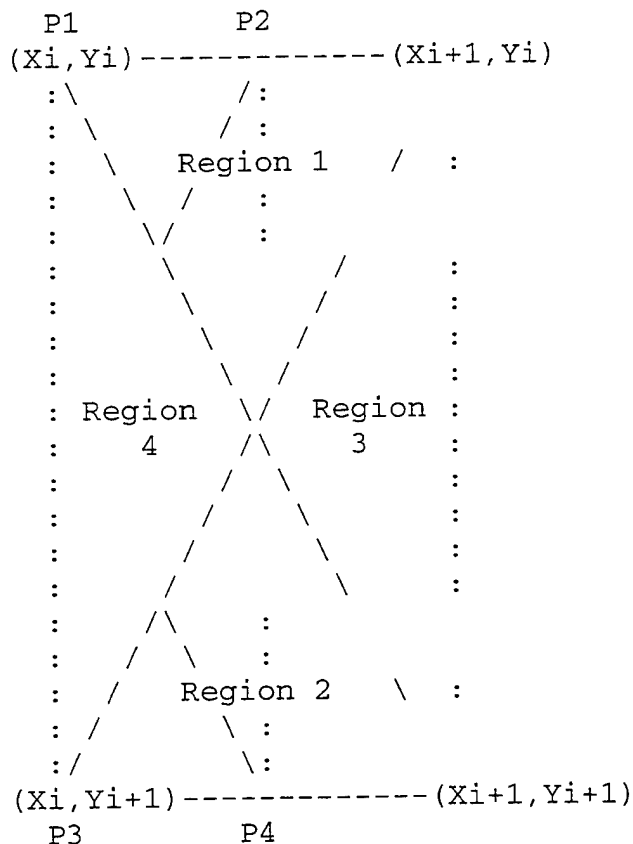
SUBROUTINE INTR2D

Created on: Wed Nov 18 15:44:44 1992

Revised on: Thu Jun 23 12:43:43 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the interpolation constants for a rectangular grid. First, the grid is searched to find the boundaries of the rectangular cell containing point (X_0, Y_0) . The interpolation weights are defined as zero except for the four (4) points that define the boundary of the cell. The interpolation is designed to define a unique representation for each point in the cell, such that the center point is a equally weighted set of all four corner values. The cell is divided into four (4) triangular regions (see below) and if the (X, Y) point falls within a given region, its interpolation weights are determined by the two corner values and the center point that define the triangle.



Note: The code is designed to handle the degenerate case for one-dimension (i.e., $NX=1$ or $NY=1$), as well as the double degenerate case (i.e., $NX=NY=1$).

CHARACTER*72 FUNCTION IOERR

Created on: 3 August 1993

Revised on: Tue Mar 1 07:55:55 1994

Created by: Dr. William M. Cornette

This FUNCTION returns the appropriate error message for the input value of IOS. The FUNCTION returns the message that an end-of-file was encountered if IOS=-1 and that normal operation if IOS=0, in accordance with the ANSI X3.9-1978 FORTRAN 77 Standard. For all other values of IOS, the message is system dependent. The following systems are implemented:

- Unix (at least for SGI and HP. Not tested on others)
- PC Lahey F77L and F77L EM/32 compilers
- IBM VS
- VAX

A generic capability is also included. If your computer uses a different method for obtaining error messages, please notify the author.

SUBROUTINE ISRAEL

Created on: Wed Nov 18 15:53:43 1992

Revised on: Tue May 24 13:18:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE makes sure that the Israeli Standard Atmosphere is correct for day vs. night conditions.

INTEGER FUNCTION ISTAER

Created on: Wed Nov 18 15:53:46 1992

Revised on: Mon Nov 7 14:34:03 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the type of aerosol.

SUBROUTINE KDISTR

Created on: Wed Nov 18 15:48:11 1992

Revised on: Tue Nov 22 09:07:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE generates the k-distributions for the multiple scattering binary data file.

SUBROUTINE LAYLW

Created on: Wed Nov 18 15:49:01 1992

Created by: Dr. William M. Cornette

This SUBROUTINE computes the optical path and path-weighted temperature matrices from the vertical integrated absorber amounts.

SUBROUTINE LCTRIM

Created on: Wed Nov 18 15:49:04 1992

Created by: Dr. William M. Cornette

This SUBROUTINE trims any leading blanks from the character string CHRSTR.

INTEGER FUNCTION LENSTR

Created on: Wed Nov 18 15:49:06 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the length of the non-blank string contained in CHRSTR.

CHARACTER*(*) FUNCTION LWCASE

Created by: Dr. William M. Cornette

Created on: Tue Jul 28 14:49:15 1992

Revised on: Mon Aug 2 11:06:29 1993

This FUNCTION converts STRING from upper case to lower case.

SUBROUTINE LYRINT

Created on: Wed Nov 18 15:49:14 1992

Revised on: Thu Jun 23 12:43:40 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the layers for heat transfer calculations.

SUBROUTINE MARINE

Created on: Wed Nov 18 15:49:32 1992

Revised on: Thu Jun 23 12:43:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the aerosol extinction and absorption coefficients for the Navy Maritime model.

INTEGER FUNCTION MDLATM

Created on: Wed Nov 18 15:49:36 1992

Revised on: Thu Feb 11 15:24:38 1993

Created by: Dr. William M. Cornette

This FUNCTION determines the model atmosphere number from the latitude index and the season index.

SUBROUTINE MIE

Created on: Wed Nov 18 15:49:38 1992

Revised on: Thu Jun 23 12:43:32 1994

This SUBROUTINE calculates extinction, total scattering, and asymmetry parameters for a given size parameter and relative refractive index.

SUBROUTINE MIEINP

Created on: Wed Nov 18 15:49:41 1992

Revised on: Tue Nov 22 09:07:07 1994

Created by: Dr. William M. Cornette

This SUBROUTINE will read in the parameters for the Mie calculations.

SUBROUTINE MIEPHS

Created on: Wed Nov 18 15:49:45 1992

Revised on: Thu Jun 23 12:43:27 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the absorption and scattering coefficients, the asymmetry factor, and the polarized phase matrix.

SUBROUTINE MLSCAT

Created on: Wed Nov 18 15:49:47 1992

Revised on: Mon Nov 7 14:33:44 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the multiple scattering terms.

SUBROUTINE MODBCK

Created on: Wed Feb 24 11:29:35 1993

Revised on: Thu May 20 15:01:37 1993

Created by: Dr. William M. Cornette

This SUBROUTINE modifies the background parameters for snow conditions.

INTEGER FUNCTION MONTH

Created on: Wed Nov 18 15:49:55 1992

Revised on: Mon Aug 2 13:11:34 1993

Created by: Dr. William M. Cornette

This FUNCTION determines the month of the year from a CHARACTER argument. For example, if the CHARACTER argument is either 'JAN', 'Jan', 'jan', or '1', the function returns the value of 1 for the first month.

PROGRAM MOSART

Created on: Wed Nov 18 15:49:58 1992

Revised on: Tue Nov 22 09:07:01 1994

Created by: Dr. William M. Cornette

Moderate Spectral Atmospheric Radiance and Transmittance Code

SUBROUTINE MRNDFL

Created on: Wed Nov 18 15:50:02 1992

Created by: Dr. William M. Cornette

This SUBROUTINE determines the parameters for the Navy marine aerosol model.

INTEGER FUNCTION NCHAER

Created on: Wed Nov 18 15:49:55 1992

Revised on: Tue Jun 28 08:00:21 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the aerosol model index from a CHARACTER argument. For example, if the CHARACTER argument is either 'RU', 'Ru', 'ru', or '1', the function returns the value of 1 for the Rural Aerosol Model.

INTEGER FUNCTION NCHATM

Created on: Wed Nov 18 15:49:55 1992

Revised on: Mon Aug 2 11:04:39 1993

Created by: Dr. William M. Cornette

This FUNCTION determines the model atmosphere index from a CHARACTER argument. For example, if the CHARACTER argument is either 'EQUATO', 'Equato', 'equato', or '1', the function returns the value of 1 for the Equatorial Model Atmosphere.

INTEGER FUNCTION NCHAZE

Created on: Wed Nov 18 15:49:55 1992

Revised on: Tue Jun 28 08:00:21 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the haze profile index from a CHARACTER argument. For example, if the CHARACTER argument is either 'BACKGR', 'Backgr', 'backgr', or '1', the function returns the value of 1 for Background.

INTEGER FUNCTION NCHSEA

Created on: Wed Nov 18 15:49:55 1992

Revised on: Tue Jun 28 08:00:21 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the season index from a CHARACTER argument. For example, if the CHARACTER argument is either 'SUMMER', 'Summer', 'summer', or '1', the function returns the value of 1 for Spring/Summer.

INTEGER FUNCTION NCYCLE

Created on: Wed Nov 18 15:50:18 1992

Revised on: Thu Feb 11 15:33:38 1993

Created by: Dr. William M. Cornette

This FUNCTION functions in a mode similar to the generic MOD function, only the value returned varies from 1 to NMOD, rather than 0 to NMOD-1. If the value is negative, it is added to NMOD.

SUBROUTINE NXXPAU

Created on: Wed Nov 18 15:50:21 1992

Revised on: Mon May 17 16:40:52 1993

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the location of the tropopause according to the definition of the conventional tropopause of the World Meteorological Organization:

The conventional tropopause is the lowest altitude at which the lapse rate decreases to 2 deg C/km or less, provided also that the average lapse rate between this altitude and all higher altitudes within two kilometers does not exceed 2 deg C/km.

Note - The lapse rate equals $-DT/DZ$ (i.e., the rate of decrease of temperature with altitude). The average lapse rate is the difference between the temperatures at the respective end points divided by the altitude interval, irrespective of the lapse-rate variations in between the end points. All higher altitudes mean that no point on the profile in the two-kilometer interval above the lowest altitude can fall to the left of the 2 deg C/km line extending from the lowest altitude.

Reference - Air Weather Service Manual AWSM 105-124 Dated 15 July 1969, Page 6-19, Paragraph 6.10.1

Also, the stratopause and mesopause are also calculated.

Note: If any of the values are meaningless, then default values of 10 km, 35 km, and 75 km are used for the tropopause, stratopause, and mesopause, respectively.

REAL FUNCTION O2CNT

Created on: Wed Nov 18 15:47:42 1992

Revised on: Tue Mar 1 07:55:43 1994

Created by: Dr. William M. Cornette

This FUNCTION provides the oxygen continuum coefficients as a function of wavenumber and temperature.

SUBROUTINE OPATH

Created on: Wed Nov 18 15:47:45 1992

Revised on: Thu Jun 23 12:43:22 1994

Created by: Dr. William M. Cornette

This SUBROUTINE performs the vertical integration to obtain the layer absorber amounts, optical paths, flux transmissivity, and optical path matrices.

SUBROUTINE OPNSCR

Created on: Wed Nov 18 15:47:47 1992

Revised on: Tue Nov 2 10:43:14 1993

Created by: Dr. William M. Cornette

This SUBROUTINE OPENS a scratch file on an available file unit.

SUBROUTINE PARSE

Created on: Wed Nov 18 15:59:33 1992

Revised on: Thu Jun 23 12:43:39 1994

Created by: Dr. William M. Cornette

This SUBROUTINE parses the CHARACTER string VARIN and places one field in each CHARACTER string VAROUT.

REAL FUNCTION PARTIT

Created on: Wed Nov 18 15:59:36 1992

Revised on: Wed Jun 15 14:01:11 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the vibration and rotation partition functions, relative to a reference temperature, for a variety of different molecules.

REAL FUNCTION PFR

Created on: Wed Nov 18 15:59:39 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates H₂O partition function corrections.

SUBROUTINE PHFUNC

Created on: Wed Nov 18 15:59:45 1992

Revised on: Thu Jun 23 12:43:03 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the scattering phase function for a specified set of aerosols and hydrometeors.

REAL FUNCTION PHMLSC

Created on: Fri May 26 14:38:54 1995

Revised on: Fri May 26 15:32:23 1995

Created by: Dr. William M. Cornette

This FUNCTION calculates the single scattering phase function for molecular scattering.

Reference: Cornette, "Suggested modification to the total volume molecular scattering coefficient in LOWTRAN," Applied Optics, Vol. 19 (1980), pp A182-3.

SUBROUTINE PHYDRO

Created on: Wed Nov 18 15:59:48 1992

Revised on: Thu Jun 23 12:43:12 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the scattering phase function for a specified set of hydrometeors.

REAL FUNCTION PLANCK

Created on: Wed Nov 18 15:59:51 1992

Revised on: Tue Nov 2 10:42:47 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the spectral blackbody curve (Planck function) ($\text{W}/\text{cm}^2/\text{cm}^{-1}$).

SUBROUTINE PLANET

Created on: Wed Nov 18 15:59:54 1992

Revised on: Tue Nov 2 10:42:22 1993

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the perturbation on the solar ephemeris due to the moon and planets.

SUBROUTINE PLMSUB

Created on: Wed Nov 18 16:00:00 1992

Revised on: Mon Nov 7 14:34:02 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the parameters for the plume file.

DOUBLE PRECISION FUNCTION POLY

Created on: Wed Nov 18 16:00:05 1992

Revised on: Mon Aug 2 11:06:55 1993

This FUNCTION calculates the polynomial $C1+C2*X+...+CN*X^{**N-1}$.

SUBROUTINE PRALT

Created on: Wed Nov 18 16:00:07 1992

Revised on: Tue Mar 1 07:55:41 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the pressure altitude (km) from the pressure, assuming the U.S. Standard (1976) Atmosphere. If the pressure is greater than 1777.6 mb or less than 0.0044568 mb, the altitude is set to 0.0, and the error flag is set.

SUBROUTINE PRCALC

Created on: Wed Nov 18 16:00:10 1992

Revised on: Tue Nov 22 09:07:07 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the transmittance and radiance for the observer-source-background, observer-source-solar/lunar, observer-background-solar/lunar paths, plus skyshine on source and background.

SUBROUTINE PRETEM

Created on: Wed Nov 18 16:00:25 1992

Revised on: Mon Nov 7 14:34:01 1994

Created by: Dr. William M. Cornette

This SUBROUTINE computes the vertical profiles of temperature altitude, H_2O , CO_2 , and O_3 as a function of pressure. The pressure runs from 10 to 1010 mb in increments of 10 mb.

SUBROUTINE PROFAC

Created on: Wed Nov 18 16:00:28 1992

Revised on: Mon May 17 17:33:59 1993

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the parameters required for interpolation.

SUBROUTINE PROMPT

Created on: Wed Nov 18 16:00:30 1992

Revised on: Tue Mar 1 07:55:50 1994

Created by: Dr. William M. Cornette

This SUBROUTINE uses non-standard FORTRAN (where possible) so that a screen prompt does not give a line feed (or carriage return) immediately after writing the string.

SUBROUTINE PRTHDR

Created by: Dr. William M. Cornette

Created on: Tue Nov 22 09:07:13 1994

Revised on: Tue Jun 28 12:34:24 1994

This SUBROUTINE prints the MOSART file header in ASCII form.

SUBROUTINE PTHOSB

Created on: Wed Nov 18 16:00:41 1992

Revised on: Tue Nov 22 09:07:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the path radiance and variation along the observer-source-background path.

SUBROUTINE PTHTAU

Created on: Wed Nov 18 16:00:45 1992

Revised on: Mon Nov 7 14:34:01 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the transmittance along a path. Either the final transmittance or the incremental transmittances are calculated.

SUBROUTINE PUTCLD

Created on: Wed Nov 18 16:00:50 1992

Revised on: Tue Nov 22 09:07:07 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out the cloud summary data.

SUBROUTINE PUTHDR

Created on: Wed Nov 18 16:00:54 1992

Revised on: Mon Nov 28 10:08:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out the header for the various binary data files.

SUBROUTINE PUTSLR

Created on: Wed Nov 18 16:00:57 1992

Revised on: Tue Nov 22 09:07:06 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out the solar, lunar, and ephemeris summary data.

REAL FUNCTION RAB

Created on: Wed Nov 18 16:01:08 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite reflection function from above given individual layer reflection and transmission functions.

REAL FUNCTION RADFLD

Created on: Wed Nov 18 16:01:12 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the radiation field for the absorption coefficients.

REAL FUNCTION RADTRX

Created on: Wed Nov 18 16:01:16 1992

Revised on: Mon May 17 17:34:01 1993

Created by: Dr. William M. Cornette

This FUNCTION performs the integral of $Y(X)/X$ between $X1$ and $X2$ assuming Y/X and X vary exponentially with respect to the free parameter R .

REAL FUNCTION RADTRY

Created on: Wed Nov 18 16:01:18 1992

Revised on: Mon May 17 17:34:04 1993

Created by: Dr. William M. Cornette

This FUNCTION performs the integral of $Y(X)$ between $X1$ and $X2$ assuming Y varies exponentially with respect to the parameter X .

REAL FUNCTION RAINEX

Created on: Wed Nov 18 16:01:22 1992

Revised on: Mon May 17 17:34:07 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the extinction coefficient for rain, based upon the assumption that the drop diameter is large relative to the wavelength so that the Mie extinction efficiency is independent of wavelength ($Q_{\text{ext}}=2.0$). This assumes that the drop diameter is between 0.1 and 10 mm.

SUBROUTINE RAINSP

Created on: Wed Nov 18 16:01:24 1992

Revised on: Thu Jun 23 12:42:49 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the normalized (to 0.55 μm) absorption and scattering coefficients for rain.

SUBROUTINE RAYPTH

Created on: Wed Nov 18 16:01:28 1992

Revised on: Mon Nov 7 14:34:00 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for a specified ray path through a spherically isotropic atmosphere.

REAL FUNCTION RBE

Created on: Wed Nov 18 16:01:30 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite reflection function from below given individual layer reflection and transmission functions.

SUBROUTINE RDFLTR

Created on: Wed Nov 18 16:01:35 1992

Revised on: Tue Nov 22 09:07:06 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the user-defined filter response.

SUBROUTINE RDGBL

Created on: Mon Mar 8 15:43:02 1993

Revised on: Tue Nov 22 09:07:03 1994

Created by: Dr. William M. Cornette

This SUBROUTINE obtains the global climatology parameters from the global data base, or sets defaults values.

SUBROUTINE RDLIN

Created on: Wed Nov 18 16:01:38 1992

Revised on: Wed Jun 15 14:01:21 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads an input buffer from unit IUNIT. It is assumed that the input file is structured in CHARACTER*80 lines with any line that is to be continued terminated by the '&' character. Any number of characters can be read subject to the limitation that only a string of the maximum length of OUTBUF will be returned. ISKIP characters and any leading blanks will be ignored in the first line read.

SUBROUTINE RDSCN

Created on: Mon Mar 8 15:43:02 1993

Revised on: Tue Nov 22 09:07:03 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads the scene type and the altitude from the scenes data base, or sets defaults values.

COMPLEX FUNCTION REFEST

Created on: Wed Nov 18 16:01:42 1992

Revised on: Mon Apr 25 08:34:55 1994

Created by: Dr. William M. Cornette

This FUNCTION estimates the complex index of refraction from the reflection coefficient.

DOUBLE PRECISION FUNCTION REFRAC

Created on: Wed Nov 18 16:01:49 1992

Revised on: Thu Jun 23 12:43:50 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the refractivity or modified refractivity of the earth's atmosphere.

Note - Refractivity, $N = (n-1) \times 10^6$, where n is the index of refraction.

Modified refractivity, $M = (nr/r_e - 1) \times 10^6$, where r_e is the radius of the earth and $r = r_e + h$, where h is the altitude.

REAL FUNCTION RELHUM

Created on: Wed Nov 18 16:01:52 1992

Created by: Dr. William M. Cornette

This FUNCTION determines the relative humidity using a modified definition of the relative humidity as defined by the Twelfth Conference of Directors of the International Meteorological Organization (Resolution 166, dated 1947). The modification involves the expression of relative humidity as a fraction rather than a percentage.

SUBROUTINE RESOLV

Created on: Wed Nov 18 16:01:55 1992

Revised on: Thu Jun 23 12:43:42 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the increment of the calculations.

SUBROUTINE RSHINE

Created on: Wed Nov 18 16:01:58 1992

Revised on: Mon Nov 7 14:33:42 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the skyshine.

REAL FUNCTION SATUR

Created on: Wed Nov 18 16:02:09 1992

Revised on: Thu Jun 23 12:43:30 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the saturation level of water vapor or ice in ppmv.

REAL FUNCTION SCINTL

Created on: Wed Nov 18 16:02:12 1992

Revised on: Mon May 17 16:40:46 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the scintillation from the path averaged turbulence. Aperture averaging using the work of D.L. Fried (JOSA 57 (1967) pp. 169-175) is used.

SUBROUTINE SCNRIO

Created on: Wed Nov 18 16:02:15 1992

Revised on: Tue Nov 22 09:11:59 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the ray paths for the desired observer-source-background geometry scenario.

REAL FUNCTION SEAICE

Created on: Mon Mar 8 15:43:02 1993

Revised on: Tue May 2 16:38:12 1995

Created by: Dr. William M. Cornette

This SUBROUTINE reads the scene type and the altitude from the scenes data base, or sets defaults values.

REAL FUNCTION SEATMP

Created on: 12 April 1993

Revised on: Tue Nov 2 10:42:47 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the ocean temperatures (K) at the surface for four seasons of the year. A temperature of zero (0.0) implies that only terrain exists in the 5 deg by 5 deg resolution cell.

COMPLEX FUNCTION SEAWTR

Created on: Wed Nov 18 16:02:19 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the complex dielectric constant of water and sea water by the Debye formula.

Reference: Saxton and Lane, Wireless Engineer, Oct. 1952.

SUBROUTINE SETALT

Created on: Wed Nov 18 16:02:21 1992

Revised on: Mon Nov 7 14:33:59 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the altitude grid points.

SUBROUTINE SETBCK

Created on: Wed Nov 18 16:02:26 1992

Revised on: Tue Nov 22 09:07:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE sets the background parameters.

SUBROUTINE SETFLG

Created on: Wed Nov 18 16:02:29 1992

Revised on: Mon Apr 25 08:34:59 1994

Created by: Dr. William M. Cornette

This SUBROUTINE sets the flags for various calculational paths.

SUBROUTINE SETUP

Created on: Mon Jan 6 14:37:32 1992

Revised on: Thu Jun 23 12:43:45 1994

Created by: Dr. William M. Cornette

This SUBROUTINE provided the inputs for the skyshine rays.

REAL FUNCTION SHADOW

Created on: Wed Nov 18 16:02:39 1992

Revised on: Tue Nov 2 10:42:47 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the self-shadowing of a rough surface.

SUBROUTINE SHNGEO

Created on: Wed Nov 18 16:02:42 1992

Revised on: Tue Nov 22 09:07:15 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for the scattered solar/lunar irradiance.

SUBROUTINE SKYNOI

Created on: Wed Nov 18 16:02:46 1992

Revised on: Tue May 24 13:18:21 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines the temperature variations for the skynoise calculations.

REAL FUNCTION SLPOS

Created on: Wed Nov 18 16:02:50 1992

Revised on: Thu Jun 23 12:43:28 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the solar or lunar positions given latitude and longitude of the sub-solar/lunar point, including the effects of refraction.

REAL FUNCTION SLRCNT

Created on: Wed Nov 18 16:02:55 1992

Revised on: Tue Mar 1 07:55:46 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the exoatmospheric solar constant (W/m^2).

REAL FUNCTION SLUNAR

Created on: Wed Nov 18 16:02:58 1992

Revised on: Thu Jun 23 12:43:38 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the lunar exoatmospheric irradiance ($\text{W/cm}^2/\text{cm}^{-1}$).

SUBROUTINE SMPCAL

Created on: Wed Nov 18 16:03:02 1992

Revised on: Tue Nov 8 11:27:29 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the altitude dependent irradiance profiles for the simple solar calculations and the lunar calculations.

REAL FUNCTION SNOWEX

Created on: Wed Nov 18 16:03:07 1992

Revised on: Tue Mar 1 07:55:42 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the extinction due to falling snow at $0.55 \mu\text{m}$.

SUBROUTINE SNOWSP

Created on: Wed Nov 18 16:03:14 1992

Revised on: Thu Jun 23 12:42:49 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the normalized (to $0.55 \mu\text{m}$) absorption and scattering coefficients for snow.

SUBROUTINE SOIL

Created on: Wed Nov 18 16:03:16 1992

Revised on: Thu Jun 23 12:43:55 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the soil mean dielectric constant and variance by biphasic mixture formula.

Reference: Wang and Schmugge, AE-18, No. 4, 1980 pp 288-293.

REAL FUNCTION SOLAR

Created on: Wed Nov 18 16:03:18 1992

Revised on: Tue Mar 1 07:55:46 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the exoatmospheric solar spectral irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$).

SUBROUTINE SOLBND

Created on: Wed Nov 18 16:03:22 1992

Revised on: Tue Nov 22 09:07:17 1994

Created by: Dr. William M. Cornette

This SUBROUTINE computes the layer optical properties in the solar band and then performs the radiative transfer.

SUBROUTINE SOLRAD

Created on: Wed Nov 18 16:03:25 1992

Revised on: Tue Nov 22 09:07:15 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the various solar radiation parameters. It is also used for the lunar radiation parameters.

SUBROUTINE SPCLYR

Created on: Wed Nov 18 16:03:36 1992

Revised on: Thu Jun 23 12:43:49 1994

Created by: Dr. William M. Cornette

This SUBROUTINE specifies the properties of the sublayer.

REAL FUNCTION SPHAIR

Created on: Wed Jan 5 16:03:47 1995

Revised on: Tue May 2 16:38:11 1995

Created by: Dr. William M. Cornette

This FUNCTION calculates the specific heat of air as a function of water vapor content (W-sec/gm/K).

REAL FUNCTION SPHICE

Created on: Wed Nov 18 16:03:47 1992

Revised on: Mon May 17 16:42:59 1993

This FUNCTION calculates the specific heat of ice as a function of temperature (W-sec/gm/K).

REAL FUNCTION SPHWTR

Created on: Wed Nov 18 16:03:56 1992

Revised on: Mon May 17 16:42:24 1993

This FUNCTION calculates the specific heat of water as a function of temperature (W-sec/gm/K).

SUBROUTINE SPROD

Created on: Wed Nov 18 16:03:58 1992

Created by: Dr. William M. Cornette

This SUBROUTINE computes the layer diffuse flux that is produced from the solar beam using the particular solution to the two-stream approximation. (Ref. J. Jafolla, Ph.D. Thesis, 1981).

SUBROUTINE SPTRIG

Created on: Wed Nov 18 16:04:02 1992

Revised on: Tue Apr 6 16:00:03 1993

Created by: Dr. William M. Cornette

This SUBROUTINE determines the latitude and longitude of a point a given angular distance away from a reference latitude and longitude.

SUBROUTINE SRAT

Created on: Wed Nov 18 16:04:05 1992

Revised on: Thu Jun 23 12:43:42 1994

Created by: Dr. William M. Cornette

This SUBROUTINE computes the spherical atmosphere correction to the layer local zenith angle (Ref. J. Jafolla, Ph.D. Thesis, 1981).

SUBROUTINE SRCFLX

Created on: Wed Nov 18 16:04:09 1992

Revised on: Tue Nov 22 09:07:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the flux (up and down longwave; up, down, and beam shortwave) at the source altitude.

SUBROUTINE SRCGEO

Created on: Wed Nov 18 16:04:15 1992

Revised on: Tue Nov 22 09:07:16 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometric parameters for a point source (e.g., sun or moon).

SUBROUTINE SRCIRR

Created on: Mon Jan 6 14:37:32 1992

Revised on: Tue Nov 22 09:07:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the ray paths for the solar irradiance and sky/earthshine at the source.

REAL FUNCTION SRFLUX

Created on: Wed Nov 18 16:04:30 1992

Revised on: Thu Jun 23 12:43:38 1994

This FUNCTION calculates the heat flux at the surface.

SUBROUTINE SRTLAY

Created on: Wed Nov 18 16:04:37 1992

Revised on: Tue Nov 22 09:07:17 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the two stream spherical R and T values.

REAL FUNCTION STARAD

Created on: Wed Nov 18 16:04:40 1992

Revised on: Mon May 17 17:34:28 1993

Created by: Dr. William M. Cornette

This FUNCTION calculates the spectral mean space background due to stars in $W/sr/cm^2/cm^{-1}$.

SUBROUTINE STGEOM

Created on: Wed Nov 18 16:04:43 1992

Revised on: Mon Nov 7 14:34:14 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the geometry index based upon an input CHARACTER string.

REAL FUNCTION STRCN2

Created on: Wed Nov 18 16:04:49 1992

Revised on: Mon Nov 7 14:33:58 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the index of refraction structure constant, Cn^2 .

SUBROUTINE SUMFIL

Created on: Wed Nov 18 16:04:53 1992

Revised on: Tue Nov 22 09:07:03 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out a summary of the environmental conditions represented on the main header.

REAL FUNCTION SUPK

Created on: Wed Nov 18 16:04:57 1992

Revised on: Mon Aug 2 11:06:25 1993

Created by: Dr. William M. Cornette

This FUNCTION computes the super kinetic line profile factor.

SUBROUTINE SWAT

Created on: Wed Nov 18 16:04:59 1992

Created by: Dr. William M. Cornette

This SUBROUTINE computes the three (up, down diffuse, down direct) stream solar band fluxes using a recursive adding technique (Ref. J. Jafolla, Ph.D. Thesis, 1981).

SUBROUTINE TANGPT

Created on: Wed Nov 18 15:50:35 1992

Revised on: Tue Nov 22 09:07:12 1994

Created by: Dr. William M. Cornette

This SUBROUTINE determines if a tangent point exists along a ray path. If it does, it adds the appropriate data to the arrays.

SUBROUTINE TERMPR

Created on: Wed Nov 18 15:52:14 1992

Revised on: Mon Nov 7 14:33:45 1994

Created by: Dr. William M. Cornette

This SUBROUTINE loads background index and establishes the projection of the solar/lunar ray on the background surface.

REAL FUNCTION THCAIR

Created on: Wed Jan 5 15:52:29 1995

Revised on: Tue May 2 16:38:11 1995

Created by: Dr. William M. Cornette

This FUNCTION calculates the thermal conductivity of air as a function of temperature (W/m/K).

REAL FUNCTION THCICE

Created on: Wed Nov 18 15:52:11 1992

Revised on: Mon May 17 16:43:20 1993

This FUNCTION calculates the thermal conductivity of ice as a function of temperature (W/m/K).

REAL FUNCTION THCSNW

Created on: Wed Nov 18 15:52:22 1992

Revised on: Tue Nov 2 10:42:34 1993

This FUNCTION calculates the thermal conductivity of snow as a function of density (W/m/K).

REAL FUNCTION THCWTR

Created on: Wed Nov 18 15:52:29 1992

Revised on: Mon May 17 16:43:16 1993

This FUNCTION calculates the thermal conductivity of water as a function of temperature (W/m/K).

SUBROUTINE TITLCR

Created on: Wed Nov 18 15:52:32 1992

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE creates the standard portion of the title used as part of the first record in the MOSART binary data files.

SUBROUTINE ADDARR

Created on: Wed Nov 18 15:52:32 1992

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

DISCLAIMER: This routine was extracted from a document on how to obtain the time and date from an RS/6000 machine. It has not been tested.

The routine ADDARR is utterly stupid and should perhaps be called 'COPY'. The trick is that our program calls it by value, passing the address, and picks the result by reference, allowing access of the array. Maybe there is a smarter way of doing this, without the need of generating a new copy of the data.

REAL FUNCTION TMPCLD

Created on: Wed Nov 18 15:52:36 1992

Revised on: Thu Jun 23 12:43:48 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the temperature of a cloud based upon its radiance.

AD - INTEGER Variable - Cloud radiance ($\mu\text{W}/\text{cm}^2/\text{sr}$)

SUBROUTINE TRANLW

Created on: Wed Nov 18 15:52:40 1992

Revised on: Tue Mar 1 07:55:51 1994

Created by: Dr. William M. Cornette

This SUBROUTINE does a table look up with 2D interpolation from the Staley & Jurica tables to calculate an element $TF(K,L)$ in the total flux transmissivity matrix. Ref. Staley, D.O., and G.M. Jurica, 1974, JAM, 9, 365-372.

SUBROUTINE TRNSMT

Created on: Wed Nov 18 15:52:43 1992

Revised on: Mon Nov 7 14:33:57 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the total transmittance and the transmittance due to absorption.

SUBROUTINE TURBUL

Created on: Wed Nov 18 15:52:46 1992

Revised on: Wed Jun 15 14:01:02 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the turbulence parameters.

REAL FUNCTION UDIF

Created on: Wed Nov 18 15:45:33 1992

Created by: Dr. William M. Cornette

This FUNCTION calculates the three layer composite upward diffuse flux from solar beam given individual layer upward diffuse from solar fluxes and two-stream reflection and transmission functions.

SUBROUTINE UDLAY

Created on: Wed Nov 18 15:45:36 1992

Revised on: Tue Nov 22 09:07:16 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the diffuse upper and lower reflectances using a three-stream radiative transfer methodology.

CHARACTER*(*) FUNCTION UPCASE

Created by: Dr. William M. Cornette

Created on: Tue Jul 28 14:49:15 1992

Revised on: Mon Aug 2 11:06:27 1993

This FUNCTION converts STRING from lower case to upper case.

SUBROUTINE USRBCK

Created on: Wed Nov 18 15:45:52 1992

Revised on: Tue Nov 22 09:07:06 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads the user-defined background file and loads the appropriate arrays.

SUBROUTINE USRCLD

Created on: Wed Nov 18 15:45:59 1992

Revised on: Tue Nov 22 09:07:06 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the user-defined hydrometeor file.

SUBROUTINE USRDEF

Created on: Wed Nov 18 15:45:56 1992

Revised on: Tue Nov 22 09:07:12 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the user-defined atmospheric parameters.

REAL FUNCTION VIRIAL

Created on: Wed Nov 18 15:46:17 1992

Revised on: Tue May 2 16:38:11 1995

Created by: Dr. William M. Cornette

This SUBROUTINE determines the second and third virial coefficients for moist air.

REAL FUNCTION VISRH

Created on: Wed Nov 18 15:44:44 1993

Revised on: Mon Apr 25 08:35:00 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the meteorological range in km based upon the relative humidity, based on Hanel (1972).

SUBROUTINE VSA

Created on: Wed Nov 18 15:46:24 1992

Revised on: Tue May 24 13:17:44 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the vertical structure profile of aerosol density near the ground, including clouds and fog, at 9 altitudes between 0 and 2 km.

REAL FUNCTION XMCONV

Created on: Wed Nov 18 15:46:38 1992

Revised on: Thu Jun 23 12:43:29 1994

Created by: Dr. William M. Cornette

This FUNCTION converts the various types of units for molecular concentrations to ppmv.

SUBROUTINE XPNDAR

Created on: Wed Nov 18 15:46:41 1992

Revised on: Mon May 17 16:43:07 1993

Created by: Dr. William M. Cornette

This SUBROUTINE expands a partially filled array. The part of the array that has been filled must be ordered in X.

REAL FUNCTION XTERP

Created on: Wed Nov 18 15:46:44 1992

Revised on: Wed Oct 26 11:04:56 1994

Created by: Dr. William M. Cornette

This FUNCTION performs interpolation on the function $Y(X)$ to determine the value $Y(X_0)$. The search for the adjacent points in $X(I)$ to the value X_0 starts at $X(\text{KEY})$. If X_0 falls outside the range of $X(I)$, then either the value $X(1)$ or $X(N)$ is used, depending on whether X_0 is less than $X(1)$ or greater than $X(N)$, respectively.

REAL FUNCTION ZLAT

Created on: Wed Nov 18 15:46:58 1992

Revised on: Thu Jun 23 12:43:32 1994

Created by: Dr. William M. Cornette

This FUNCTION determines the zodiacal latitude.

REAL FUNCTION ZODICL

Created on: Wed Nov 18 15:47:05 1992

Revised on: Tue Jun 28 08:00:22 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the zodiacal light, employing a Lorentzian dust distribution. The radiance is calculated as a function of wavelength and geocentric ecliptic elongation and latitude.

SUBROUTINE ZROHDR

Created on: Wed Nov 18 15:47:12 1992

Revised on: Tue Nov 22 09:07:12 1994

Created by: Dr. William M. Cornette

This SUBROUTINE zeros the MOSART file header.

SUBROUTINE ZROINT

Created on: Wed Nov 18 15:47:14 1992

Revised on: Wed Oct 26 11:04:47 1994

Created by: Dr. William M. Cornette

This SUBROUTINE zeroes the summation variables for the spectral integration.

WRAPPER:

C Language Wrapper for the MOSART Code

CLEAR:

This routine is for use on a Sun computer to suppress the warning messages for Inexact and Underflow conditions.

3.2 Block Data Modules

The BLOCK DATA modules contained in the MOSART program are listed below in alphabetical order. A brief description and the Creation Date and the Revision Date are provided for each module.

BLOCK DATA ARSABD

Created on: Wed Nov 18 16:06:03 1992

Revised on: Tue May 4 12:03:52 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the model aerosols absorption coefficients.

BLOCK DATA ARSLBD

Created on: Wed Nov 18 16:06:03 1992

Revised on: Tue May 4 12:03:07 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the model aerosols.

BLOCK DATA ARSXBD

Created on: Wed Nov 18 16:06:03 1992

Revised on: Tue May 4 12:03:55 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the model aerosols extinction coefficients.

BLOCK DATA ATMSBD

Created on: Wed Nov 18 16:06:07 1992

Revised on: Tue May 24 13:17:40 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the model Atmospheres.

BLOCK DATA BKGDBD

Created on: Wed Nov 18 16:06:10 1992

Revised on: Tue May 24 13:17:39 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains all of the parameters for the earth background materials.

BLOCK DATA BKSTBD

Created on: Wed Nov 18 16:06:14 1992

Revised on: Mon May 17 16:35:56 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the parameters for the temperature-dependent background stratospheric aerosol model.

BLOCK DATA BRBNBD

Created on: Wed Nov 18 16:06:18 1992

Revised on: Tue Mar 1 07:55:52 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module provides the various constants for the broad-band, heat transfer calculations.

BLOCK DATA CFCBD

Created on:

Created by: Dr. William M. Cornette

This BLOCK DATA module provides the cross-sections for the chloro-fluorocarbons.

BLOCK DATA CHRCBD

Created on: Wed Nov 18 16:06:28 1992

Revised on: Tue Mar 1 07:55:45 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains miscellaneous CHARACTER strings.

BLOCK DATA CIRRBD

Created on: Wed Nov 18 16:06:31 1992

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the asymmetry factors for the cirrus cloud models.

BLOCK DATA CLDRBD

Created on: Wed Nov 18 16:06:35 1992

Revised on: Tue May 4 09:13:21 1993

Created by: Dr. William M. Cornette

This module contains the cloud and rain data bases.

BLOCK DATA CROSD

Created on: Wed Oct 2 09:41:44 1994

Revised on: Sun Nov 27 20:55:28 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the cross-sections of various molecules for which band parameters are not available.

BLOCK DATA DEVCBD

Created on: Wed Nov 18 16:08:22 1992

Revised on: Tue Nov 22 09:07:04 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module assigns file unit numbers for all files.

BLOCK DATA DSRTBD

Created on: Wed Nov 18 16:06:51 1992

Revised on: Mon Jul 5 11:41:48 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the desert aerosol extinction coefficients, absorption coefficients, and asymmetry parameters for four wind speeds: 0 m/sec, 10 m/sec, 20 m/sec, and 30 m/sec.

BLOCK DATA ECOSBD

Created on: 8 November 1993

Revised on: Tue May 2 16:38:12 1995

Created by: Dr. William M. Cornette

This BLOCK DATA contains the labels and conversions for the World Ecosystems (WE1.4D) data base, based on the Olson World Ecosystem Classes Version 1.4D. The data is a 10-minute GED grid with a mixed resolution of 10 to 30 minute. The positional error is unknown. Although there are 74 categories, 15 categories are not used, and two (2) categories are empty (i.e., City complexes CCX and Broadleaf Evergreen Scrub BES).

BLOCK DATA EMISBD

Created on: Wed Nov 18 16:06:57 1992

Revised on: Tue Mar 1 07:55:48 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the descriptions of various materials.

BLOCK DATA EXMLBD

Created on: Wed Nov 18 16:07:05 1992

Revised on: Wed Jun 15 14:01:10 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the non-latitude dependent molecular profiles.

BLOCK DATA GLCFBD

Created on: Wed Nov 18 16:07:10 1992

Revised on: Tue Mar 1 07:55:47 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the Gauss-Legendre coefficients.

BLOCK DATA H2OBD

Created on: Wed Nov 18 16:07:13 1992

Revised on: Tue Mar 1 07:55:36 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the parameters for the self-broadened correction to the water vapor continuum at 260 K and 296 K.

BLOCK DATA HAZEBD

Created on: Wed Nov 18 16:07:21 1992

Revised on: Mon May 17 16:36:04 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the haze profiles.

BLOCK DATA ICEBD

Created on: Wed Nov 18 16:07:24 1992

Revised on: Mon May 17 16:36:01 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module provides the real and imaginary indices of refraction for ice.

BLOCK DATA INFLBD

Created on: Fri Mar 30 14:49:28 1990

Revised on: Sat Jun 18 13:09:45 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample filter response spectral data file. The data contained in this sample file is for the photopic response of the human eye.

BLOCK DATA INPTBD

Created on: Wed Nov 18 16:08:25 1992

Revised on: Tue Nov 22 09:07:01 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains a sample input file.

BLOCK DATA LAGRBD

Created on: Wed Nov 18 16:08:28 1992

Revised on: Wed Nov 3 13:37:17 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the abscissas and weights for Laguerre integration. Also provided is the product of the weights, WLG, and the exponential of the abscissa, XLG, namely, WLGEX.

BLOCK DATA LUNPBD

Created on: Wed Nov 18 16:08:32 1992

Revised on: Wed Nov 3 13:37:16 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the lunar perturbations data selected from the Table of Motion of the Moon by Ernest W. Brown.

BLOCK DATA MARNBD

Created on: Wed Nov 18 16:08:36 1992

Revised on: Tue Mar 1 07:55:45 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the Navy Marine aerosol extinction and absorption data.

BLOCK DATA MOLNBD

Created on: Wed Oct 2 09:41:44 1994

Revised on: Mon Nov 7 14:33:37 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the names of the different molecules, aerosols, hydrometeors, and the like.

BLOCK DATA MOLPBD

Created on: Wed Nov 18 16:08:44 1992

Revised on: Tue Nov 22 09:07:11 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the molecular partition functions.

BLOCK DATA NO2BD

Created on: Wed Nov 18 15:44:44 1992

Revised on: Tue May 24 13:18:14 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the cross-sections of NO₂ between 14095 and 49970 cm⁻¹.

BLOCK DATA O2CBD

Created on: Wed Nov 18 16:08:46 1992

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the parameters for the oxygen continuum.

BLOCK DATA O2UVBD

Created on: Wed Nov 18 16:09:07 1992

Created by: Dr. William M. Cornette

This BLOCK DATA modules contains the Herzberg and Schumann-Runge O2 band model.

BLOCK DATA O3CWBD

Created on: Wed Nov 18 15:44:44 1992

Revised on: Tue May 24 13:18:15 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the cross-sections of the Chappuis and Wulf band of O3 between 9170 and 24565 cm⁻¹.

BLOCK DATA O3HHBD

Created on: Wed Nov 18 16:09:16 1992

Revised on: Tue May 24 13:18:18 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the ozone Hartley Huggins cross-sections for a temperature of 273 K. The units are of

The data now includes Molina & Molina data at 273 K with the temperature dependence determined from the 195 K Harvard measurements employing the Bass algorithm, $C_0*(1+C_1*T+C_2*(T**2))$. This is only for the wavelength range from 0.34 to 0.35 microns. Otherwise, the Bass data alone have been employed between 0.245 and 0.34 microns.

BLOCK DATA OCNTBD

Created on: 12 April 1993

Revised on: Mon Aug 2 09:52:44 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the ocean temperatures the surface for four seasons of the year. A temperature of zero (0.0) implies that only terrain exists in the 5 deg by 5 deg resolution cell.

BLOCK DATA PHFGBD

Created on: Wed Nov 18 16:09:31 1992

Revised on: Tue Mar 1 07:55:34 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the fog models.

BLOCK DATA PHHYBD

Created on: Wed Nov 18 16:09:34 1992

Revised on: Thu Feb 11 15:06:19 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the hydrometeor models.

BLOCK DATA PHMABD

Created on: Wed Nov 18 16:09:37 1992

Revised on: Tue Mar 1 07:55:35 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer maritime aerosol.

BLOCK DATA PHOCBD

Created on: Wed Nov 18 16:09:42 1992

Revised on: Tue Mar 1 07:55:33 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer oceanic aerosol.

BLOCK DATA PHRUBD

Created on: Wed Nov 18 16:09:45 1992

Revised on: Tue Mar 1 07:55:33 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer rural aerosol.

BLOCK DATA PHSTBD

Created on: Wed Nov 18 16:09:51 1992

Revised on: Tue Mar 1 07:55:32 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for all stratospheric were extrapolated exponentially for 65 angles.

BLOCK DATA PHTRBD

Created on: Wed Nov 18 16:09:54 1992

Revised on: Tue Mar 1 07:55:30 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the relative humidity dependent tropospheric aerosol.

BLOCK DATA PHURBD

Created on: Wed Nov 18 16:09:58 1992

Revised on: Tue Mar 1 07:55:31 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the phase functions for the relative humidity dependent boundary layer urban aerosol.

BLOCK DATA RAINBD

Created on: Wed Nov 18 16:10:01 1992

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the rain and snow model data.

BLOCK DATA REFRBD

Created on: Wed Nov 18 16:10:04 1992

Created by: Dr. William M. Cornette

This BLOCK DATA modules contains the parameters for the refractivity from 10 to 1000 GHz for H₂O vapor and O₂.

BLOCK DATA SCENBD

Created on: Wed Nov 18 16:10:07 1992

Revised on: Mon Jul 5 11:41:55 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains all of the parameters for the earth background scenes.

BLOCK DATA SICEBD

Created on: Wed Nov 18 16:10:01 1992

Revised on: Tue May 2 16:38:14 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the sea ice indices.

BLOCK DATA SLR1BD

Created on: Wed Nov 18 16:10:19 1992

Revised on: Thu Apr 13 17:35:24 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 100 and 10,000 cm^{-1} .

BLOCK DATA SLR2BD

Created on: Wed Nov 18 16:10:19 1992

Revised on: Thu Apr 13 17:35:32 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 10,001 and 20,000 cm^{-1} .

BLOCK DATA SLR3BD

Created on: Wed Nov 18 16:10:19 1992

Revised on: Thu Apr 13 17:35:37 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 20,001 and 30,000 cm^{-1} .

BLOCK DATA SLR4BD

Created on: Wed Nov 18 16:10:19 1992

Revised on: Thu Apr 13 17:35:43 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 30,001 and 40,000 cm^{-1} .

BLOCK DATA SLR5BD

Created on: Wed Nov 18 16:10:19 1992

Revised on: Thu Apr 13 17:35:48 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the spectral irradiance of the sun at the earth for the mean earth-sun distance above 40,001 cm^{-1} .

BLOCK DATA SNOWBD

Created on: Wed Nov 18 16:10:12 1992

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the parameters for snow.

BLOCK DATA SO2BD

Created on: Wed Nov 18 15:44:44 1992

Revised on: Tue May 24 13:18:15 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the cross-sections of SO_2 between 24820 and 52625 cm^{-1} .

BLOCK DATA STMLBD

Created on: Wed Nov 18 16:10:23 1992

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the data for the latitude dependent molecular profiles.

BLOCK DATA UFTPBD

Created on: Thu Sep 22 1993

Revised on: Tue Mar 1 07:55:50 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the pointer information for the MODTRAN molecular data base file 'UFTAPE'.

BLOCK DATA UPPRBD

Created on: Wed Nov 18 16:10:41 1992

Revised on: Tue May 24 13:17:39 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the atmospheric profile above 100 km altitude.

BLOCK DATA VIRLBD

Created on: Wed Nov 18 16:10:45 1992

Revised on: Tue May 2 16:38:10 1995

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the virial coefficients for dry air, vapor, and the interaction coefficient as a function of temperature.

BLOCK DATA WTRBD

Created on: Wed Nov 18 16:10:52 1992

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the index of refraction for water.

BLOCK DATA ZOD1BD

Created on: Wed Nov 18 16:10:59 1992

Revised on: Tue May 4 09:12:03 1993

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the first set of the zodiacal light parameters.

BLOCK DATA ZOD2BD

Created on: Wed Nov 18 16:10:59 1992

Revised on: Tue Mar 1 07:55:47 1994

Created by: Dr. William M. Cornette

This BLOCK DATA module contains the second set of zodiacal light parameters.

3.3 ASCBIN

The routines contained in the ASCBIN program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM ASCBIN

Created on: Tue Sep 25 09:40:01 1990

Revised on: Tue Nov 22 09:07:01 1994

Created by: Dr. William M. Cornette

MOSART ASCII from Binary Computer Code.

SUBROUTINE CONVAB

Created on: Tue Sep 25 09:41:05 1990

Revised on: Tue Nov 29 10:37:17 1994

Created by: Dr. William M. Cornette

This SUBROUTINE converts an MOSART binary data file into an ASCII data file. It also converts the ASCII data file into an MOSART binary file.

SUBROUTINE SETFIL

Created on: Mon Jul 23 11:23:58 1990

Revised on: Thu Jun 23 12:43:25 1994

Created by: Dr. William M. Cornette

This SUBROUTINE checks for the existence of a file, and if it exists, it OPENS the file.

SUBROUTINE SLITFN

Created on: Fri Nov 20 12:05:04 1992

Revised on: Thu Jun 30 11:12:28 1994

Created by: Dr. William M. Cornette

This SUBROUTINE initializes the slit function variables and then step-wise convolves the input parameter with the slit function weights.

SUBROUTINE TABLEA

Created on: Wed Apr 3 10:29:45 1991

Revised on: Tue Nov 22 09:07:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE provides the spectral data in an MOSART source binary data file in a tabular form.

SUBROUTINE TABLEB

Created on: Wed Apr 3 10:29:48 1991

Revised on: Tue Nov 22 09:07:12 1994

Created by: Dr. William M. Cornette

This SUBROUTINE provides the spectral data in an MOSART background binary data file in a tabular form.

SUBROUTINE TABLEH

Created on: Wed Apr 3 10:29:48 1991

Revised on: Tue Nov 22 09:07:12 1994

Created by: Dr. William M. Cornette

This SUBROUTINE provides the temporal data in an MOSART heat transfer binary data file in a tabular form.

SUBROUTINE TABLET

Created on: Wed Apr 3 10:29:48 1991

Revised on: Tue Nov 22 09:07:10 1994

Created by: Dr. William M. Cornette

This SUBROUTINE provides the spectral data in an MOSART molecular transmittance binary data file in a tabular form.

3.4 BBTEMP

The routines contained in the BBTEMP program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM BBTEMP

Created on: Thu Jul 2 11:49:18 1992
Revised on: Tue Nov 22 09:07:06 1994
Created by: Dr. William M. Cornette

Blackbody Temperature Summary Program.

This PROGRAM reads the '.atm' binary data file from MOSART and convert the radiance values to equivalent blackbody temperatures (K).

REAL FUNCTION INVPLK

Created on: Thu Jul 2 11:49:21 1992
Revised on: Fri Mar 26 16:06:00 1993
Created by: Dr. William M. Cornette

This FUNCTION calculates the temperature corresponding to the spectral blackbody curve (Planck function).

3.5 CRFILE

The routines contained in the CRFILE program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section. Except for the driver routines, MSAG and MDRI, the components of the SAG code are not provided.

SUBROUTINE CNVJTK

Created on: Wed Nov 18 16:00:30 1992
Revised on: Tue Apr 5 17:30:17 1994
Created by: Dr. William M. Cornette

This SUBROUTINE converts the MODTRAN JCHAR string to the MOSART indexing scheme.

SUBROUTINE CRBKGD

Created on: Tue Sep 25 09:41:02 1990

Revised on: Tue Mar 1 07:47:02 1994

Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined background data file.

PROGRAM CRFILE

Created on: Tue Sep 25 09:40:01 1990

Revised on: Tue Nov 22 09:07:05 1994

Created by: Dr. William M. Cornette

SUBROUTINE CRFLTR

Created on: Tue Sep 25 09:40:16 1990

Revised on: Thu Jun 23 12:43:25 1994

Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART filter response file.

SUBROUTINE CRINPT

Created on: Tue Sep 25 09:39:58 1990

Revised on: Tue Nov 22 09:07:00 1994

Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART input file.

SUBROUTINE CRUAER

Created on: Tue Sep 25 09:40:55 1990

Revised on: Tue Nov 2 10:43:27 1993

Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined aerosol data file.

SUBROUTINE CRUATM

Created on: Tue Sep 25 09:40:13 1990

Revised on: Tue Nov 22 09:06:59 1994

Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined atmosphere data file.

SUBROUTINE CRUCLD

Created on: Tue Sep 25 09:40:52 1990

Revised on: Tue Nov 2 10:43:25 1993

Created by: Dr. William M. Cornette

This SUBROUTINE creates the MOSART user-defined hydrometeor data file.

BLOCK DATA INARBD

Created on: Fri Mar 30 14:49:21 1990

Revised on: Sat Jun 18 13:09:45 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample user-defined aerosol file.

BLOCK DATA INBKBD

Created on: Fri Mar 30 14:49:35 1990

Revised on: Sat Jun 18 13:09:44 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample user-defined background and scene file.

BLOCK DATA INCLBD

Created on: Fri Mar 30 14:49:32 1990

Revised on: Sat Jun 18 13:09:43 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains a sample user-defined hydrometeor file.

SUBROUTINE MDRI

Created on: 6 July 1994

Created by: Dr. William M. Cornette

This SUBROUTINE has been modified to operate with CRFILE for MOSART user-defined files.

SUBROUTINE MENU

Created on: Mon Jul 23 11:24:00 1990

Revised on: Tue Mar 1 07:47:01 1994

Created by: Dr. William M. Cornette

This SUBROUTINE provides the keys and indices for the input to the MOSART code.

SUBROUTINE MSAG

Created on: Tue Mar 29 15:44:44 1994

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

This SUBROUTINE drives the SHARC/SAMM Atmosphere Generator for use by MOSART.

BLOCK DATA NRLBD

Created on: 6 July 1994

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the file number and names of the NRL data bases.

SUBROUTINE RDMDTN

Created on: Wed Nov 18 16:00:30 1992

Revised on: Tue Nov 22 09:06:59 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads a MODTRAN input file and creates an equivalent (at least approximately) MOSART input file.

3.6 FACET

The routines in the FACET program are listed below in alphabetical order, together with a brief description and the Creation Date and Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM FACET

Created on: Thu Jun 23 12:36:15 1992

Revised on: Tue Nov 22 09:07:05 1994

Created by: Dr. William M. Cornette

This PROGRAM computes the emitted and reflected radiances from a unit area flat plate. Emissivities can be either

- Lambertian (diffuse) or
- directional,

depending upon the available data. Reflectivities can be either

- Lambertian (diffuse),
- directional, or
- bidirectional,

depending upon the available data. The emissivity and reflectivity are related as follows:

Emissivity	Reflectivity		
	Diffuse	Directional	Bidirectional
Diffuse	x		
Directional		x	x

REAL FUNCTION ROUGH

Created on: Wed Nov 18 15:43:15 1992

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the amount of energy reflected specularly from a rough surface. Losses are due to incoherent scattering and interference.

REAL FUNCTION SURFAC

Created on: Wed Nov 18 15:41:27 1992

Revised on: Mon Nov 7 14:34:15 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the facet element radiance.

3.7 FPTEST

The routines contained in the Fptest program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE CKSTAT

Created on: Mon Aug 2 11:06:44 1993

Revised on: Thu Jun 23 12:43:48 1994

Created by: Dr. William M. Cornette

This SUBROUTINE checks for whether a code is running in static or dynamic mode and at what uninitialized variables are set.

REAL FUNCTION ZSTAT

LOGICAL FUNCTION FLCOL1

Created on: Thu Oct 28 1993

Revised on: Tue Nov 2 10:43:32 1993

Created by: Dr. William M. Cornette

This FUNCTION determines if a file written by the code can then be read by the code, or if column one is suppressed. A value of .TRUE. implies that the code can read a file that it has written.

PROGRAM Fptest

Created on: Tue Sep 15 1992

Revised on: Tue Nov 22 09:07:06 1994

Created by: Dr. William M. Cornette

This PROGRAM tests certain numerical algorithms for calculating key floating point parameters that are machine dependent.

INTEGER FUNCTION LRECHK

Created on: Tue Sep 15 1992

Revised on: Mon Nov 7 14:34:12 1994

Created by: Dr. William M. Cornette

This FUNCTIONs calculates the record length for different length and type of records. Duplicate methods for declaring variables (e.g., REAL and REAL*4, DOUBLE COMPLEX and COMPLEX*16) are declared in the more conventional method, with the alternate method commented out. Also, non-ANSI standard variable types (e.g., LOGICAL*1, INTEGER*1) are also commented out. Each type is commented out with the following abbreviations:

"CINT1" for INTEGER*1

"CINT4" for INTEGER*4

"CRL4" for REAL*4

"CRL8" for REAL*8

"CCM6" for COMPLEX*8

"CCM16" for COMPLEX*16

"CLOG2" for LOGICAL*2

"CLOG4" for LOGICAL*4

"CIBM" for IBM

"CUNV" for Univac

"CDBL" for the INTRINSICs DCMPLX and DIMAG

3.8 INSTDB

The routines contained in the CRFILE program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

PROGRAM INSTDB

Created on: Thu Jul 2 09:36:53 1992

Revised on: Tue Nov 22 09:07:02 1994

Created by: Dr. William M. Cornette

This PROGRAM installs the MOSART data bases.

Note: To OPEN the direct access files on an IBM VM/CMS operating system, certain file parameters must be set. Remove the occurrences of 'CIBMV' below.

3.9 MRFLTR

The routines contained in the MRFLTR program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE ATMINT

Created on: Wed Nov 18 15:41:04 1992

Revised on: Tue Nov 22 09:07:05 1994

Created by: Dr. William M. Cornette

This SUBROUTINE integrates the spectral data from the source file.

SUBROUTINE ATMOUT

Created on: Wed Nov 18 15:41:07 1992

Revised on: Tue Nov 22 09:07:04 1994

Created by: Dr. William M. Cornette

This SUBROUTINE prints out the atmospheric parameters.

SUBROUTINE BCKINT

Created on: Wed Nov 18 15:41:30 1992

Revised on: Tue Nov 22 09:07:05 1994

Created by: Dr. William M. Cornette

This SUBROUTINE integrates the background spectral data.

SUBROUTINE GETHDR

Created on: Wed Nov 18 15:56:33 1992

Revised on: Tue Nov 22 09:07:11 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads the MOSART file header into the COMMON block HEADER.

PROGRAM MRFLTR

Created on: Wed Nov 18 15:49:58 1992

Revised on: Tue Nov 22 09:07:04 1994

Created by: Dr. William M. Cornette

MOSART Spectral Filter Response Convolution Code.

3.10 PLTGEN

The routines contained in the PLTGEN program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE AGUTOL

Created on: Wed Feb 13 16:13:10 1991

Revised on: Thu Jun 23 12:43:39 1994

Created by: Dr. William M. Cornette

This SUBROUTINE is used by the NCAR graphics package for mapping the various axis.

CHARACTER*(*) FUNCTION APPEND

Created on: Mon Jul 23 11:23:50 1990

Revised on: Thu Jun 23 12:43:36 1994

Created by: Dr. William M. Cornette

This FUNCTION appends STRNG2 at the end of the non-blank portion of STRNG1.

BLOCK DATA PLTBD

Created on: Wed Jan 2 09:41:44 1991

Revised on: Wed Jun 15 14:01:07 1994

Created by: Dr. William M. Cornette

This BLOCK DATA contains the standard plot parameter definition for all plot types.

SUBROUTINE PLTDRV

Created on: Thu Nov 15 10:59:11 1990

Revised on: Tue Nov 22 09:07:11 1994

Created by: Dr. William M. Cornette

This SUBROUTINE is the driver for setting up the plots.

PROGRAM PLTGEN

Created on: Tue Sep 25 09:40:50 1990

Revised on: Tue Nov 22 09:07:11 1994

Created by: Dr. William M. Cornette

This PROGRAM initializes plotting with installation specific routines. Please refer to the installation instructions for customizing for a specific installation. This PROGRAM is the driver for the NCAR graphics package.

SUBROUTINE RDMSRT

Created on: Wed Apr 3 10:29:52 1991

Revised on: Tue Nov 22 09:07:11 1994

Created by: Dr. William M. Cornette

This SUBROUTINE reads in the MOSART .atm binary output file. The file is OPENed outside the SUBROUTINE by the main driver.

3.11 VISUAL

The routines contained in the VISUAL program are listed below in alphabetical order, together with a brief description and the Creation Date and the Revision Date for each routine. Routines that are duplicates of routines in the MOSART program or other utility programs can be found in the appropriate section.

SUBROUTINE COLOR

Created on: Thu Jul 2 09:12:48 1992

Revised on: Fri Mar 26 16:14:42 1993

Created by: Dr. William M. Cornette

This SUBROUTINE determines the human eye color response.

SUBROUTINE HUMAN

Created on: Thu Jul 2 09:12:55 1992

Revised on: Mon Aug 2 09:57:22 1993

Created by: Dr. William M. Cornette

This FUNCTION determines the spectral lumen/watt response of the human eye, based on available background illumination.

SUBROUTINE NRMLZ

Created on: Thu Jul 2 09:12:58 1992

Revised on: Fri Mar 26 16:14:34 1993

Created by: Dr. William M. Cornette

This SUBROUTINE normalizes the terms X and Y by the sum $X+Y+Z$.

SUBROUTINE SUMIT

Created on: Thu Jul 2 09:13:07 1992

Revised on: Thu Jun 23 12:43:50 1994

Created by: Dr. William M. Cornette

This SUBROUTINE performs an incremental integration of the variable RV over the spectral interval DV for the weights FILTER, X, Y, and Z.

PROGRAM VISUAL

Created on: Thu Jul 2 11:49:56 1992

Revised on: Tue Nov 22 09:07:04 1994

Created by: Dr. William M. Cornette

This PROGRAM reads the '.atm' binary data file from APART for the human visual response region of the spectrum (0.34 - 0.78 microns), determines the appropriate eye spectral response (i.e., photopic, scotopic, or mesopic), calculates the environmental parameters in lumen and evaluates the color content of the parameters.

3.12 FACET

PROGRAM FACET

Created on: Thu Jan 23 12:36:15 1992

Revised on: Thu Apr 13 17:47:29 1995

Created by: Dr. William M. Cornette

This PROGRAM computes the emitted and reflected radiances from a unit area flat plate. Emissivities can be either

- Lambertian (diffuse) or
- directional,

depending upon the available data. Reflectivities can be either

- Lambertian (diffuse),
- directional, or
- bidirectional,

depending upon the available data. The emissivity and reflectivity are related as follows:

Emissivity	Reflectivity		
	Diffuse	Directional	Bidirectional
Diffuse	x		
Directional		x	
			x

REAL FUNCTION ROUGH

Created on: Wed Nov 18 15:43:15 1992

Revised on: Mon Nov 7 14:34:13 1994

Created by: Dr. William M. Cornette

This FUNCTION calculates the amount of energy reflected specularly from a rough surface. Losses are due to incoherent scattering and interference.

REAL FUNCTION SURFAC

Created on: Wed Nov 18 15:41:27 1992

Revised on: Mon Nov 7 14:34:15 1994

Created by: Dr. William M. Cornette

This SUBROUTINE calculates the facet element radiance.

3.13 SCNGEN

SUBROUTINE COEFF

Created on: Thu Jul 2 08:59:07 1992

Revised on: Thu Feb 2 13:30:26 1995

Created by: Dr. William M. Cornette

This SUBROUTINE generates the Fourier coefficients for the scene by using random numbers scaled by the PSD. Since the resulting scene is real valued, half of the complex Fourier coefficients are redundant and only half the array space is required.

REAL FUNCTION CORF

Created on: Thu Jul 2 08:59:10 1992

Revised on: Mon Aug 2 09:56:46 1993

Created by: Dr. William M. Cornette

This FUNCTION returns the spatial correlation function given the correlation length (defined as the correlation function at $1/e$), the PSD frequency scale and the PSD power law index.

SUBROUTINE FM2D

Created on: Thu Jul 2 08:59:12 1992

Revised on: Fri Mar 26 16:12:17 1993

Created by: Dr. William M. Cornette

This SUBROUTINE performs a midpoint displacement and successive random additions in two dimensions.

SUBROUTINE FOUR1

Created on: Thu Jul 2 08:59:15 1992

Revised on: Thu Feb 2 13:30:06 1995

Created by: Dr. William M. Cornette

This SUBROUTINE performs the Cooley-Tukey Fast Fourier Transform.

$$\text{TRNSFM}(K) = \text{sum}(\text{PDATA}(J) * \text{EXP}(\text{ISIGN} * 2 * \text{PI} * \text{SQRT}(-1) * (J-1) * (K-1) / \text{NN})),$$

summed over all J and K from 1 to NN. The rms relative error is bounded by $6 * \text{SQRT}(2) * \text{LOG2}(\text{NN}) * 2^{(-B)}$, where B is the number of bits in the floating point fraction.

The output has the form such that the 1st (complex) value corresponds to 0 freq, the next to + DELF, up to $(N/2 - 1)$ DELF, then $-N/2$ DELF to the last entry corresponding to -DELF, where $\text{DELF} = 1/\text{NN}$.

REAL FUNCTION GAMMA

Created on: Thu Jul 2 08:59:17 1992

Revised on: Mon Aug 2 09:56:51 1993

Created by: Dr. William M. Cornette

This FUNCTION returns the gamma function of the argument for values of the argument greater than zero. It uses the polynomial approximation from the Handbook of Mathematical Functions (9th Dover printing) by Abramowitz and Stegun (page 257, 6.1.35).

REAL FUNCTION GAUS

Created on: Thu Jul 2 08:59:19 1992

Revised on: Mon Aug 2 09:56:50 1993

Created by: Dr. William M. Cornette

This FUNCTION produces Gaussian random numbers having the specified standard deviation by adding and scaling 12 uniform random numbers. The sum of 12 uniformly distributed random numbers on $(a, -a)$ has standard deviation = $2a$.

REAL FUNCTION KNU

Created on: Thu Jul 2 08:59:22 1992

Revised on: Mon Aug 2 09:56:43 1993

Created by: Dr. William M. Cornette

This FUNCTION returns the modified Bessel function K for values of the index greater than 0.5. It numerically evaluates an integral expression from The Handbook of Mathematical Functions (9th Dover edition) by Abramowitz and Stegun (page 376, 9.6.23). Accuracy is about three places.

SUBROUTINE RUNIF

Created on: Thu Jul 2 08:59:27 1992

Revised on: Fri Mar 26 16:11:55 1993

Created by: Dr. William M. Cornette

This FUNCTION is a random number generator that returns a value between 0. and 0. It is portable among a wide variety of computers. It generates a random number between 0.0 and 1.0 according to the algorithm presented by Bays and Durham (TOMS, 2, 59, 1976). The motivation for using this scheme, which resembles the Maclaren-Marsaglia method, is to greatly increase the period of the random sequence. If the period of the basic generator (UNI) is P, then the expected mean period of the sequence generated by RUNIF is given by new mean

$$P = \text{SQRT} (\text{PI} * \text{FACTORIAL}(N) / (8 * P)),$$

where FACTORIAL(N) must be much greater than P in this asymptotic formula. Generally, N should be around 32 if P=4.E6 as for UNI.

This routine was modified from a routine written by W. Fullerton (LANL).

REAL FUNCTION SCALE

Created on: Thu Jul 2 08:59:29 1992

Revised on: Mon Aug 2 09:56:48 1993

Created by: Dr. William M. Cornette

This FUNCTION returns the frequency scale required for specification of the 1-dimensional PSD from the spatial correlation length and the power law index by using the Fourier transform relationship between the PSD and the correlation function. The correlation length is defined as the correlation function evaluated at $1/e$. The algorithm evaluates the correlation function for various values of the frequency scale until the condition is satisfied.

PROGRAM SCNGEN

Created on: Thu Jul 2 08:59:38 1992

Revised on: Tue May 9 10:03:10 1995

Created by: Dr. William M. Cornette

This PROGRAM computes a 1024×1024 2-dimensional scene containing correlated random fluctuations described by a set of specified 1-dimensional PSDs. It is assumed that the fluctuations in the 2-dimensional scene are isotropic. Each PSD is completely described by a material correlation length, material scene variance, and material power law slope for each material in the scene. Different values of the input random number seed will produce statistically independent realizations of the scene. The 1-dimensional PSD for each material has the form,

$$\text{PSD}(KX) = 2 \cdot \text{SQRT}(\text{PI}) \cdot \text{VAR} \cdot (\text{GAMMA}(\text{ALPHA}/2.) / \text{GAMMA}((\text{ALPHA}-1.)/2.)) \\ / (K0 \cdot (1. + (KX/K0)**2)**(\text{ALPHA}/2.))$$

while the 2-dimensional PSD for each material has the form:

$$\text{PSD2D} = 2 \cdot \text{PI} \cdot (\text{ALPHA}-1.) \cdot \text{VAR} / (K0X \cdot K0Y) \cdot \\ ((1. + (KX/K0X)**2 + (KY/K0Y)**2)**(-(\text{ALPHA}+1.)/2.))$$

SUBROUTINE TDFFT

Created on: Thu Jul 2 08:59:41 1992

Revised on: Fri Mar 26 16:11:49 1993

Created by: Dr. William M. Cornette

This SUBROUTINE performs an in-place 2-dimensional FFT on the packed complex Fourier coefficients generated in COEFF and produces the real valued scene. It first partially unpacks the coefficients by creating one extra row in array UNPCK.

SUBROUTINE TILEIT

Created on: Wed Nov 18 15:44:44 1992

Revised on: Thu Feb 2 13:30:26 1995

Created by: Dr. William M. Cornette

This SUBROUTINE tiles a larger array using the results from a smaller array, with a smooth transition at the edges.

REAL FUNCTION UNI

Created on: Thu Jul 2 08:59:43 1992

Revised on: Fri Mar 26 16:11:46 1993

Created by: Dr. William M. Cornette

This FUNCTION is a pseudo-random number generator that produces numbers between 0. and 1. This code is portable among a wide variety of computers. UNI(R) undoubtedly is not as good as many readily available installation dependent versions, and so this routine is not recommended for widespread usage. Its redeeming feature is that the exact same random numbers (to within final round-off error) can be generated from machine to machine. Thus, programs that make use of random numbers can be easily transported to and checked in a new environment. The random numbers are generated by the linear congruential method described, e.g., by Knuth in Seminumerical Methods (pg. 9), Addison-Wesley, 1969. Given the l -th number of a pseudo-random sequence, the $l+1$ -st number is generated from

$$X(l+1) = (A * X(l) + C) \text{ MOD } M,$$

where here $M = 2^{**}22 = 4194304$, $C = 1731$ and several suitable values of the multiplier A are discussed below. Both the multiplier A and random number X are represented in double precision as two 11-bit words. The constants are chosen so that the period is the maximum possible, 4194304. In order that the same numbers be generated from machine to machine, it is necessary that 23-bit integers be

reducible modulo 2^{11} exactly, that 23-bit integers be added exactly, and that 11-bit integers be multiplied exactly. Furthermore, if the restart option is used (where R is between 0 and 1), then the product $R \cdot 2^{22} = R \cdot 4194304$ must be correct to the nearest integer. The first four random numbers should be 0.0004127026, 0.6750836372, 0.1614754200, and 0.9086198807. The tenth random number is 0.5527787209, and the hundredth is 0.3600893021. The thousandth number should be 0.2176990509. In order to generate several effectively independent sequences with the same generator, it is necessary to know the random number for several widely spaced calls. The l -th random number times 2^{22} , where $l = K \cdot P/8$ and P is the period of the sequence ($P = 2^{22}$), is still of the form $L \cdot P/8$. In particular, we find the l -th random number multiplied by 2^{22} is given by

$$\begin{aligned} I &= 0 \ 1 \cdot P/8 \ 2 \cdot P/8 \ 3 \cdot P/8 \ 4 \cdot P/8 \ 5 \cdot P/8 \ 6 \cdot P/8 \ 7 \cdot P/8 \ 8 \cdot P/8 \\ \text{UNI} &= 0 \ 5 \cdot P/8 \ 2 \cdot P/8 \ 7 \cdot P/8 \ 4 \cdot P/8 \ 1 \cdot P/8 \ 6 \cdot P/8 \ 3 \cdot P/8 \ 0 \end{aligned}$$

Thus the $4 \cdot P/8 = 2097152$ random number is $2097152/2^{22}$. Several multipliers have been subjected to the spectral test (see Knuth, p. 82). Four suitable multipliers roughly in order of goodness according to the spectral test are

$$\begin{aligned} 3146757 &= 1536 \cdot 2048 + 1029 = 2^{21} + 2^{20} + 2^{10} + 5 \\ 2098181 &= 1024 \cdot 2048 + 1029 = 2^{21} + 2^{10} + 5 \\ 3146245 &= 1536 \cdot 2048 + 517 = 2^{21} + 2^{20} + 2^9 + 5 \\ 2776669 &= 1355 \cdot 2048 + 1629 = 5^{10} + 7^7 + 1 \end{aligned}$$

In the table below $\text{LOG}_{10}(\text{NU}(I))$ gives roughly the number of random decimal digits in the random numbers considered I at a time.

C is the primary measure of goodness. In both cases bigger is better.

A	LOG ₁₀ NU(I)				C(I)			
	I=2	I=3	I=4	I=5	I=2	I=3	I=4	I=5
3146757	3.3	2.0	1.6	1.3	3.1	1.3	4.6	2.6
2098181	3.3	2.0	1.6	1.2	3.2	1.3	4.6	1.7
3146245	3.3	2.2	1.5	1.1	3.2	4.2	1.1	0.4
2776669	3.3	2.1	1.6	1.3	2.5	2.0	1.9	2.6
Best								
Possible	3.3	2.3	1.7	1.4	3.6	5.9	9.7	14.9

This code has been modified from a code developed by W. Fullerton (LANL).

3.14 TERTEM

INTEGER FUNCTION NCHTER

Created on: Wed Nov 18 15:49:55 1992

Revised on: Tue May 9 10:03:08 1995

Created by: Dr. William M. Cornette

This FUNCTION determines the terrain material index from a CHARACTER argument. For example, if the CHARACTER argument is either 'ASPHALT', 'Asphalt', 'asphalt', or '64 ', the function returns the value of 64 for Asphalt.

SUBROUTINE RDUSRM

Created on: Wed Apr 2 15:49:55 1995

Revised on: Tue May 9 10:03:11 1995

Created by: Dr. William M. Cornette

This SUBROUTINE reads in and initializes user-defined terrain materials for TERTEM.

PROGRAM TERTEM

Created on: Thu Aug 5 15:42:16 1994

Revised on: Fri May 26 15:32:25 1995

Created by: Dr. William M. Cornette

This PROGRAM calculates the terrain material temperatures for the GENESSIS code.

4.0 ROUTINE DATA DICTIONARY

4.1 MOSART Routines

The data dictionaries for the executable routines and BLOCK DATA for MOSART are given below.

Descriptions of all input variables, together with declarations of PARAMETERS, INTRINSIC and EXTERNAL routines, local variables, and COMMON blocks are provided.

REAL FUNCTION ABCCL4

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
INTRINSIC	INT
EXTERNAL	XTERP,CROSD

Local Variable Declarations:

INTEGER	I,N
REAL	TMP(5)

COMMON Blocks: /CRSECT/

REAL FUNCTION ABHNO4

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
INTRINSIC	INT
EXTERNAL	XTERP,CROSD

Local Variable Declarations:

INTEGER	I,N
REAL	TMP(5)

COMMON Blocks: /CRSECT/

REAL FUNCTION ABN2O5

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
INTRINSIC	INT
EXTERNAL	XTERP,CROSD

Local Variable Declarations:

INTEGER	I,N
REAL	TMP(5)

COMMON Blocks: /CRSECT/

REAL FUNCTION ABSCFC

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 TEMP - REAL Variable - Temperature (K)
 INDCFC - INTEGER Variable - CFC index
 INDCFC = 1 implies CCl3F (CFC-11)
 INDCFC = 1 implies CCl2F2 (CFC-12)
 INDCFC = 1 implies CClF3 (CFC-13)
 INDCFC = 1 implies CF4 (CFC-14)
 INDCFC = 1 implies CHF2Cl (CFC-22)
 INDCFC = 1 implies C2Cl3F3 (CFC-113)
 INDCFC = 1 implies C2Cl2F4 (CFC-114)
 INDCFC = 1 implies C2ClF5 (CFC-115)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
INTRINSIC	INT
EXTERNAL	XTERP, CFCBD

Local Variable Declarations:

INTEGER	I, N
REAL	TMPCFC(5)

COMMON Blocks: /CFCBM/

REAL FUNCTION ABSCLO

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
INTRINSIC	INT
EXTERNAL	XTERP, CROSD

Local Variable Declarations:

INTEGER	I, N
REAL	TMP(5)

COMMON Blocks: /CRSECT/

REAL FUNCTION ABSH2O

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT, MIN

Local Variable Declarations:

INTEGER I, IP, NPTS
REAL CH2O(4), WL, WLX, FAC, WL1, WL2, DWL

COMMON Blocks: None

SUBROUTINE ABSMOL

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
SDV - REAL Vector (Len = Unspecified) (Output) - Extinction coefficient (cm^{-1})
ODV - REAL Vector (Len = Unspecified) (Output) - Inverse line spacing (cm)
CDV - REAL Vector (Len = Unspecified) (Output) - Pressure-broadened continuum extinction coefficient (cm^{-1})
TDEPA - REAL Variable (Output) - Temperature-dependence exponent for line width
ALF - REAL Variable (Output) - Foreign-broadened line width at STP (cm^{-1})
RADFLO - REAL Vector (Len = Unspecified) (Input) - Radiation field term for the band temperatures
PRTNO - REAL Vector (Len = Unspecified) (Input) - Partition function for the band temperatures
NTEMP - INTEGER Variable (Output) - Number of temperature values
MOLEC - INTEGER Variable (Input) - Molecular index number

PARAMETER Declarations:

INTEGER NPMAX, NTMPMX, MOLMAX, MLIDMX
PARAMETER (NPMAX=250, NTMPMX=5, MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC INT, ABS, REAL
EXTERNAL DEVCBD, UFTPBD, IOERR

Local Variable Declarations:

INTEGER I, N, NREC, IOS, IBIN(NPMAX), IMOL(NPMAX), IP, IV,
IALF(NPMAX), NRECU
REAL VDUM(MOLMAX), SDZ(NTMPMX, NPMAX),
ODZ(NTMPMX, NPMAX)

COMMON Blocks: /CONSTN/, /DEVICE/, /MOLECP/, /UFTAPE/

REAL FUNCTION ABSN2

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT, MIN, SQRT

Local Variable Declarations:

INTEGER I, IP, NPTS
REAL CN2(133), T0, TSS, VX, FAC, V1, V2, DV

COMMON Blocks: None

REAL FUNCTION ABSN2O

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT, MIN

Local Variable Declarations:

INTEGER I, IP, NPTS
REAL CN2O(7), WL, WLX, FAC, WL1, WL2, DWL

COMMON Blocks: None

REAL FUNCTION ABSNO2

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=7176)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, REAL
EXTERNAL NO2BD

Local Variable Declarations:

INTEGER N
REAL XI, FAC

COMMON Blocks: /NO2XS/

SUBROUTINE ABSO2

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 PRESS - REAL Variable (Input) - Pressure (mb)
 TEMP - REAL Variable (Input) - Temperature (K)
 SIGMA - REAL Variable (Output) - Absorption coefficient ($\text{cm}^{-1} \text{ atm}$)
 CONT - REAL Variable (Output) - Continuum absorption coefficient
 ($\text{cm}^{-1} \text{ atm}$)
 IBAND - INTEGER Variable (Input/Output) - Band model index
 QA - REAL Variable (Input/Output) - LOWTRAN double
 exponential band model parameter

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC INT, MIN, REAL
 EXTERNAL XTERP, O2UVBD

Local Variable Declarations:

INTEGER I, IP, ITRP1
 REAL P0, T0, DENUM, WL, TORRAT, SDV, APR, VX, FAC, PS, TS

COMMON Blocks: /HERZBG/, /SHURUN/

REAL FUNCTION ABSO3

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NMAX
 PARAMETER (NMAX=3080)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MIN, REAL, INT
 EXTERNAL O3HHBD, O3CWBD

Local Variable Declarations:

INTEGER I, IP
 REAL DT, VX, FAC, C0, C1, C2

COMMON Blocks: /O3CWB/, /O3HHB/

REAL FUNCTION ABSSO2

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=5562)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, REAL
EXTERNAL SO2BD

Local Variable Declarations:

INTEGER N
REAL XI, FAC

COMMON Blocks: /SO2XS/

SUBROUTINE AECALC

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Input) - Extra altitudes in
altitude grid
NXTRA - INTEGER Variable (Input) - Dimension of HXTRA
TITLE - CHARACTER*(*) Variable (Input) - Title in printout
HEADNG - CHARACTER*(*) Variable (Input) - Heading in printout

INTRINSIC and EXTERNAL Declarations:

REAL PLANCK
INTRINSIC REAL, MAX, MIN
EXTERNAL PLANCK

Local Variable Declarations:

INTEGER I, IM, IP
REAL ASUM, ESUM, TSOLAR, TTHRML, V, DV, A, E

COMMON Blocks: None

SUBROUTINE AERSOL

Argument Declarations:

IAERO - INTEGER Variable (Input) - Index for aerosol type
 RH - REAL Variable (Input) - Relative humidity
 LAYER - INTEGER Variable (Input) - Layer index
 VIS - REAL Variable (Output) - Visible range (km)
 This is output for the Navy Marine aerosol model,
 IAERO = 4, and the Desert aerosol model, IAERO = 6.
 WIND - REAL Variable (Input) - Current windspeed (m/sec)
 WHH - REAL Variable (Input) - 24-hour average windspeed (m/sec)
 ICSTL - INTEGER Variable (Input) - Coastal influence index
 TEMP - REAL Variable (Input) - Temperature (K)

PARAMETER Declarations:

INTEGER MLMAX, NWLAER, NWLCLD, NANG, NSTTMP
 PARAMETER (MLMAX=140, NSTTMP=16)
 PARAMETER (NWLAE=47, NWLCLD=79, NANG=65)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC MAX, MIN
 EXTERNAL PROFAC, MARINE, ARSLBD, DESAER, BKSTBD, XTERP,
 MIEPHS, ARSABD, ARSXBD

Local Variable Declarations:

INTEGER I, IAP, ITRP1, IMATRL
 REAL BEXT(NWLAER), RHX, CXV, SUM

COMMON Blocks: /AEROSL/, /AERSCA/, /AERSLA/, /AERSLX/, /AERUSR/,
 /BSTAER/

REAL FUNCTION AH2O2

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})

PARAMETER Declarations:

INTEGER NWL
 PARAMETER (NWL=29)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRP
 REAL XH2O2(NWL), XD2O2(NWL), WL(NWL), WL0, XLOSCH,
 PH2O2

COMMON Blocks: None

REAL FUNCTION AIRTMP

Argument Declarations:

HOUR - REAL Variable - Hour of the day (decimal time)
MONTH - INTEGER Variable - Month of the year (JAN = 1)
TMIDN - REAL Variable - Air temperature at midnight (K)
TNOON - REAL Variable - Air temperature at noon (K)
HOUR0 - REAL Variable - Reference hour (decimal time)
TAIR0 - REAL Variable - Reference air temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS

Local Variable Declarations:

REAL B(12), THETA, DELT

COMMON Blocks: /CONSTN/

SUBROUTINE AMMNIA

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
SD - REAL Variable (Output) - S/d ($\text{amagat}^{-1} \text{cm}^{-1}$)
Note: SD still needs to be multiplied by the
rotation and vibration partition function
OD - REAL Variable (Output) - $1/d$ (cm)
CD - REAL Variable (Output) - Line wings contribution ($\text{amagat}^{-1} \text{cm}^{-1}$)
Note: CD still needs to be multiplied by the
rotation and vibration partition function
ALF - REAL Variable (Output) - Line width (cm^{-1})
IBAND - INTEGER Variable (Output) - Band model index

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, MIN

PARAMETER Declarations:

INTEGER NVMAX
PARAMETER (NVMAX=111)

Local Variable Declarations:

INTEGER IV
REAL SDV(NVMAX), ODV(NVMAX), ALFV, FAC, V1, V2, DV

COMMON Blocks: None

REAL FUNCTION AMOLSC

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
P - REAL Variable - Pressure (mb)
T - REAL Variable - Temperature (K)
WH2O - REAL Variable - Water vapor mixing ratio (ppm)
WCO2 - REAL Variable - Carbon dioxide mixing ratio (ppm)
WO2 - REAL Variable - Oxygen mixing ratio (ppm)

INTRINSIC and EXTERNAL Declarations:

REAL DEPOL
DOUBLE PRECISION REFRAC
INTRINSIC REAL, DPROD
EXTERNAL REFRAC

Local Variable Declarations:

REAL WL
DOUBLE PRECISION DUM, DPL, XN, AN0

COMMON Blocks: /CONSTN/

SUBROUTINE ASPECT

Argument Declarations:

ISHINE - INTEGER Variable (Input) - Sky/Earthshine index
Refer to User Reference Manual for definition.
PHISH - REAL Vector (Len = Unspecified) (Output) - Sky/Earthshine
angles (deg)
NASPCT - INTEGER Variable (Output) - Number of Sky/Earthshine angles
LSRCE - INTEGER Variable (Input) - Location of source altitude in
altitude array
LBKGD - INTEGER Variable (Input) - Location of background altitude in
altitude array
XMH - REAL Vector (Len = Unspecified) (Input) - Atmospheric
refractivity as a function of altitude
RE - DOUBLE PRECISION Variable (Input) - Earth radius (km)
HT - REAL Variable (Input) - Source altitude (km)

PARAMETER Declarations:

INTEGER MLMAX, NASMAX, ISMX, MOLMAX
PARAMETER (MLMAX=140, NASMAX=15)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, ACOS, ABS
EXTERNAL GETGLC

Local Variable Declarations:

INTEGER K, M, ICHK, KASPCT(15)
REAL DPHI, PHI0, PHIHOR, PHIX, A, B
DOUBLE PRECISION HORA, XMU(5), WT(5)

COMMON Blocks: /CONSTN/, /USERDF/

SUBROUTINE ATMPRN

Argument Declarations:

IFLTR - INTEGER Variable (Input) - Index for filter response
 IFLTR = 0 implies a square wave response
 IFLTR = 1 implies a user-defined response
 TFLTR - CHARACTER*(*) Variable (Input) - Title for user-defined filter
 HEADNG - CHARACTER*(*) Variable (Input) - User-defined heading
 TITLE - CHARACTER*(*) Variable (Input) - Title
 BW - REAL Variable (Input) - Bandwidth (cm^{-1})
 BWL - REAL Variable (Input) - Bandwidth (μm)
 IGEOM - INTEGER Variable (Input) - Geometry number
 IV - INTEGER Variable (Input) - Spectral interval number
 ISMARY - INTEGER Variable (Input) - Summary switch

PARAMETER Declarations:

INTEGER	NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, NSCEN, MAXLAT,
	MAXLON, NL, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(NMATL=28, NSCEN=35, NVSMAX=20)
PARAMETER	(MAXLAT=3, MAXLON=1, NL=50)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL	RELHUM
CHARACTER*72	IOERR
INTRINSIC	REAL, DBLE, SQRT, COS, SIN
EXTERNAL	DEV CBD, RELHUM, CHRCBD, PRALT, SETBCK,
	INDXBK, IOERR, ATMSBD, BKGDBD, SCENBD

Local Variable Declarations:

INTEGER	I, K, M, MM, IOS, JT, IERR, ITYPE0, ITYPE1, KSCENE
REAL	WL1, WL2, RHW (NAZMAX), RHI (NAZMAX), ALTPR (NAZMAX),
	TAIRP, FRSNWP, CLDCVP (0:3), TERR, TMIDNP, TNOONP,
	FRICEP, FRWTRP
DOUBLE PRECISION	RE
CHARACTER*24	TFLTR0, TFLTRX
LOGICAL	FLBK

COMMON Blocks: /ATMDAT/, /BACKGD/, /CHRCNM/, /CONSTN/, /DEVICE/,
 /FLAGS/, /HEADER/, /INTSTO/, /OUTPUT/, /SCENES/

DOUBLE PRECISION FUNCTION BAND

Argument Declarations:

XSTAR - DOUBLE PRECISION Variable - Weak line optical depth
 S1 - REAL Variable - Summing variable for Lorentz halfwidth
 times line density
 S2 - REAL Variable - Summing variable for Doppler halfwidth
 times line density
 S3 - REAL Variable - Summing variable for line density
 S6 - REAL Variable - Summing variable for (Lorentz halfwidth)²
 times line density
 QA - REAL Variable - Exponential parameter for LOWTRAN model
 DV - REAL Variable - Wavenumber increment (cm⁻¹)
 IBAND - INTEGER Variable - Index for band model
 IBAND = 0 for exponential band model
 IBAND = 1 for Voight band model
 IBAND = 2 for LOWTRAN double exponential model

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
 PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION DERF
 INTRINSIC MAX, MIN, REAL, SQRT, LOG, ABS, DBLE, EXP, LOG10
 EXTERNAL DERF

Local Variable Declarations:

INTEGER IEXP
 REAL ANLINE, EXMIN
 DOUBLE PRECISION ACBAR, ADBAR, ODBAR, XS, TXP, WS, QAWS, WL, WD, DUM, U23
 AC2BAR, RHO, F1, F2, F3, XSTARP, WSL, U0, U2, RATIO
 DOUBLE PRECISION STORE, WL, WD, U0

COMMON Blocks: /CONSTN/, /MOLECP/

SUBROUTINE BBARSL

Argument Declarations:

ARSLAS - REAL Vector (Len = Unspecified) (Output) - Aerosol
 absorption for the solar region (km^{-1})
 ARSLSS - REAL Vector (Len = Unspecified) (Output) - Aerosol
 scattering for the solar region (km^{-1})
 ARSLAT - REAL Vector (Len = Unspecified) (Output) - Aerosol
 absorption for the thermal region (km^{-1})
 ARSLST - REAL Vector (Len = Unspecified) (Output) - Aerosol
 scattering for the thermal region (km^{-1})
 ZP - REAL Vector (Len = Unspecified) (Output) - Altitude array
 for multiple scattering calculation (m)
 KK - INTEGER Variable (Input) - Latitude index
 LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER MLMAX, NWLAER, NWLCLD, NANG, NGMAX, MAXLAT, MAXLON,
 ISMX, MOLMAX, MLIDMX
 PARAMETER (MLMAX=140, NGMAX=15, MAXLAT=3, MAXLON=1)
 PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL PLANCK, XTERP
 EXTERNAL PLANCK, XTERP, ARSLBD

Local Variable Declarations:

INTEGER I, L, LZ
 REAL TMPSLR, TMPTML, SUMS, SUMT, V, DV, PLTML, PLSLR,
 A, S, WZ, DUMA(101), DUMAP(101), DUMS(101),
 DUMSP(101), DUMW(101), ZKM

COMMON Blocks: /AEROSL/, /AERSCA/, /INITAL/, /MOLECP/

REAL FUNCTION BBO3

Argument Declarations:

X - REAL Variable - Ozone concentration (atm-cm STP)

SUBROUTINE BCKCHK

Argument Declarations:

ITERM - INTEGER Variable (Input/Output) - Background index.
Refer to User Reference manual for definition.
SCTNGS - REAL Variable (Input) - Solar scattering angle (deg)
SCTNGS = 0.0 implies looking directly into the sun
SCTNGL - REAL Variable (Input) - Lunar scattering angle (deg)
SCTNGL = 0.0 implies looking directly into the moon

PARAMETER Declarations:

INTEGER NGMAX
PARAMETER (NGMAX=15)

COMMON Blocks: /FLAGS/

SUBROUTINE BCKGND

Argument Declarations:

ITYPE - INTEGER Variable (Input) - Type of background
 V - REAL Variable (Input) - Wavenumber (cm^{-1})
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
 RADEM - REAL Variable (Output) - Emitted background radiance ($\text{W/cm}^2/\text{sr/cm}^{-1}$)
 RADRF - REAL Variable (Output) - Reflected background radiance
 ($\text{W/cm}^2/\text{sr/cm}^{-1}$)
 RADSD - REAL Variable (Output) - Standard deviation of the background
 radiance ($\text{W/cm}^2/\text{sr/cm}^{-1}$)
 XLGAL - REAL Variable (Input) - Galactic azimuth (deg)
 BGAL - REAL Variable (Input) - Galactic elevation (deg)
 XLECL - REAL Variable (Input) - Ecliptic azimuth (deg)
 BECL - REAL Variable (Input) - Ecliptic elevation (deg)
 HSKYSH - REAL Variable (Input) - Spectral, spatially integrated
 emitted skyshine ($\text{W/cm}^2/\text{cm}^{-1}$)
 HSCATT - REAL Variable (Input) - Spectral, spatially integrated
 scattered solar skyshine ($\text{W/cm}^2/\text{cm}^{-1}$)
 HSOLAR - REAL Variable (Input) - Spectral solar irradiance ($\text{W/cm}^2/\text{cm}^{-1}$)
 PROJS - REAL Vector (Len = Unspecified) (Input) - Projection of
 solar irradiance on oriented surfaces
 SHDWS - REAL Variable (Input) - Solar self-shadowing factor
 HLUNAR - REAL Variable (Input) - Spectral lunar irradiance ($\text{W/cm}^2/\text{cm}^{-1}$)
 PROJL - REAL Vector (Len = Unspecified) (Input) - Projection of
 lunar irradiance on oriented surfaces
 SHDWL - REAL Variable (Input) - Lunar self-shadowing factor
 TAU - REAL Variable (Input) - Transmittance observer-background
 PHIIS - REAL Variable (Input) - Elevation angle of incident solar
 radiation (deg)
 PHIIL - REAL Variable (Input) - Elevation angle of incident lunar
 radiation (deg)
 PHIRF - REAL Variable (Input) - Elevation angle of reflected line
 of sight at the background (deg)
 AZOBS - REAL Variable (Input) - Observer azimuthal angle (deg)
 AZSOL - REAL Variable (Input) - Azimuthal angle between incident
 solar and reflected lines-of-sight (deg)
 AZLUN - REAL Variable (Input) - Azimuthal angle between incident
 lunar and reflected lines-of-sight (deg)
 BCKSUM - REAL Array (Dim = 6 x Unspecified) (Input/Output) -
 Background material radiances ($\text{W/cm}^2/\text{sr/cm}^{-1}$)
 CC - REAL Variable (Input) - Fractional cloud cover
 BCKFAC - REAL Array (Dim = MAXLAT x Unspecified) (Input) -
 Background temperature proportionality factor
 NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for
 non-zero elements of BCKFAC
 FRSNW - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Percentage
 snow (%)
 FRICE - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Percentage
 ice (%)
 FRWTR - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Percentage
 water (%)

PARAMETER Declarations:

INTEGER	NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(NMATL=28, NVSMAX=20)
PARAMETER	(MAXLAT=3, MAXLON=1, MOLMAX=26, ISMX=MOLMAX+8)

SUBROUTINE BCKGND (continued)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP, SOLAR, GALRAD, PLANCK, STARAD, ZODICL, EXGALS, SLUNAR, BDRF
COMPLEX	INDEXW, INDEXI, EMTREF, REFEST
INTRINSIC	SQRT, REAL, DBLE, DPROD, ABS, SIN, COS
EXTERNAL	XTERP, SOLAR, GALRAD, PLANCK, STARAD, ZODICL, EXGALS, BKGDBD, SLUNAR, FRESNL, BDRF, INDEXW, INDEXI, EMTREF, SETBCK, REFEST, DEMSXX

Local Variable Declarations:

INTEGER	I, K, M, NDX, KK, LL, IGRND, ITRP0, NINCL, IRGH0, IRGH1
REAL	OMEG, WL0, REFLS, REFL, REFLD, EMIS, PLK, XNORM(6,3), REFLX, TMPNDX(6), EMV, EMH, EMV1, EMH1, EMVF, EMHF, SLOPE, FOAMT, WVHT, TPLYR(0:3), TAIRND, UOBS(3), USOL(3), ULUN(3), POBS, PSOL, PLUN, XOBS, XSOL, XLUN
DOUBLE PRECISION	EM, EMI, RF, RFI, RTERS(6), RTERL(6), RTERD, VARNC, DUMF, SDVM, DUMR, FRSLP(6)
COMPLEX	DIELEC, XMUC, INAIR(2), INICE, INMAT, REFR, EPSX, RH, RV, TV, TH, EPSA

COMMON Blocks: /BACKGD/, /CONSTN/, /HEADER/

SUBROUTINE BCKPRN

Argument Declarations:

IFLTR - INTEGER Variable (Input) - Index for filter response
 IFLTR = 0 implies a square wave response
 IFLTR = 1 implies a user-defined response
 TFLTR - CHARACTER*(*) Variable (Input) - Title for user-defined filter
 HEADBK - CHARACTER*(*) Variable (Input) - User-defined heading
 TITLE - CHARACTER*(*) Variable (Input) - Title
 BW - REAL Variable (Input) - Bandwidth (cm⁻¹)
 BWL - REAL Variable (Input) - Bandwidth (μm)
 IGEOM - INTEGER Variable (Input) - Geometry number
 IV - INTEGER Variable (Input) - Spectral set number
 FLBCKZ - LOGICAL Variable (Input) - Flag for existence of background parameters

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, MLMAX, NZSMAX, MAXLAT,
 MAXLON, NL, ISMX, NVSMAX, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, NL=50, NVSMAX=20)
 PARAMETER (MAXLAT=3, MAXLON=1, MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 INTRINSIC REAL, DBLE, SQRT, COS, SIN
 EXTERNAL DEV CBD, IOERR, ATMSBD

Local Variable Declarations:

INTEGER MM, LB, IOS
 REAL WL1, WL2
 DOUBLE PRECISION RE
 CHARACTER*24 TFLTR0, TFLTRX

COMMON Blocks: /ATMDAT/, /BCKDAT/, /CONSTN/, /DEVICE/, /FLAGS/,
 /HEADER/, /OUTPUT/

REAL FUNCTION BDRF

Argument Declarations:

PHII - REAL Variable - Incident elevation angle (deg)
 PHIR - REAL Variable - Reflected elevation angle (deg)
 AZIM - REAL Variable - Azimuth (deg)
 WL - REAL Variable - Wavelength (μm)
 DELH - REAL Variable - Standard deviation of surface roughness (m)
 CORREL - REAL Variable - Correlation length of surface roughness (m)
 ITYPE - INTEGER Variable - Roughness type
 ITYPE = 1 implies Gaussian roughness
 Otherwise, exponential roughness
 DIELEC - COMPLEX Variable - Permittivity (dielectric constant and
 conductivity) of surface
 XMUC - COMPLEX Variable - Permeability of surface

INTRINSIC and EXTERNAL Declarations:

REAL	SHADOW
COMPLEX	DIREFL
INTRINSIC	MIN, EXP, SIN, COS, CMPLX, ABS, REAL, AIMAG, DBLE, SQRT, MAX
EXTERNAL	DIREFL, SHADOW

Local Variable Declarations:

INTEGER	IPOLR1, IPOLR2
REAL	SIGMA(2,2), SNC, XKC, XKH, SN3, XI, SLOPE, DTPRD, XJ, AZIMP
DOUBLE PRECISION	THETAI, THETAR, PHI, CS1, SN1, CS2, SN2, CST, SNT, A1, A2, A3, A4, EX, EY, EZ, EXY, EXYZ, ETEMP, TMP3
COMPLEX	DEN1, DEN2, DEN3, DEN4, XS1, XS2, DIEFAC, XMUFAC, RHOF(2)

COMMON Blocks: /CONSTN/

SUBROUTINE BEAUFT

Argument Declarations:

WIND - REAL Variable (Input) - Wind speed at 10 m (m/sec)
Note: 10 m height per Resolution 9, International
Meteorological Committee, Paris, 1946
WAVEHT - REAL Variable (Output) - Wave height (m)
SLOPE - REAL Variable (Output) - RMS wave slope
FOAM - REAL Variable (Output) - Fraction of foam

INTRINSIC and EXTERNAL Declarations:

INTRINSIC AINT, MAX, MIN, SQRT

Local Variable Declarations:

INTEGER I, IBFRT
REAL WINDMN(0:17)
REAL WNDMAX(0:17), WNDMIN(0:17),
HTMIN(0:17), HTMAX(0:17), WNDSPD, FAC,
WINDCM(3,2), SLOPCM(3,2)

COMMON Blocks: None

REAL FUNCTION BETA

Argument Declarations:

ASYM - REAL Variable - Phase function asymmetry factor

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, ABS, SQRT, MAX, MIN, DBLE

Local Variable Declarations:

INTEGER I, J
REAL GJ, A(1000), SUM, DSUM, G, A0, G2, XBETA
CHG REAL AHG(60)

COMMON Blocks: /CONSTN/

REAL FUNCTION BETAU

Argument Declarations:

XMU0 - REAL Variable - Cosine of the zenith angle
ASYM - REAL Variable - Phase function asymmetry factor

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, REAL, MAX, MIN, SQRT

Local Variable Declarations:

INTEGER I, J, JP
REAL PJM, PJ, G2, AU(3, 1000), GJ(3), SUM, DSUM, A0, G

COMMON Blocks: /CONSTN/

SUBROUTINE BINFIL

Argument Declarations:

IFINP - INTEGER Variable (Input/Output) - Input file number
IFATM - INTEGER Variable (Input/Output) - Atmosphere/source file number
IFBCK - INTEGER Variable (Input/Output) - Background file number
IFPLM - INTEGER Variable (Input/Output) - Plume file number
IFMSC - INTEGER Variable (Input/Output) - Multiple scatter file number
IFTRN - INTEGER Variable (Input/Output) - Component transmission file number
IFHTR - INTEGER Variable (Input/Output) - Heat transfer file number
IFTP7 - INTEGER Variable (Input/Output) - MODTRAN TAPE7 file number
IFTP8 - INTEGER Variable (Input/Output) - MODTRAN TAPE8 file number
IFDIS - INTEGER Variable (Input/Output) - DIS data base file number
FILENM - CHARACTER(*) Vector (Len = Unspecified) - File names
ISMARY - INTEGER Variable (Output) - File summary switch

PARAMETER Declarations:

INTEGER NGMAX
PARAMETER (NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1 UPCASE
CHARACTER*72 IOERR
EXTERNAL RDLINE, FLSTAT, UPCASE, CHKRST, IOERR, CHKVER, DISEND

Local Variable Declarations:

INTEGER IOS, NDUM1, NDUM2, NDUM3, ISMP
LOGICAL FILXST, FILXSB, FILXSP, FILXSM, FILXSC, FILXSH,
FILXS7, FILXS8, LDUM
CHARACTER*1 YES
CHARACTER*3 STAT(2)
CHARACTER*40 HEADNG, HEADNB
CHARACTER*80 TITLE, TITLB
CHARACTER*255 VARIAB

COMMON Blocks: /FLAGS/, /RSTART/

SUBROUTINE BMOD

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX, ISMX, MAXTMP, MAXLAT, MAXLON, NGMAX, MOLMAX,
 MLIDMX
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8,
 MAXTMP=5)
 PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL RADFLD, PARTIT, ABSN2, ABSH2O, ABSN2O, ABSNO2,
 ABSSO2, ABSO3, O2CNT, AH2O2, ABSCFC, ABCCL4,
 ABHNO4, ABN2O5, ABSCLO
 LOGICAL EVEN
 INTRINSIC SQRT, ABS, REAL, INT, MIN
 EXTERNAL PROFAC, MOLPBD, EVEN, RADFLD, ABSMOL, PARTIT,
 ABSNO2, ABSN2, ABSO3, H2OCNT, O2CNT, ABSO2, ABSH2O,
 ABSN2O, ABSSO2, AH2O2, AMMNA, ABSCFC, ABCCL4,
 ABHNO4, ABN2O5, ABSCLO

Local Variable Declarations:

INTEGER K, L, N, KEYML (MLMAX, MAXLAT, MAXLON), KK, LL, NDV,
 KEYMLP (MLMAX, MAXLAT, MAXLON), ISWX, MLOLD, NTEMP,
 IV, KEY, KEYP
 REAL SD2 (ISMX, MLMAX, MAXLAT, MAXLON), SDV (MAXTMP),
 ODV (MAXTMP), T0, V0, SUM, VP, WT, CDV (MAXTMP),
 TBAND (MAXTMP), RADFL (MLMAX, MAXLAT, MAXLON),
 AD0 (ISMX), FAC (MLMAX, MAXLAT, MAXLON), ALF,
 TS (MLMAX, MAXLAT, MAXLON), TDEPA,
 PRTN0 (MAXTMP, ISMX), TSS (MLMAX, MAXLAT, MAXLON),
 RADFL0 (ISMX), ODAV (ISMX, MLMAX, MAXLAT, MAXLON),
 SDX, ODX, CDSX, CDX, PS, P0, HERZ, CDX25, CDSX25
 LOGICAL EVN

COMMON Blocks: /CONSTN/, /INITAL/, /MOLCON/, /MOLDAT/, /MOLECP/,
 /PRBNDA/, /PRBNDB/

SUBROUTINE BNDMLG

Argument Declarations:

MOLEC - INTEGER Variable (Input) - Molecular index
1 - Water vapor
2 - Carbon dioxide
3 - Ozone
4 - Nitrogen oxide
5 - Carbon monoxide
6 - Methane
TEMP - REAL Variable (Input) - Temperature (K)
F - REAL Vector (Len = Unspecified) (Output) - Line strength
partition function
G - REAL Variable (Output) - Fine structure partition function
NNN - INTEGER Variable (Input) - DIMENSION of F

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP

Local Variable Declarations:

INTEGER K
REAL TH(MOLMAX), ETHTL, ETHKTL, FN, SUM, SUM1

COMMON Blocks: None

SUBROUTINE BNDPAR

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NAZMAX, NASMAX, NGMAX, NZSMAX, NWLAER,
 NWLCLD, NANG, MAXLAT, MAXLON, NVSMAX, MOLMAX,
 MLIDMX
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTEGER IBNSRC
 REAL AMOLSC, XTERP, PHMLSC
 EXTERNAL AMOLSC, XTERP, PHFUNC, ARSLBD, BMOD, RAINSP, SNOWSP,
 IBNSRC, OPNSCR, MOLPBD, PHMLSC
 CMMW EXTERNAL MMWPAR

Local Variable Declarations:

INTEGER I, L, K, JICE, JCIRUS, KK, LL, ITRP
 REAL P0, T0, WL, RNABS, RNSCT, SNABS, SNSCT, PS, TS, SDT, DUM,
 CDT, SCPHM, SCPHX, FPIINV, PHASEM(NANG)

COMMON Blocks:

/AEROSL/, /AERSCA/, /AERSCC/, /ARSLSC/, /CGWTS/,
 /CLDUSR/, /CONSTN/, /HEADER/, /INITAL/, /LOWMSC/,
 /MOLCON/, /MOLECP/, /PRBND/, /PRBNDB/

SUBROUTINE BNTPTH

Argument Declarations:

XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
 S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for Lorentz halfwidth times line density.
 S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for Doppler halfwidth times line density.
 S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for line density
 S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for continuum
 S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for scattering
 S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for (Lorentz halfwidth)² times line density.
 XSS - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Initial
 values of optical depth for new path
 S1S - REAL Vector (Len = Unspecified) (Output) - Initial values
 of S1 for new path
 S2S - REAL Vector (Len = Unspecified) (Output) - Initial values
 of S2 for new path
 S3S - REAL Vector (Len = Unspecified) (Output) - Initial values
 of S3 for new path
 S4S - REAL Vector (Len = Unspecified) (Output) - Initial values
 of S4 for new path
 S5S - REAL Vector (Len = Unspecified) (Output) - Initial values
 of S5 for new path
 S6S - REAL Vector (Len = Unspecified) (Output) - Initial values
 of S6 for new path
 N - INTEGER Variable (Input) - Number of species

Local Variable Declarations:

INTEGER K

COMMON Blocks: None

SUBROUTINE BRBNDR

Argument Declarations:

TMIDN - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Temperature at midnight (K)
 TNOON - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Temperature at noon (K)
 INITV - INTEGER Variable (Input) - Restart spectral index
 HEADNG - CHARACTER*(*) Variable (Input) - Header
 TITLE - CHARACTER*(*) Variable (Input) - Title
 MTIME - INTEGER Variable (Output) - Number of temporal values

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, NL, NSCEN,
 NTIME, MLMAX, ISMX, NANTMX, NLayer, MAXLAT, MAXLON,
 NVSMAX, MOLMAX, MLIDMX
 PARAMETER (NMATL=28, NSCEN=35)
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (NTIME=97, MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (NANTMX=25, NLayer=20)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (NL=50, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL SLRCNT, XTERP, AIRTMP, SATUR, SEATMP
 CHARACTER*72 IOERR
 INTRINSIC SIN, MAX, MIN, REAL, ABS, COS, SQRT, MOD
 EXTERNAL SLRCNT, PRETEM, OPATH, FLUXLW, SOLBND, IOERR, BBARS, L,
 AIRTMP, EPHEMS, HTBLNC, XTERP, DEVCBD, CHRCBD,
 SATUR, BKGDBD, SPCLYR, SEATMP, ATMSBD, MOLPBD

Local Variable Declarations:

INTEGER I, K, L, M, IM, MTL, ITM, NSTAB, IOS, KK, LL, IG, NDAYS,
 JTIME, ITRP0, ITRP6, ITYPE, MTL, LLO
 REAL ZP(101), UP(101), VP(101), WP(101), ALBS, EMRAD,
 DELTIM, RFDS(NTIME, 6, NMATL),
 DCTIME, SOLDIX, YLUNAZ, YLUNEV, UO,
 YLUNDS, PHLUNY, LTEMP(NTIME), TSRF(NTIME),
 FO, SIGMA, CC, T4, T1, T2, TAIRLC(NTIME), STABRS,
 XLATS, XLONS, XLATL, XLONL, DT24, DUM,
 WINDT(NTIME), PAIRLC(NTIME), CH2OLC(NTIME),
 CLCVT(3, NTIME), CLBST(3, NTIME), CLTPT(3, NTIME),
 AHRN(NANTMX), RHT, SLRCX, TLayer(0:NLayer+1),
 DTMAX, SPHLYR(0:NLayer+1), DENLYR(0:NLayer+1),
 HTCLYR(0:NLayer+1), ZLayer(0:NLayer+1), TSSL,
 DUMLYR(2, NLayer+1), ARSLAS(101), ARSLSS(101),
 ARSLAT(101), ARSLST(101), XNORM(6, 3), SATURL,
 SOLTIM, SOLAZL, SOLEVL
 LOGICAL FLINI

COMMON Blocks:

/ANTECD/, /ATMDAT/, /BACKGD/, /BRBNDT/, /CHRCNM/,
 /CONSTN/, /DEVICE/, /HEADER/, /INITAL/, /MOLCON/,
 /OUTPUT/

SUBROUTINE CALCUL

Argument Declarations:

ISHINE - INTEGER Vector (Len = Unspecified) (Input) - Sky/earthshine index for source.
 Refer to the User Reference Manual for definition.
 LENP - INTEGER Vector (Len = Unspecified) (Input) - Path length index
 LENP(I) = 0 implies the short path
 LENP(I) = 1 implies the long path, if any ambiguity exists
 HEADNG - CHARACTER*(*) Variable (Input) - User-defined heading
 TITLE - CHARACTER*(*) Variable (Input) - Title, including version number, date, and time of file generations
 FILERT - CHARACTER*(*) Variable (Input) - File root
 IFLTR - INTEGER Variable (Input) - Filter index
 TFLTR - CHARACTER*(*) Variable - Filter name
 ISMARY - INTEGER Variable (Input) - Summary index

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, MLMAX, ISMX, NGMAX, NZSMAX, MAXLAT, MAXLON, NL, MLMX2, NVSMAX, ISTMAX, MOLMAX, NTIME
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MAXLAT=3, MAXLON=1, NL=50, NVSMAX=20)
PARAMETER	(ISTMAX=30000, NTIME=97)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL
CHARACTER*72	IOERR
EXTERNAL	PRCALC, SCNRIO, OPNSCR, DEVCBD, SUMFIL, SETBCK, INDXBK, BRBND, SRCFLX, PUTHDR, RESOLV, IOERR, SRCIRR, ATMSBD, SRCGEO

Local Variable Declarations:

INTEGER	I, L, INITGM, INITV, IOS, IScene, IV, KK, LL, IFSCR, JSCENE, ISWOLD, ITP1, IERR, IP, IGEOM, MM, INITVS, NSLTOT, NLNTOT, ISWATM (MAXLAT, MAXLON), ITM, KKK, LLL, JX, KX, KL, MTIME
REAL	TMIDN (MAXLAT, MAXLON), TNOON (MAXLAT, MAXLON), DV, TAIRP, CLDCVP (0:3), TMIDNP, TNOONP, FRSNWP, RSOLAR, RLUNAR, YLAT, YLON, FRWTRP, FRICEP
LOGICAL	FLOLD, FLSHN

COMMON Blocks:

```

/ATMDAT/, /BRBNDT/, /DEVICE/, /FLAGS/, /HEADER/,
/INITAL/, /PATH1/, /PATH1A/, /PATH4/, /PATH5A/,
/PATH5B/, /PATH5C/, /PATH5D/, /PATH6/, /PATH8/,
/RSTART/

```

SUBROUTINE CALEND

Argument Declarations:

IDAY - INTEGER Variable (Input/Output) - Day of the month
 IMONTH - INTEGER Variable (Input/Output) - Month of the year
 IYEAR - INTEGER Variable (Input/Output) - Year
 IDAYX - INTEGER Variable (Input/Output) - Day of the year
 YEAR - REAL Variable (Output) - Decimal year
 ITYPE - INTEGER Variable (Input) - Switch
 ITYPE = 0 implies day/month/year input
 ITYPE = 1 implies day of year input

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL

Local Variable Declarations:

INTEGER IDYMN(13,2), LPYR, IYR4, IYR100, IYR400, I

COMMON Blocks: None

SUBROUTINE CHANGE

Argument Declarations:

CMOL - REAL Vector (Len = Unspecified) (Input/Output) - Molecular concentrations (ppmv)
 CMOL0 - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at surface (ppmv)
 MONTH - INTEGER Variable (Input) - Month of year
 IYEAR - INTEGER Variable (Input) - Year
 XLAT - REAL Variable (Input) - Latitude (deg)

PARAMETER Declarations:

INTEGER NVAR6, NYR1, NYR2
 PARAMETER (NVAR6=6, NYR1=44, NYR2=258)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC REAL
 EXTERNAL XTERP

Local Variable Declarations:

INTEGER I, ITRP1
 REAL YR(NVAR6), CO2(NVAR6), N2O(NVAR6), CH4(NVAR6),
 CMOL2, CMOL4, CMOL6, YEAR, CMOL5, CO, YEAR1(NYR1),
 CO2X1(NYR1), YEAR2(NYR2), CO2X2(NYR2)

COMMON Blocks: None

SUBROUTINE CHKRST

Argument Declarations:

NFILE - INTEGER Variable (Input) - File unit number
RESTRT - LOGICAL Variable (Output) - Restart flag
NGEOM - INTEGER Variable (Output) - Geometry index for restart
NREC - INTEGER Variable (Output) - Spectral record index for restart
NRECS - INTEGER Variable (Output) - Spectral subset index for restart

PARAMETER Declarations:

INTEGER NVSMAX, NGMAX
PARAMETER (NVSMAX=20, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC MAX
EXTERNAL IOERR

Local Variable Declarations:

INTEGER NHDR(2), IH, NG, IG, NVAR(NGMAX), IV, IVX, IOS, NVSET,
IGEOM, NV(NVSMAX), IFILE, IVS, IHDR(2000)
REAL HDR(2500), VAR(10000)
CHARACTER*40 HEADNG
CHARACTER*80 TITLE

COMMON Blocks: None

SUBROUTINE CHKVER

Argument Declarations:

NFILE - INTEGER Variable (Input/Output) - Device unit number
FILXST - LOGICAL Variable (Input/Output) - Flag for existence of file
HEADNG - CHARACTER*(*) Variable (Input) - Heading for reference
TITLE - CHARACTER*(*) Variable (Input) - Title for reference

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER IOS
CHARACTER*40 HEADNX
CHARACTER*80 TITLX

COMMON Blocks: None

SUBROUTINE CHTIME

Argument Declarations:

TIME - REAL Variable (Input/Output) - Decimal time (hours)
IHR - INTEGER Variable (Input/Output) - Hours (hours)
IMN - INTEGER Variable (Input/Output) - Minutes (min)
Value is between 0 and 59.
SEC - REAL Variable (Input/Output) - Seconds (sec)
ITYPE - INTEGER Variable (Input) - Conversion index
ITYPE = 0 implies decimal to Hr, Min, Sec
Otherwise Hr, Min, Sec to decimal.

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT

Local Variable Declarations:

REAL XMIN

COMMON Blocks: None

REAL FUNCTION CIREX

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, EXP, DBLE, REAL, MAX, MIN, SQRT

Local Variables

INTEGER I
REAL D0, SIGMAE, SQ3, DIAM(5), WIDTH(5), DL(5)
DOUBLE PRECISION SIZEN, FN100, FN1000, TC, FIWC, B1, B2

COMMON Blocks: None

SUBROUTINE CIRRUS

Argument Declarations:

ICIRUS - INTEGER Variable (Input) - Cirrus cloud index
ICIRUS = 0 implies no cirrus clouds
ICIRUS = 1 implies standard cirrus clouds
ICIRUS = 2 implies subvisual cirrus clouds
ICIRUS = 3 implies a Heymsfield cirrus cloud model
CIRBS - REAL Variable (Input/Output) - Cirrus base altitude (km)
CIRTHK - REAL Variable (Input/Output) - Cirrus thickness (km)
CIREXT - REAL Variable (Input) - Extinction at 0.55 μm (km^{-1})
CIRICE - REAL Variable (Input/Output) - Ice concentration (gm/m^3)
ITYPE - INTEGER Variable (Input) - Latitude index
ISEASN - INTEGER Variable (Input) - Season index

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MIN

Local Variable Declarations:

INTEGER ISN, I
REAL CAMEAN(10,2)

COMMON Blocks: None

SUBROUTINE CITIES

Argument Declarations:

XLAT - REAL Variable (Input) - Latitude (deg)
XLON - REAL Variable (Input) - Longitude (deg)
FLURB - LOGICAL Variable (Output) - Flag for an urban area
URBNAM - CHARACTER*(*) Variable (Output) - Name of urban area

PARAMETER Declarations:

INTEGER NCITY
PARAMETER (NCITY=289)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, INT, LEN, ABS

Local Variable Declarations:

INTEGER I, NLN, IURB(NCITY), LNDX(181), ILAT, ILATM
REAL CLAT(NCITY), CLON(NCITY), DLAT(5), DLON(5), YLON
CHARACTER*34 CITYNM(NCITY), BLANKS

COMMON Blocks: None

SUBROUTINE CLDALT

Argument Declarations:

Z - REAL Vector (Len = Unspecified) (Input) - Altitude profile (km)
 T - REAL Vector (Len = Unspecified) (Input) - Temperature profile (K)
 NTRPAU - INTEGER Variable (Input) - Position of tropopause in profile
 XLAT - REAL Variable (Input) - Latitude (deg)
 XLONG - REAL Variable (Input) - Longitude (deg)
 MONTH - INTEGER Variable (Input) - Month of year
 HOUR - REAL Variable (Input) - Time of day (dec. hours LST)
 HB - REAL Variable (Input) - Terrain altitude (km)
 CLALTB - REAL Vector (Len = Unspecified) (Input/Output) - Cloud base altitude (km)
 CLALTT - REAL Vector (Len = Unspecified) (Input/Output) - Cloud top altitude (km)

INTRINSIC and EXTERNAL Declarations:

REAL	TMPCLD
INTRINSIC	MAX, MIN, ABS, SIGN
EXTERNAL	TMPCLD, RDGBL

Local Variable Declarations:

INTEGER	M, KL, KLX
REAL	TEMP, CLHMIN(3), CLHMAX(3), FACTM, DUM, FAC, HTMIN, GMT(2,2), TSRF(2), FRSNWP, CIRR, CLCV(2,0:3,2), CLDRAD(2,3,2), FRICEP

COMMON Blocks: None

SUBROUTINE CLDLR

Argument Declarations:

T - REAL Variable (Output) - Cloud optical depth
 B - REAL Variable (Output) - Backscattering fraction
 BU - REAL Variable (Output) - Zenith angle dependent backscattering fraction
 UO - REAL Variable (Input) - Cosine of solar zenith angle
 I - INTEGER Variable (Input) - Atmospheric layer number
 CLA - REAL Variable (Output) - Layer cloud fraction
 CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
 1 - Low etage
 2 - Middle etage
 3 - High etage
 G - REAL Variable (Output) - Asymmetry factor

INTRINSIC and EXTERNAL Declarations:

REAL	BETA, BETAU
INTRINSIC	MAX
EXTERNAL	BETA, BETAU, BRBNBD

Local Variable Declarations:

REAL	G

COMMON Blocks: /CLDPAR/

SUBROUTINE CNSTNT

Argument Declarations: None

INTRINSIC and EXTERNAL Declarations:

CIBM	INTEGER	IBITS
CVAX	INTEGER	JIBITS
CLAH	INTEGER	JIBITS
	REAL	ADD, SUB, MUL, DIV
	DOUBLE PRECISION	DADD, DSUB, DMUL, DDIV
CUNX	REAL	FLMIN, FLMAX
CSUN	REAL	R_MIN_NORMAL, R_MAX_NORMAL
CUNX	DOUBLE PRECISION	DFLMIN, DFLMAX
CSUN	DOUBLE PRECISION	D_MIN_NORMAL, D_MAX_NORMAL
	INTRINSIC	ASIN, DBLE, REAL, INT, ABS, EXP
	INTRINSIC	IBITS
CUNX	INTRINSIC	MAX
CVAX	INTRINSIC	JIBITS
CLAH	EXTERNAL	JIBITS
CIBM	EXTERNAL	IBITS
	EXTERNAL	ADD, SUB, MUL, DIV, DADD, DSUB, DMUL, DDIV

Local Variable Declarations:

INTEGER	I, J, K, IZ, MXR, MXD
INTEGER*2	I2(2)
REAL	X, Y, Z, T, ONER, ZEROR, RADIX, RADINV, A, B
DOUBLE PRECISION	DX, DY, DZ, DT, ONED, ZEROD, DRADIX, DRADNV, DA, DB, DC, DD

COMMON Blocks: /CONSTN/

REAL FUNCTION ADD

Argument Declarations:

X	- REAL Variable - First argument
Y	- REAL Variable - Second argument

REAL FUNCTION SUB

Argument Declarations:

X	- REAL Variable - First argument
Y	- REAL Variable - Second argument

REAL FUNCTION MUL

Argument Declarations:

X	- REAL Variable - First argument
Y	- REAL Variable - Second argument

REAL FUNCTION DIV

Argument Declarations:

X - REAL Variable - First argument
Y - REAL Variable - Second argument

DOUBLE PRECISION FUNCTION DADD

Argument Declarations:

DX - DOUBLE PRECISION Variable - First argument
DY - DOUBLE PRECISION Variable - Second argument

DOUBLE PRECISION FUNCTION DSUB

Argument Declarations:

DX - DOUBLE PRECISION Variable - First argument
DY - DOUBLE PRECISION Variable - Second argument

DOUBLE PRECISION FUNCTION DMUL

Argument Declarations:

DX - DOUBLE PRECISION Variable - First argument
DY - DOUBLE PRECISION Variable - Second argument

DOUBLE PRECISION FUNCTION DDIV

Argument Declarations:

DX - DOUBLE PRECISION Variable - First argument
DY - DOUBLE PRECISION Variable - Second argument

CIBM INTEGER FUNCTION IBITS

Argument Declarations:

I - INTEGER Variable - Input variable
 J - INTEGER Variable - Initial position for extracting bits
 K - INTEGER Variable - Number of bits to be extracted

INTRINSIC and EXTERNAL Declarations:

CIBM INTEGER IBSET, IBCLR
 CIBM LOGICAL BTEST
 CIBM INTRINSIC IBSET, IBCLR, BTEST

Local Variable Declarations:

CIBM INTEGER N, NBITS

COMMON Blocks: None

SUBROUTINE COAT

Argument Declarations:

RADCOR - REAL Variable (Input) - Core radius (μm)
 RADCOT - REAL Variable (Input) - Coating radius (μm)
 WL - REAL Variable (Input) - Wavelength (μm)
 XNP - COMPLEX Vector (Len = Unspecified) (Input) - Complex indices of refraction of core and coating
 RNB - COMPLEX Variable (Input) - Complex index of refraction of the medium
 NSANGL - INTEGER Variable (Input) - Number of scattering angles
 QABSP - REAL Variable (Output) - Absorption coefficient (km^{-1} per particles cm^{-3})
 QSCAT - REAL Variable (Output) - Absorption coefficient (km^{-1} per particles cm^{-3})
 GQSCAT - REAL Variable (Output) - Asymmetry coefficient times QSCAT

PARAMETER Declarations:

INTEGER NXMIE
 PARAMETER (NXMIE=101)

INTRINSIC and EXTERNAL Declarations:

INTEGER NCYCLE
 INTRINSIC REAL, CMPLX, AIMAG, ABS, CONJG, INT, COS, SIN
 EXTERNAL NCYCLE

Local Variable Declarations:

INTEGER N, NSTOP, N1, N2, M1, M2, M3, J, JJ, NS2
 REAL X, Y, FN, CHIY(3), PSYIY(3), P, T, DUM, TAU1, QEXT
 LOGICAL FLAG
 COMPLEX RFREL(2), AN(2), BN(2), REFREL, CN, C2NM1, X1, X2, Y2, CONE, DNBAR, GNBAR, CRACK, BRACK, DX1(2), DX2(2), DY2(2), XIY(3), CHIX2(3), CHIPX2, CHIY2(3), CHIPY2, DUMC(4)

COMMON Blocks: /CONSTN/, /MIECOT/

REAL FUNCTION COMFNC

Argument Declarations:

XN - REAL Variable - Optical depth
ACNP - REAL Variable - Summing variable for Lorentz line width
ACND - REAL Variable - Summing variable for Doppler line width
IV - INTEGER Variable - Switch for Doppler/Lorentz line shape
IV = 0 implies a Lorentz line shape
IV = 1 implies a Doppler line shape

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, LOG, REAL, DPROD

Local Variable Declarations:

REAL TEST, DENC, DEND, COMC, COMD, YN
DOUBLE PRECISION XN2

COMMON Blocks: /CONSTN/

SUBROUTINE CONFIG

Argument Declarations: None

INTRINSIC and EXTERNAL Declarations:

CSUN EXTERNAL IEEE_HANDLER, ERROR_HANDLER
CIBMV EXTERNAL ERRSET
CLAH EXTERNAL UNDERO

Local Variable Declarations:

CSUN INTEGER N

COMMON Blocks: None

CSUN INTEGER FUNCTION ERROR_HANDLER

Argument Declarations:

SIG - INTEGER Variable -
CODE - INTEGER Variable - Error code index
CNTEXT - INTEGER Vector (Len = Unspecified) -

Local Variable Declarations:

CSUN CHARACTER*14 LABEL

COMMON Blocks: None

SUBROUTINE COUPLE

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
 ISCENE - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Background scene index
 NMOLEC - INTEGER Variable (Input) - Number of molecules
 ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Switch for model atmospheres

PARAMETER Declarations:

INTEGER MLMAX, NAZMAX, NASMAX, ISMX, NBAND, NZSMAX, NMATL, MAXLAT, MAXLON, NGMAX, NVSMAX, MOLMAX
 PARAMETER (MLMAX=140, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NBAND=16)
 PARAMETER (NMATL=28)
 PARAMETER (MAXLAT=3, MAXLON=1)
 PARAMETER (NGMAX=15, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC MAX, SIN, ABS, MIN
 EXTERNAL XTERP, BCKGND, PROFAC, INICPL, BKGDBD

Local Variable Declarations:

INTEGER I, L, K, M, LTER, KEY, KEYP, LP, MLP, ITER, NPTS, LTOP, MTOP, LERR, KK, LL, ITRP0, ISPACE, KX, LX, NBCK(2,2)
 REAL EMISS, HP0(2), HPX(MLMAX, NBAND), HMX(MLMAX, NBAND), EMBCK, EMSPAC, REFBCK, WL, DUM1, DUM2, HSOLAR, CC, HLUNAR, PROJL(6), RADRF, HPOLD(0:MLMAX+1), FAC, HMOLD(0:MLMAX+1), ERR, ERRP, ERRM, REF0, PROJS(6), BCKFAC(MAXLAT, MAXLON), BCKSUM(6, NMATL), HSKY0, PRJS1(6), HLNRO, PRJL1(6), TAU1, PS90, PL90, PB90, AZO90, AZS90, AZL90, HSCAT0, HSLR0, DUM, SHDWS, SHDWL
 CHARACTER*7 HTYPE(2)

COMMON Blocks: /BACKGD/, /CONSTN/, /HEADER/, /INITAL/, /LYRSTO/, /MSPARM/, /PATH4/

REAL FUNCTION CSPHFN

Argument Declarations:

ASYM - REAL Variable - Asymmetry factor
 THETA - REAL Variable - Scattering angle (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC COS, INT, REAL, MAX, MIN, SQRT

Local Variable Declarations:

INTEGER I, IG, IGP
 REAL G, GCS(-200:200), FAC, G2, CST

COMMON Blocks: /CONSTN/

REAL FUNCTION DBANDS

Argument Declarations:

XMLBDA - REAL Variable - Ecliptic longitude (deg)
 BETA - REAL Variable - Ecliptic latitude (deg)
 LABSUN - REAL Variable -
 V - REAL Variable - Wavenumber (cm^{-1})
 DV - REAL Variable - Wavenumber increment (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

REAL	ZLAT, SOLAR, PLANCK
INTRINSIC	REAL, ABS, MIN
EXTERNAL	PLANCK, SOLAR, ZLAT, ZOD2BD

Local Variable Declarations:

INTEGER	I, IREC, IRECP
REAL	FAC, REC, AU, DUM, SRC, RSOL, RSUN, SCAT, THERM

COMMON Blocks: /ZODBND/

SUBROUTINE DBINIT

Argument Declarations: None

PARAMETER Declarations:

INTEGER	MOLMAX, MLIDMX
PARAMETER	(MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
INTRINSIC	INT, INDEX, LEN, ABS
EXTERNAL	DEV CBD, IOERR

Local Variable Declarations:

INTEGER	I, N, IOS, NVRMXP, IXM, ISWUFT
CIBM INTEGER	LRECL, IERR
REAL	DUMMY
CHARACTER*120	NFILE

COMMON Blocks: /CONSTN/, /DEV CNM/, /DEVICE/, /MOLECP/

REAL FUNCTION DDIF

Argument Declarations:

U2 - REAL Variable - Upward flux, layer 2
 U3 - REAL Variable - Upward flux, layer 3
 D1 - REAL Variable - Downward flux, layer 1
 D2 - REAL Variable - Downward flux, layer 2
 D3 - REAL Variable - Downward flux, layer 3
 R1S - REAL Variable - Directional reflection coefficient, layer 1
 R2 - REAL Variable - Diffuse reflection coefficient, layer 2
 R2S - REAL Variable - Directional reflection coefficient, layer 2
 T2 - REAL Variable - Transmission, layer 2
 T3 - REAL Variable - Transmission, layer 3
 G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL T,R,RR

COMMON Blocks: None

SUBROUTINE DEFAULT

Argument Declarations:

ISWINP - INTEGER Vector (Len = Unspecified) (Input) - Input switches
 IFLTR - INTEGER Variable (Output) - Filter index
 ISHINE - INTEGER Variable (Output) - Earth/skyshine index
 NXTRA - INTEGER Variable (Output) - Number of extra altitudes

PARAMETER Declarations:

INTEGER NAZMAX,NASMAX,NGMAX,NZSMAX,NANTMX,MLMAX,
 MAXLAT,MAXLON,ISMX,NVSMAX,MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (NANTMX=25, NVSMAX=20)
 PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS,AINT,SIGN,MOD,MAX
 EXTERNAL EXOATM,GBLBCK,DEV CBD

Local Variable Declarations:

INTEGER I,ISCENE,IXOTMP,KK,LL
 REAL TMIDN,TNOON,TSURF,FRSNW,FRWTR,CLDCVP(0:3)

COMMON Blocks: /ANTECD//, /DEVICE//, /HEADER//, /USERDF/

SUBROUTINE DEFBCK

Argument Declarations:

NSRCE - INTEGER Variable (Input) - Position index for source
 THETA - REAL Variable (Input) - Source-background earth-center angle (deg)
 JBKGD - INTEGER Variable (Input) - Background index
 IGEOM - INTEGER Variable (Input) - Geometry number
 FRSNW - REAL Vector (Len = Unspecified) - Percentage snow at end of
 line-of-sight (%)
 FRICE - REAL Vector (Len = Unspecified) - Percentage ice at end of
 line-of-sight (%)
 FRWTR - REAL Vector (Len = Unspecified) - Percentage water at end of
 line-of-sight (%)

PARAMETER Declarations:

INTEGER MLMAX,MLMX2,NAZMAX,NASMAX,NGMAX,NZSMAX,NVSMAX,
 MAXLAT,MAXLON,ISMX,MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL BCKCHK,INDXBK,SPTRIG,SETBCK

Local Variable Declarations:

INTEGER I,MM,NLOCAT
 REAL XLATP,XLONP,TAIRP,CLDCVP(0:3),TDUM,TMIDN,TNOON,
 AZP,SOLAZP,FRSNWP,FRICEP,FRWTRP

COMMON Blocks: /HEADER/,/PATH5A/,/PATH5C/

SUBROUTINE DEMSXX

Argument Declarations:

IGRND - INTEGER Variable (Input) - Material index
V - REAL Variable (Input) - Wavenumber (cm^{-1})
DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
TEMP - REAL Vector (Len = 0:Unspecified) (Input) - Temperature of each layer in material (K)
EMV - REAL Variable (Output) - Emissivity for vertical polarization
EMH - REAL Variable (Output) - Emissivity for horizontal polarization
ANGLE - REAL Variable (Input) - Elevation angle (deg)
DH - REAL Variable (Input) - Standard deviation of the distribution of heights (m)
IRGH - INTEGER Variable (Input) - Roughness type

PARAMETER Declarations:

INTEGER NLMAX
PARAMETER (NLMAX=10)

INTRINSIC and EXTERNAL Declarations:

COMPLEX EMTREF, SEAWTR, INDEXW, INDEXI
INTRINSIC CMPLX, AIMAG, MAX, DBLE, DPROD, EXP, REAL, ABS, SQRT,
+ SIN
EXTERNAL DIREMS, EMTREF, INDEXI, INDEXW, SEAWTR, SOIL, EMISBD

Local Variable Declarations:

INTEGER NLayer, IType, NINCL, IGRD
REAL WL, DELS
COMPLEX DSOIL, AIR, WATER, ICE, INEF(0:NLMAX), INDX(2)

COMMON Blocks: /CDRYDS/, /WETNES/

REAL FUNCTION DENAIR

Argument Declarations:

P - REAL Variable - Pressure (mb)
T - REAL Variable - Temperature (K)
CMOL - REAL Vector (Len = Unspecified) - Molecular concentrations (ppm)

PARAMETER Declarations:

INTEGER MLIDMX
PARAMETER (MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL VIRIAL
EXTERNAL VIRIAL, MOLPBD

Local Variable Declarations:

INTEGER K
REAL RSTAR, P0, XMAIR, V2, V3

COMMON Blocks: /MOLDAT/

REAL FUNCTION DENWTR

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NPTS
PARAMETER (NPTS=56)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRPO
REAL T(NPTS), DEN(NPTS)
REAL TC

COMMON Blocks: None

REAL FUNCTION DEPOL

Argument Declarations:

WL - REAL Variable - Wavelength (μm)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

REAL WLD(36), DPL(36)

COMMON Blocks: None

DOUBLE PRECISION FUNCTION DERF

Argument Declarations:

DX - DOUBLE PRECISION Variable - Argument of error function

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, EXP, ABS

Local Variable Declarations:

DOUBLE PRECISION A(5), T, P, DUM

COMMON Blocks: None

SUBROUTINE DESAER

Argument Declarations:

WSPD - REAL Variable (Input) - Wind speed at 10 m altitude (m/sec)
VIS - REAL Variable (Output) - Meteorological range (km)
DESEXT - REAL Vector (Len = Unspecified) (Output) - Extinction
coefficient (km^{-1})
DESABS - REAL Vector (Len = Unspecified) (Output) - Absorption
coefficient (km^{-1})
ASYMD - REAL Vector (Len = Unspecified) (Output) - Asymmetry factor

PARAMETER Declarations:

INTEGER NWLAER
PARAMETER (NWLAER=47)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, MIN
EXTERNAL DSRTBD

Local Variable Declarations:

INTEGER I, NWSPD
REAL EXT55, RAYSCT, WIND(4), FAC, DWND

COMMON Blocks: /CONSTN/, /DESDAT/

SUBROUTINE DFLT2

Argument Declarations:

ITYPE - INTEGER Variable (Input) - Latitude index
 ISEASN - INTEGER Variable (Input/Output) - Season index
 IAERO1 - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Boundary layer aerosol index
 IAERO2 - INTEGER Variable (Input/Output) - Stratospheric aerosol index
 IHAZE - INTEGER Variable (Input/Output) - Haze profile index
 IUPPER - INTEGER Variable (Input/Output) - Upper haze profile index
 ISMX - INTEGER Variable (Input) - Maximum DIMENSION of MC
 MP - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Pressure profile index
 MT - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Temperature profile index
 MC - INTEGER Array (Dim = ISMX x MAXLAT x Unspecified)
 (Input/Output) - Molecular concentration profile index
 MA - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Model atmosphere index
 VIS - REAL Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Sea-level visible range (km)
 RE - DOUBLE PRECISION Variable (Output) - Earth radius (km)
 MONTH - INTEGER Variable (Input) - Month of the year (Jan =1 ,...)
 XLAT - REAL Variable (Input) - Latitude (deg)
 XLONG - REAL Variable (Input) - Longitude (deg)
 LATSTR - REAL Vector (Len = Unspecified) (Output) - Latitude of the
 model atmosphere.
 LONSTR - REAL Vector (Len = Unspecified) (Output) - Longitude of the
 model atmosphere.
 NLAT - INTEGER Variable (Output) - Number of latitudes
 NLON - INTEGER Variable (Output) - Number of longitudes
 IBKGD - INTEGER Variable (Input) - Background index
 HBCK - REAL Variable (Input) - Terrain altitude (km)

PARAMETER Declarations:

INTEGER NL, MAXLAT, MAXLON
 PARAMETER (NL=50, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTEGER MDLATM, IDAERO
 INTRINSIC ABS, SQRT, COS, SIN, MIN, DBLE, INT
 EXTERNAL ATMSBD, MDLATM, IDAERO

Local Variable Declarations:

INTEGER K, KK, LL, ITYPE0, JTYPE

COMMON Blocks: /ATMDAT/, /CONSTN/

SUBROUTINE DFLT8

Argument Declarations:

V1 - REAL Vector (Len = Unspecified) (Input/Output) - Initial
wavenumber (cm^{-1} or micron)
V2 - REAL Vector (Len = Unspecified) (Input/Output) - Final
wavenumber (cm^{-1} or micron)
DVI - REAL Vector (Len = Unspecified) (Input/Output) - Calculation
width (cm^{-1})
IDV - INTEGER Vector (Len = Unspecified) (Input) - Wavenumber/
Wavelength index
IDV = 1 implies wavenumber (cm^{-1})
IDV = 2 implies wavelength (micron)
DWL - REAL Vector (Len = Unspecified) (Output) - Calculation
width (micron)
NV - INTEGER Variable (Output) - Number of wavenumber sets of values
NVMAX - INTEGER Variable (Input) - Maximum number of wavenumber sets of
values
ISPCAL - INTEGER Variable (Output) - Spectral calculation index
ISPCAL = 1 implies 2 cm^{-1} band parameters
ISPCAL = 3 implies line-by-line millimeter wave parameters

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL DVINCR
CHARACTER*2 UPCASE
INTRINSIC MAX, MIN, ABS, AINT
EXTERNAL DVINCR, RDLIN, GETVEC, UPCASE, DEVCB

Local Variable Declarations:

INTEGER I, L, N1, N2, N3
REAL VR(2), VI, VF, VX, DVX
CHARACTER*255 VARIAB, VARS1, VARS2, VARS3

COMMON Blocks: /CONSTN/, /DEVICE/, /MOLECP/

COMPLEX FUNCTION DIREFL

Argument Declarations:

DOTPR - REAL Variable - Dot product of incident vector to surface normal
DIELEC - COMPLEX Variable - Permittivity (dielectric constant and conductivity) of surface
XMU - COMPLEX Variable - Permeability of surface
IPOLAR - INTEGER Variable - Polarization index
IPOLAR = 1 implies polarization parallel to surface
IPOLAR = 2 implies polarization normal to surface

INTRINSIC and EXTERNAL Declarations:

INTRINSIC CMPLX, SQRT

Local Variable Declarations:

COMPLEX EP, CCST

COMMON Blocks: None

SUBROUTINE DISEND

Argument Declarations:

IFDIS - INTEGER Variable (Input) - File number for DIS file

PARAMETER Declarations:

INTEGER NVSMAX, NGMAX
PARAMETER (NVSMAX=20, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER NHDR(2), NVAR(NGMAX), IV, IVSET, IVS, IG, NVSET,
+ NVS(NVSMAX), IH, IOS, ICHK, IHDR(6000),
+ NGEOM, IGEOM
REAL HDR(7500), VAR(10000)
CHARACTER*40 HEADNG
CHARACTER*80 TITLE
EQUIVALENCE (NGEOM, IHDR(1)), (NVSET, IHDR(2)),
+ (NVS(1), IHDR(3))

SUBROUTINE DISPRN

Argument Declarations:

IFDIS - INTEGER Variable (Input) - File number for DIS file
 IGEOM - INTEGER Variable (Input) - Number of geometry
 NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of
 observer azimuths
 NASPCT - INTEGER Vector (Len = Unspecified) (Input) - Number of
 earth/skyshine elevation angles
 NAZSH - INTEGER Variable (Input) - Number of earth/skyshine
 azimuth angles

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, NZSMAX, NMATL, MAXLAT,
 + MAXLON, MLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (NMATL=28)
 PARAMETER (MAXLAT=3, MAXLON=1)
 PARAMETER (MLMAX=100)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 EXTERNAL IOERR

Local Variable Declarations:

INTEGER L, M, MM, IOS

COMMON Blocks: /BCKDAT/, /INTSTO/

REAL FUNCTION DNDR

Argument Declarations:

RADN - REAL Vector (Len = Unspecified) - Midpoints of the radii
 intervals (microns)
 IMATRL - INTEGER Variable - Particle material index
 TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL GAMMLN
 INTRINSIC REAL, EXP, LOG, SQRT, MAX, MIN, INT, AINT, ABS, DBLE
 EXTERNAL GAMMLN

Local Variable Declarations:

INTEGER I, IP
 REAL TSSQ, SUM, CON, DR, XI, FAC, RATE, GAM, D0, DP, ROP,
 DIAM(5), DL(5), SIZEN
 DOUBLE PRECISION FN100, FN1000, B1, B2

COMMON Blocks: /CONSTN/, /MATERL/

REAL FUNCTION DPLDT

Argument Declarations:

TEMP - REAL Variable - Temperature (K)
V - REAL Variable - Wavenumber (cm^{-1})
DV - REAL Variable - Wavenumber increment (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, EXP, DPROD, LOG

Local Variable Declarations:

INTEGER I
REAL VP
DOUBLE PRECISION X, Y, C1, C2, XMU(3), WT(3), DPL

COMMON Blocks: /CONSTN/

SUBROUTINE DRTLAY

Argument Declarations:

R - REAL Variable (Output) - Reflection coefficient
T - REAL Variable (Output) - Transmission coefficient
BU - REAL Variable (Input) - Backscatter coefficient
PHI - REAL Variable (Input) - Elevation angle (deg)
W - REAL Variable (Input) - Scattering albedo
TAU - REAL Variable (Input) - Layer optical depth
RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
ZM - REAL Variable (Input) - Prior altitude (km)
Z - REAL Variable (Input) - Altitude of interest (km)
ZP - REAL Variable (Input) - Next altitude (km)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP, ABS, DBLE, REAL, SIN

Local Variable Declarations:

REAL U, EM, G

COMMON Blocks: /CONSTN/

REAL FUNCTION DVINCR

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
DVI - REAL Variable - Initial wavenumber increment (cm^{-1})
IDV - INTEGER Variable - Wavenumber/wavelength index
 IDV = 1 implies wavenumber (cm^{-1})
 IDV = 2 implies wavelength (micron)
 IDV = 3 implies frequency (GHz)
DWL - REAL Variable - Wavelength increment (micron)

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC AINT, MAX

COMMON Blocks: /MOLECP/

SUBROUTINE ECLGAL

Argument Declarations:

ALPHA - REAL Variable (Input) - Ecliptic azimuth (deg)
DELTA - REAL Variable (Input) - Ecliptic elevation (deg)
XL - REAL Variable (Output) - Galactic azimuth (deg)
XB - REAL Variable (Output) - Galactic elevation (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS, ATAN2, ABS

Local Variable Declarations:

REAL CSA, SNA, CSD, SND, CS0, SN0, DUM1, DUM2, DUM3, XLP, XBP,
 CSL, SNL

COMMON Blocks: /CONSTN/

REAL FUNCTION EHBSL0

Argument Declarations:

X - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION POLY
INTRINSIC DBLE, ABS, EXP, SQRT, REAL
EXTERNAL POLY

Local Variable Declarations:

DOUBLE PRECISION C1(7), C2(9), T, T1, T2

COMMON Blocks: None

REAL FUNCTION EMISSV

Argument Declarations:

R - REAL Variable - Distance from sun
V - REAL Variable - Wavenumber (cm^{-1})

PARAMETER Declarations:

INTEGER MOLMAX, MLIDMX
PARAMETER (MOLMAX=26, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL SOLAR, PLANCK
INTRINSIC MAX, MIN, INT, LOG10, REAL
EXTERNAL ZOD1BD, SOLAR, PLANCK

Local Variable Declarations:

INTEGER IW, IWP, ICEN, ICENP
REAL DMIN, DMAX, DSLOPE, ALINE, FACW, FACD, C, AWL,
SOLDIS, V1, V2, TEMP

COMMON Blocks: /MOLECP/, /SILEMS/

COMPLEX FUNCTION EMTREF

Argument Declarations:

INDEXM - COMPLEX Variable - Index of refraction of matrix
INDEXI - COMPLEX Vector (Len = Unspecified) - Index of refraction of
 inclusions
F - REAL Vector (Len = Unspecified) - Volume fraction of inclusions
NINCL - INTEGER Variable - Number of inclusion types
ITYPE - INTEGER Variable - Type of mixture
 ITYPE = 0 implies the Bruggeman effective medium theory which
 applies to a two-component mixture in which there
 are no distinguishable inclusions embedded in a
 definite matrix
 ITYPE = 1 implies Maxwell-Garnett theory for spherical
 inclusions in a matrix
 ITYPE = 2 implies the Lorentz-Lorens form of the Clausius-
 Mosotti equation for a mixture; this equation holds
 for gases, but is only an approximation for liquids
 (i.e., it fails near strong absorption bands)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, CMPLX

Local Variable Declarations:

INTEGER I
COMPLEX E, EM, VF, BETA, EAV, C1, C2, DUM

COMMON Blocks: None

SUBROUTINE ENDP

Argument Declarations:

R - REAL Vector (Len = Unspecified) (Input/Output) - Slant range (km)
 THETA - REAL Vector (Len = Unspecified) (Input/Output) - Earth center angle (rad)
 PHI - REAL Vector (Len = Unspecified) (Input/Output) - Elevation angle (rad)
 IZ - INTEGER Vector (Len = Unspecified) (Input/Output) - Altitude index
 LLST - INTEGER Variable (Input) - Location of last valid point on ray
 SLRNG - REAL Variable (Input) - Total slant range (km)
 BETA - REAL Variable (Input) - Total earth center angle (deg)
 JTPGM - INTEGER Variable (Input) - Type of calculation
 JTPGM = 5 implies slant range is specified
 JTPGM = 6 implies earth center angle is specified
 JTPGM = 9 implies earth center angle is specified
 HSEND - REAL Variable (Output) - End point altitude (km)
 IERR - INTEGER Variable (Output) - Error index
 IERR = 0 implies no error encountered
 IERR = -1 implies initial value exceeds specified value or final value does not exceeds specified value

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NNNMAX, NAZMAX, NASMAX, NGAS, NGMAX,
 NZSMAX, MAXLAT, MAXLON, NPTS, NVSMAX, NVSA, MOLMAX,
 MLIDMX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, NNNMAX=5, NGAS=6)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, NVSA=9)
 PARAMETER (NPTS=2000)

INTRINSIC and EXTERNAL Declarations:

INTEGER ISTAER
 REAL STRCN2, XTERP, HAZE
 INTRINSIC REAL, DBLE, MAX, MIN, COS, ACOS, SIN, SQRT, SIGN, INT,
 ABS
 EXTERNAL STRCN2, XTERP, EQABS, ISTAER, MOLPBD, AERSOL, HYDROM,
 HAZE, CLDRBD

Local Variable Declarations:

INTEGER I, J, K, L, MLP, KK, LL, IDRCT, JM, MLX, KL, JDRCT, KPHI,
 IZI (NPTS), ITRPAU (MAXLAT, MAXLON), ITRP0,
 ISTPAU (MAXLAT, MAXLON), JMM, JP, KLAT, KLON,
 IPRINT
 REAL WL, DTD PJ (NPTS), XMHI (NPTS), XDRCT, VISX, VI, VF,
 DZL, PLI, TLI, RH LI, WI (ISMX), PR TNFI (ISMX),
 CMOLI (ISMX), PLUMIF (NNNMAX, NGAS),
 PLUMIG (NGAS), FAC, TAV, FACICE, FACSNW, DUM, ZLP
 DOUBLE PRECISION MH, MHM, SNELL, TD, RD, PX (NPTS), DMDH, DXMH1, DXMH2,
 DPHI1, DPHI2, RX, PX0, DFAC, DRD, DTD, XMH0
 LOGICAL DUPLIC

COMMON Blocks: /CLDRN/ , /CONSTN/ , /HEADER/ , /INITAL/ , /MOLCON/ ,
 /MOLECP/ , /PLMDAT/ , /VSADTA/

SUBROUTINE EPHEML

Argument Declarations:

LATIT - REAL Variable (Input) - Geographical Latitude of observer (deg)
 (+ implies North)
 LONG - REAL Variable (Input) - Geographical Longitude of observer (deg)
 (+ implies East)
 LONSUN - DOUBLE PRECISION Variable (Input) - Longitude of the sun (deg)
 LABSUN - DOUBLE PRECISION Variable (Input) - Mean ecliptic longitude of the
 sun (deg)
 PERSUN - DOUBLE PRECISION Variable (Input) - Mean perigee of the sun (deg)
 OBLIQ - DOUBLE PRECISION Variable (Input) - Obliquity of the ecliptic (deg)
 SOLEV - REAL Variable (Input) - Elevation of sun (deg)
 SOLAZ - REAL Variable (Input) - Azimuth of sun (deg)
 0.0 implies North (or undefined)
 90.0 implies East
 180.0 implies South
 270.0 implies West
 SOLDIS - REAL Variable (Input) - Earth-sun distance normalized by mean
 distance
 XLUNEV - REAL Variable (Output) - Elevation of moon (deg)
 XLUNAZ - REAL Variable (Output) - Azimuth of moon (deg)
 0.0 implies North (or undefined)
 90.0 implies East
 180.0 implies South
 270.0 implies West
 PHLUNR - REAL Variable (Output) - Lunar phase (deg)
 0.0 implies new moon
 90.0 implies first quarter
 180.0 implies full moon
 270.0 implies last quarter
 360.0 implies new moon
 XLNDIS - REAL Variable (Output) - Earth-moon distance normalized
 by the mean distance
 IECL - INTEGER Variable (Output) - Lunar eclipse index
 IECL = 0 implies no lunar eclipse
 IECL = 1 implies that a lunar eclipse is likely to affect the
 calculations. Consult an almanac. If there is no
 eclipse, the output will be reliable.
 IECS - INTEGER Variable (Output) - Solar eclipse index
 IECS = 0 implies no solar eclipse
 IECS = 1 implies that a solar eclipse is likely to affect the
 calculations. Consult an almanac. If there is no
 eclipse, the output will be reliable.
 ETIME - DOUBLE PRECISION Variable (Input) - Ephemeris time since
 Jan 1 1900, 12:00 Noon, GMT (days)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, MAX, MIN, SIN, COS, ASIN, ACOS, ATAN2, SIGN,
 ABS, DBLE, ATAN, MOD
 EXTERNAL LUNPBD

Local Variable Declarations:

INTEGER I
 REAL LHSUN, LHMOON, LOCEL, MOORAD, ARGUM, TINMOO, PARMEA, SUNRAD,
 ERMAS, GHSUN, GHMOON, DECMOO, PARLOC, DIFLON, TEMP16,
 TEMP17, DUMM, PARLAX, AZIMOO, DECSUN, XS, YS, ZS, XM, YM, ZM,
 GELONG, SUNMOO, CRITEL, THETA
 DOUBLE PRECISION GHARI, LONMOO, LATMOO, LABMOO, PERMOO, NODMOO,
 CENT, DUM, BLM, BLS, BRP, BRD, RATE, DAYPYR

COMMON Blocks: /CONSTN/, /PERLUN/

SUBROUTINE EPHEMS

Argument Declarations:

LAT - REAL Variable (Input) - Latitude (in degrees and fractions of degrees, is north)
 LONG - REAL Variable (Input) - Longitude (in degrees and fractions of degrees, is east)
 DAY - INTEGER Variable (Input) - Day of the month
 MONTH - INTEGER Variable (Input) - Month of the year
 YEAR - INTEGER Variable (Input) - Year
 TIME - REAL Variable (Input) - Time (decimal) local standard (LST) or Greenwich mean (GMT)
 ITIME - INTEGER Variable (Input) - Time index
 ITIME = 0 implies local standard time
 ITIME = 1 implies Greenwich mean time
 ITIME = 2 implies local daylight savings time
 SOLAZ - REAL Variable (Output) - Azimuth angle (in degrees and fractions of a degree)
 0.0 implies north (or undefined)
 90.0 implies east
 180.0 implies south
 270.0 implies west
 SOLEV - REAL Variable (Output) - Elevation angle (in degrees and fractions of a degree)
 SOLDIS - REAL Variable (Output) - Normalized solar-earth distance
 SOLDIS = 1.0 implies the mean distance
 XLUNEV - REAL Variable (Output) - Lunar elevation (deg)
 XLUNAZ - REAL Variable (Output) - Lunar azimuth (deg)
 0.0 implies north (or undefined)
 90.0 implies east
 180.0 implies south
 270.0 implies west
 XLUNDS - REAL Variable (Output) - Normalized lunar distance
 PHLUNR - REAL Variable (Output) - Lunar phase (deg)
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL SLPOS
 DOUBLE PRECISION EPHTIM
 INTRINSIC ABS, SIN, COS, MOD, AINT, INT, SIGN, ASIN, ACOS, TAN,
 REAL, ATAN, DBLE, SQRT, MAX, MIN
 EXTERNAL PLANET, EPHEML, SPTRIG, SLPOS, EPHTIM

Local Variable Declarations:

INTEGER I, J, IECL, IECS
 REAL LHA, DCIR, ZNLONG, GMTDEG, ERR, APPLON, RASC, DUMX,
 PSAZ, ECCEN, TRANOM, ABERR, OBLQMN, ECANOM, DAYCNT,
 ASCMN, SOLAT, APRASC, EQTIME, HRANG, DECLIN, DECL,
 BETAS, BETAL, DUMMY, TANOM, TEMP
 DOUBLE PRECISION LONSUN, LABSUN, PERSUN, OBLIQ, CENT, DPHI, A, XMNLAT,
 DDCIR, ANOMN, PERTUB, PERVEN, PERJUP, OBLNUT, ETIME

COMMON Blocks: /CONSTN/, /FLAGS/, /INITAL/

DOUBLE PRECISION FUNCTION EPHTIM

Argument Declarations:

DAY - INTEGER Variable (Input) - Day of the month
MONTH - INTEGER Variable (Input) - Month of the year
YEAR - INTEGER Variable (Input) - Year
TIME - REAL Variable (Input) - Time (decimal) local standard (LST)
or Greenwich mean (GMT)
ITIME - INTEGER Variable (Input) - Time index
ITIME = 0 implies local standard time
ITIME = 1 implies Greenwich mean time
ITIME = 2 implies local daylight savings time

PARAMETER Declarations:

INTEGER NYRMAX
PARAMETER (NYRMAX=175)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, AINT, INT, SIGN, REAL, DBLE, MAX, MIN

Local Variable Declarations:

INTEGER I, J, IYR
REAL DT(NYRMAX), DYR, FAC, YR1, YR2, TEMP, DAYCNT, ZNLONG,
GMTDEG, DCIR
DOUBLE PRECISION UTIME, CENT, DDCIR

COMMON Blocks: None

SUBROUTINE EQABS

Argument Declarations:

ZL - REAL Variable (Input) - Altitude (km)
 PL - REAL Variable (Output) - Pressure (mb)
 TL - REAL Variable (Output) - Temperature (K)
 RHL - REAL Variable (Output) - Relative humidity
 XMH - REAL Variable (Output) - Refractive bending constant
 W - REAL Vector (Len = Unspecified) (Output) - Equivalent absorber amounts (km^{-1})
 PRTNFN - REAL Vector (Len = Unspecified) (Output) - Partition function for each molecule
 RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
 WL - REAL Variable (Input) - Wavelength (μm)
 CMOLL - REAL Vector (Len = Unspecified) (Output) - Molecular concentrations (ppm)
 PLUMEF - REAL Array (Dim = NNNMAX X Unspecified) (Output) - Line strength partition function
 PLUMEG - REAL Vector (Len = Unspecified) (Output) - Fine structure partition function
 NNNMAX - INTEGER Variable (Input) - Maximum number of partitions
 IPRINT - INTEGER Variable (Input) - Print index
 KK - INTEGER Variable (Input) - Latitude index
 LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER MLMAX, NGAS, NASMAX, NL, MAXLAT, MAXLON, NGMAX, NLUPR, NTEXO, NVSA, ISMX, MOLMAX, MLIDMX, NVSMAX, NAZMAX, NZSMAX
 PARAMETER (MLMAX=140, NGAS=6, NASMAX=15, NAZMAX=30)
 PARAMETER (NL=50, NLUPR=8, NTEXO=11, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, NVSA=9)
 PARAMETER (MLIDMX=45, NZSMAX=4)

INTRINSIC and EXTERNAL Declarations:

INTEGER MDLATM
 REAL XTERP, PARTIT, SATUR, RELHUM
 DOUBLE PRECISION REFRAC
 INTRINSIC MAX, REAL, MIN, ABS, INT
 EXTERNAL XTERP, REFRAC, ATMSBD, UPPRBD, PARTIT, BNDMLG, MOLPBD, SATUR, RELHUM, STMLBD, EXMLBD, MDLATM

Local Variable Declarations:

INTEGER ITRP1, ITRP2, MLC, I, K, IWATER, MPX, MTX, MCX, IT, M1, M2, MK
 REAL P0, T0, PS, TS, SATURL, FAC, ZLBL, RHDUM, ABSLAT, FACLAT, P1, P2, T1, T2, C1, C2

COMMON Blocks: /ATMDAT/, /CONSTN/, /EXTMOL/, /FLAGS/, /HEADER/, /MOLCON/, /MOLDAT/, /MOLECP/, /STDMOL/, /UPRATM/, /USERDF/, /VSADTA/

SUBROUTINE EQUABS

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Input) - Extra altitudes in altitude grid
 NXTRA - INTEGER Variable (Input) - Dimension of HXTRA
 TITLE - CHARACTER*(*) Variable (Input) - Title in printout
 HEADNG - CHARACTER*(*) Variable (Input) - Heading in printout

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NNNMAX, NAZMAX, NASMAX, NGAS, MAXLAT,
 MAXLON, NGMAX, NZSMAX, NL, NVSMAX, NVSA, MOLMAX,
 MLIDMX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, NNNMAX=5, NGAS=6)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, NVSA=9, NL=50)

INTRINSIC and EXTERNAL Declarations:

INTEGER ISTAER
 REAL STRCN2, XTERP, HAZE, HEYMS, HLOWT, VISRH
 CHARACTER*72 IOERR
 INTRINSIC REAL, MAX, MIN, SQRT, MOD, DBLE
 EXTERNAL AERSOL, EQABS, ISTAER, STRCN2, NXXPAU, CLDRBD, HLOWT,
 CHRCBD, DEVCBD, HAZE, MOLPBD, XTERP, HEYMS, IOERR,
 HYDROM, SETALT, SKYNOI, CLDALT, ATMSBD, CHANGE,
 VISRH

Local Variable Declarations:

INTEGER I, L, M, LM, LP, NLP, ITRPAU (MAXLAT, MAXLON),
 ISTPAU (MAXLAT, MAXLON), NMSPAU (MAXLAT, MAXLON),
 IBNLYR, IOS, KK, LL, NLINES, ITRP0, IPRINT, K, JCLO
 REAL ZP (MLMAX), FACSNW, FACICE, WL, XL0 (MAXLAT, MAXLON),
 DMDH, VISX, DUM, CIRICL (MAXLAT, MAXLON), TAV,
 HBLYR, SUMC, VI, VF, ZLP
 CCM3 REAL XLOSCH
 CHARACTER*8 CLABRV, MOLSYM (MLIDMX)
 COMMON Blocks: /ATMDAT/, /BCKDAT/, /CHRCNM/, /CLDRN/, /CONSTN/,
 /DEVICE/, /HEADER/, /INITAL/, /MOLCON/, /MOLECP/,
 /OUTPUT/, /PLMDAT/, /VSADTA/

SUBROUTINE EQUACL

Argument Declarations:

ALPHA - REAL Variable (Input) - Equatorial azimuth (deg)
 DELTA - REAL Variable (Input) - Equatorial elevation (deg)
 YEAR - REAL Variable (Input) - Julian date (year)
 XLMBDA - REAL Variable (Output) - Ecliptic azimuth (deg)
 BETA - REAL Variable (Output) - Ecliptic elevation (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS, ATAN2, ABS

Local Variable Declarations:

REAL T, EA, CSA, SNA, CSD, SND, CSE, SNE, DUM1, DUM2, DUM3, XL,
 CSL, SNL, B

COMMON Blocks: /CONSTN/

SUBROUTINE ESFIT

Argument Declarations:

OPTDEP - REAL Vector (Len = Unspecified) (Input) - Optical depth due to
 molecular band absorption
 ALPHAD - REAL Vector (Len = Unspecified) (Input) - Line width divided by
 the line spacing
 NMOLEC - INTEGER Variable (Input) - Number of molecules
 EXPBND - REAL Variable (Input) - Optical depth due to exponential terms in
 the band model (i.e., aerosols, hydrometeors, continuum, certain
 molecules)
 AFIT - REAL Vector (Len = unspecified) (Output) - Linear coefficients for
 the exponential sum fit
 XKFIT - REAL Vector (Len = unspecified) (Output) - Exponential coefficients
 for the exponential sum fit
 NFIT - INTEGER Variable (Output) - Number of terms for the exponential sum
 fit

PARAMETER Declarations:

INTEGER ISMX, MOLMAX
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, EXP, SQRT
 EXTERNAL LAGRBD

Local Variable Declarations:

INTEGER K, M
 REAL SUMA, TWGP, AFITM, SUMXK
 DOUBLE PRECISION BETA, FM, XLG, WLGE

COMMON Blocks: /CONSTN/, /LAGUER/, /LOWMSC/

REAL FUNCTION EVAPOR

Argument Declarations:

T - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NPTS
PARAMETER (NPTS=18)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRP0
REAL XLATNT(NPTS), TEMP(NPTS)

COMMON Blocks: None

LOGICAL FUNCTION EVEN

Argument Declarations:

I - INTEGER Variable - INTEGER input

Local Variable Declarations:

INTEGER J

COMMON Blocks: None

REAL FUNCTION EXGALS

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
DV - REAL Variable - Wavenumber increment (cm^{-1})

PARAMETER Declarations:

INTEGER NPTS
PARAMETER (NPTS=7)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, PLANCK
EXTERNAL XTERP, PLANCK

Local Variable Declarations:

INTEGER ITRP0
REAL WL(NPTS), RADNC(NPTS), WL0, WLREF

COMMON Blocks: /CONSTN/

SUBROUTINE EXOATM

Argument Declarations:

IXOTMP - INTEGER Variable (Input) - Exospheric temperature index
IXOTMP = 0 implies the standard exospheric temperature (1000 K)
IXOTMP = 1 implies a user-specified exospheric temperature
IXOTMP = 2 implies a calculated exospheric temperature
TINF - REAL Array (Dim = MATLAT x Unspecified) (Input) - Exospheric temperature (K)
ISEASN - INTEGER Variable (Input) - Seasonal index
ISEASN = 1 implies summer
ISEASN = 2 implies winter
ISEASN = 3 implies spring/fall
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MAXLAT, MAXLON, NLUPR, NTEXO
PARAMETER (MAXLAT=3, MAXLON=1, NLUPR=8, NTEXO=11)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP, UPPRBD

Local Variable Declarations:

INTEGER I, KK, LL, ITRP0

COMMON Blocks: /UPRATM/

REAL FUNCTION EXOTMP

Argument Declarations:

F - REAL Variable - Instantaneous 10.7-cm solar flux obtained from the
National Research Council, Ottawa, Canada
(10^{-22} watts/m²/cycles/sec)

FBAR - REAL Variable - Average of F over three 27-day solar rotations
(10^{-22} watts/m²/cycles/sec)

AP - REAL Vector (Len = Unspecified) - Geomagnetic planetary index
An alternate expression is KP (see equation below)
KP = 0 implies absolutely quiet geomagnetic activity
KP = 2 implies average quiet geomagnetic activity

ISNSPT - INTEGER Variable - Sunspot index
ISNSPT = 1 implies a sunspot minimum
ISNSPT = 2 implies average sunspot activity
ISNSPT = 3 implies a sunspot maximum

IDAY - INTEGER Variable - Day of the year (1 = January 1)

SOLAZ - REAL Variable - Solar azimuth (South = 0.0) (deg)

SOLEV - REAL Variable - Solar elevation (deg)

XLAT - REAL Variable - Latitude (+ implies North/- implies South) (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, ABS, SIN, COS, TAN, ATAN, EXP

Local Variable Declarations:

INTEGER ISNSPP, IDAYP
REAL A(3), BETA, P, GAM, XLATB, XM, XN, R, T1, X1, X2, X3, AX,
+ DUM, HSTAR, TAU, ETA, THETA, FP, FBARP

COMMON Blocks: /CONSTN/

SUBROUTINE FILOPN

Argument Declarations:

IFINP - INTEGER Variable (Input) - Input file number
IFILE - INTEGER Variable (Input/Output) - File number

INTRINSIC and EXTERNAL Declarations:

CHARACTER*4 UPCASE
CHARACTER*72 IOERR
EXTERNAL RDLINE, IOERR, UPCASE

Local Variable Declarations:

INTEGER IOS
CHARACTER*255 NFILE

COMMON Blocks: None

SUBROUTINE FILRT

Argument Declarations:

FILERT - CHARACTER*(*) Variable (Input) - File root
FILENM - CHARACTER*(*) Vector (Len = Unspecified) (Input) - File names

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INDEX, LEN
EXTERNAL DEV CBD, LCTRIM

Local Variable Declarations:

INTEGER I, IXM
CIBM CHARACTER*1 SLASH

COMMON Blocks: /DEV CNM/

REAL FUNCTION FILTER

Argument Declarations:

ITYPE - INTEGER Variable - Type of filter response
 ITYPE = 0 implies a square response
 ITYPE = 1 implies a user-defined response
 V - REAL Variable - Wavenumber (cm^{-1})
 VI - REAL Variable - Initial wavenumber for square response (cm^{-1})
 VF - REAL Variable - Final wavenumber for square response (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
EXTERNAL	XTERP

Local Variable Declarations:

INTEGER	ITRPO
REAL	WLO

COMMON Blocks: /CONSTN/,/FLTRDT/

SUBROUTINE FLSTAT

Argument Declarations:

FILENM - CHARACTER*(*) Vector (Len = Unspecified) (Input) - File names
 ISMARY - INTEGER Variable (Output) - Summary switch
 ISMARY = 0 implies full calculations desired
 ISMARY = 1 implies a summary of an existing file
 ISMARY = 2 implies a restart of a previous calculation
 FILXST - LOGICAL Variable (Output) - Existence flag for IFATM
 FILXSB - LOGICAL Variable (Output) - Existence flag for IFBCK
 FILXSP - LOGICAL Variable (Output) - Existence flag for IFPLM
 FILXSM - LOGICAL Variable (Output) - Existence flag for IFMSC
 FILXSC - LOGICAL Variable (Output) - Existence flag for IFTRN
 FILXSH - LOGICAL Variable (Output) - Existence flag for IFHTR
 FILXS7 - LOGICAL Variable (Output) - Existence flag for IFTP7
 FILXS8 - LOGICAL Variable (Output) - Existence flag for IFTP8
 FILXSD - LOGICAL Variable (Output) - Existence flag for IFDIS

PARAMETER Declarations:

INTEGER	MOLMAX
PARAMETER	(MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1	UPCASE
CHARACTER*72	IOERR
EXTERNAL	DEV CBD,UPCASE,IOERR

Local Variable Declarations:

INTEGER	IOS
CHARACTER*1	RESPON,YES

COMMON Blocks: /DEVICE/,/MACHIN/

SUBROUTINE FLUXLW

Argument Declarations:

T - REAL Vector (Len = Unspecified) (Input) - Temperatures (K) vs. pressure
 LEV - INTEGER Variable (Input) - Altitude level index
 FU - REAL Variable (Output) - Upward diffuse longwave flux (W/m²) at level LEV
 FD - REAL Variable (Output) - Downward diffuse longwave flux (W/m²) at level LEV
 EMRAD - REAL Variable (Input) - Emitted flux from earth (W/m²)
 CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
 1 - Low etage
 2 - Middle etage
 3 - High etage

INTRINSIC and EXTERNAL Declarations:

EXTERNAL BRBNBD

Local Variable Declarations:

REAL A, B, C, D, E, AP, BP, CP, AT, BT, CT, DT, ET,
 ATP, BTP, CTP, CC, CCH, CCL, CH, CL, CM,
 SIGMA, EMHB, EMHT, EMMB, EMMT, EMLB, EMLT

COMMON Blocks: /CLDPAR/, /CLIMAT/, /OMATLW/

SUBROUTINE FRESNL

Argument Declarations:

E1 - COMPLEX Variable (Input) - Dielectric constant of layer that electric field starts in
 E2 - COMPLEX Variable (Input) - Dielectric constant of layer that electric field ends up
 ANGLE - REAL Variable (Input) - Elevation angle in free space (deg)
 RH - COMPLEX Variable (Input) - Horizontally polarized reflectivity
 RV - COMPLEX Variable (Input) - Vertically polarized reflectivity
 TH - COMPLEX Variable (Input) - Horizontally polarized transmissivity
 TV - COMPLEX Variable (Input) - Vertically polarized transmissivity

INTRINSIC and EXTERNAL Declarations:

INTRINSIC COS, CMPLX, SQRT, ABS

Local Variable Declarations:

COMPLEX CI, S1, S2

COMMON Blocks: /CONSTN/

REAL FUNCTION GALRAD

Argument Declarations:

XL - REAL Variable - Galactic azimuth (deg)
B - REAL Variable - Galactic elevation (deg)
V - REAL Variable - Wavenumber (cm^{-1})
DV - REAL Variable - Wavenumber increment (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

REAL	PLANCK
INTRINSIC	ABS, EXP
EXTERNAL	PLANCK

Local Variable Declarations:

REAL C(3), C0, T0, AL, PHI

COMMON Blocks: /CONSTN/

REAL FUNCTION GAM

Argument Declarations:

R1S - REAL Variable - Directional reflection coefficient, layer 1
R2 - REAL Variable - Diffuse reflection coefficient, layer 2
R2S - REAL Variable - Directional reflection coefficient, layer 2
R3 - REAL Variable - Diffuse reflection coefficient, layer 3
T2 - REAL Variable - Transmission, layer 2

REAL FUNCTION GAMMLN

Argument Declarations:

X - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL, DBLE, LOG

Local Variable Declarations:

INTEGER I
DOUBLE PRECISION A(6), STP, FPF, TMP, SUM, DXINC, DX

COMMON Blocks: None

SUBROUTINE GBLBCK

Argument Declarations:

XLATIT - REAL Variable (Input) - Latitude (deg)
 - implies Northern hemisphere
 - implies Southern hemisphere
 XLONG - REAL Variable (Input) - Longitude (deg)
 - implies Western hemisphere
 - implies Eastern hemisphere
 MONTH - INTEGER Variable (Input) - Month index (1 = Jan)
 HOUR - REAL Variable (Input) - Time of day (LST) (dec. hr.)
 IScene - INTEGER Variable (Output) - Scene index
 ALTIT - REAL Variable (Input/Output) - Altitude (km)
 TSURF - REAL Variable (Input/Output) - Surface temperature (K)
 CLDCVR - REAL Vector (Len = Unspecified) (Output) - Cloud cover (%)
 0 - Total
 1 - Low etage
 2 - Middle etage
 3 - High etage
 TMIDN - REAL Variable (Output) - Air temperature at midnight (K)
 TNOON - REAL Variable (Output) - Air temperature at noon (K)
 FRSNW - REAL Variable (Output) - Percentage snow (%)
 FRICE - REAL Variable (Output) - Percentage ice (%)
 FRWTR - REAL Variable (Output) - Percentage water (%)

INTRINSIC and EXTERNAL Declarations:

REAL	AIRTMP
INTRINSIC	REAL, INT, MAX, MIN, MOD, ABS, SIGN
EXTERNAL	AIRTMP, RDGBL, RDSCN, ATMSBD, DEV CBD

Local Variable Declarations:

REAL	FAC, GMT(2,2), TSURF(2), CLCV(2,0:3,2), ALT
	CLDRAD(2,3,2), CIRRR, HOUR0, TAIR0

COMMON Blocks: None

SUBROUTINE GEOM

Argument Declarations:

L1 - INTEGER Variable (Input) - Indicates location in profile array of initial point of path
 L2 - INTEGER Variable (Input/Output) - Indicates location in profile array of final point of path
 SLRNG - REAL Variable (Input) - Slant range (km)
 BETA - REAL Variable (Input) - Earth center angle (deg)
 PHI1 - REAL Variable (Input) - Elevation angle at point L1 (rad)
 PHI2 - REAL Variable (Input) - Elevation angle at point L2 (rad)
 LENP - INTEGER Variable (Input) - Index for the type of path in case of any ambiguity
 LENP = 0 implies shorter path
 LENP = 1 implies longer path
 ITPGM - INTEGER Variable (Input) - Index for the type of geometry
 R - REAL Vector (Len = Unspecified) (Output) - Distances between initial point of path and intermediate points along path (km)
 PHI - REAL Vector (Len = Unspecified) (Output) - Elevation angles at intermediate points along path (rad)
 THETA - REAL Vector (Len = Unspecified) (Output) - Earth center angles at intermediate points along path (rad)
 IZ - INTEGER Vector (Len = Unspecified) (Output) - Location in altitude grid of intermediate points along path
 LYR - INTEGER Variable (Output) - DIMENSION of R, PHI, THETA, and IZ
 LYRMAX - INTEGER Variable (Input) - Maximum allowed DIMENSION of R, PHI, THETA, and IZ
 IBKGD - INTEGER Variable (Input/Output) - Type of background
 RHOS - REAL Variable (Input) - Slant range from L1 to tangent point at L2 (km)
 BHOS - REAL Variable (Input) - Earth-center angle from L1 to tangent point at L2 (rad)
 PHOS - REAL Variable (Input) - Elevation angle at L1 for L2 to be at the tangent point (rad)
 SRMAX - REAL Variable (Input) - Maximum slant range between L1 and L2 (km)
 BETMAX - REAL Variable (Input) - Maximum earth center angle between L1 and L2 (deg)
 IWARN - INTEGER Variable (Input) - Convergence warning printout switch
 IWARN = 0 implies no convergence warning message printed
 IWARN = 1 implies convergence warning message printed
 IERR - INTEGER Variable (Output) - Error switch
 IERR = -1 implies fatal errors in geometry
 IERR = 0 implies no errors in geometry
 IERR = 1 implies warning in geometry
 HTNGT - REAL Variable (Input/Output) - Tangent altitude (km)
 HSEND - REAL Variable (Input/Output) - End point altitude (km)
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes
 FLIMB - LOGICAL Variable (Input) - Logical flag for limb paths

PARAMETER Declarations:

INTEGER	MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX
PARAMETER	(MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	ABS, REAL, DBLE, INT, SIGN
EXTERNAL	RAYPTH, INIGEO, ENDPT

SUBROUTINE GEOM (continued)

Local Variable Declarations:

```
      INTEGER      I,J,ITER,LP,MLP,JBKGD,IDRCT, ISET(2),LLP,JTPGM,  
                  LENPP,LPP  
      REAL         VAR(3),FAC(3),EPSR,VAR0,DUM,ALTMAX  
      DOUBLE PRECISION PHID,P(3)  
      LOGICAL      FLVAR,FLPHI1,FLPHI2  
  
COMMON Blocks:      /CONSTN/,/INITAL/
```

SUBROUTINE GETASP

Argument Declarations:

ISHINE - INTEGER Variable (Output) - Sky/earthshine index

PARAMETER Declarations:

INTEGER	MLMAX, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, NVSMAX=20)
PARAMETER	(MAXLAT=3, MAXLON=1, MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
CHARACTER*1	UPCASE
INTRINSIC	MAX
EXTERNAL	IGTINT, GETVEC, RDLIN, DEVCBD, UPCASE

Local Variable Declarations:

INTEGER	NAZDUM, MM
REAL	AZDUM (NZSMAX)
CHARACTER*1	ACTION, YES
CHARACTER*255	VARIAB, VARS1, VARS2, VARS3

COMMON Blocks: /DEVICE/, /HEADER/, /USERDF/

SUBROUTINE GETATM

Argument Declarations:

ITYPE - INTEGER Variable (Output) - Latitude index

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT, NCHATM, NCHAER, NCHSEA, NCHAZE
REAL	GETVAR
CHARACTER*1	UPCASE
CHARACTER*4	LWCASE
INTRINSIC	MAX
EXTERNAL	GETVAR, DEVCBD, IGTINT, RDLIN, NCHATM, LWCASE, NCHAER, NCHSEA, NCHAZE, UPCASE, IGTVEC, MRNDFL

Local Variable Declarations:

INTEGER	K, NMX, KK, LL
REAL	ELPST, RADON
CHARACTER*1	ACTION, YES
CHARACTER*255	VARIAB, VARS1, VARS2, VARS3

COMMON Blocks: /DEVICE/, /HEADER/

SUBROUTINE GETBCK

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Input/Output) - Extra altitude
array (km)
NXTRA - INTEGER Variable (Input/Output) - Number of extra altitudes

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, NMATL, MAXLAT, MAXLON,
ISMX, NVSMAX, NSCEN, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (NMATL=28, NSCEN=35)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT
REAL GETVAR
CHARACTER*1 UPCASE
INTRINSIC MAX
EXTERNAL RDLINE, GETVAR, IGTINT, DEVCBD, USRBCK, UPCASE,
GETVEC, BKGDBD

Local Variable Declarations:

INTEGER L, KK, LL, NCLDCV, NPT3, NCLALB, NCLALT
REAL DELH
CHARACTER*255 VARIAB

COMMON Blocks: /BACKGD/, /DEVICE/, /HEADER/

SUBROUTINE GETCLD

Argument Declarations:

HXTRA - REAL Vector (Len = Unspecified) (Output) - Extra altitudes for
 profile grid (km)
 NXTRA - INTEGER Variable (Output) - Number of extra altitudes
 HCLDBS - REAL Variable (Output) - Cloud base altitude (km)
 DELCLD - REAL Variable (Output) - Cloud thickness (km)

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	GETVAR
CHARACTER*1	UPCASE
EXTERNAL	GETVAR, IGTINT, RDLIN, DEVCBD, USRCLD, UPCASE

Local Variable Declarations:

INTEGER	L
REAL	CLDBSU, CLDTPU
CHARACTER*1	ACTION, YES
CHARACTER*2	CTYPE
CHARACTER*255	VARIAB, VARS1, VARS2, VARS3, VARS4

COMMON Blocks: /CLDRN/ , /DEVICE/, /HEADER/

SUBROUTINE GETEXO

Argument Declarations:

IFINP - INTEGER Variable (Input) - Input file number
 F - REAL Variable (Output) - Instantaneous 10.7-cm solar flux obtained from the National Research Council, Ottawa, Canada (10^{-22} watts/m²/cycles/sec)
 FBAR - REAL Variable (Output) - Average of F over three 27-day solar rotations (10^{-22} watts/m²/cycles/sec)
 IXOTMP - INTEGER Variable (Output) - Exospheric temperature index
 IXOTMP = 0 implies the standard exospheric temperature (1000 K)
 IXOTMP = 1 implies a user-specified exospheric temperature
 IXOTMP = 2 implies a calculated exospheric temperature
 FLEXO - LOGICAL Variable (Output) - Exoatmospheric temperature calculation flag
 AP - REAL Vector (Len = Unspecified) (Output) - Geomagnetic planetary index
 Note: Low value Ap = 3.
 Moderate value Ap = 15.
 High value Ap = 75.

AP(1): Daily Ap index
 AP(2): 3 hr Ap index for CURRENT TIME
 AP(3): 3 hr Ap index for 3 hrs before current time
 AP(4): 3 hr Ap index for 6 hrs before current time
 AP(5): 3 hr Ap index for 9 hrs before current time
 AP(6): Average of eight 3 hr Ap indices from 12 to 33 hrs prior to current time
 AP(7): Average of eight 3 hr Ap indices from 36 to 59 hrs prior to current time

ISNSPT - INTEGER Variable (Output) - Sunspot index
 ISNSPT = 1 implies a sunspot minimum
 ISNSPT = 2 implies average sunspot activity
 ISNSPT = 3 implies a sunspot maximum
 TINFO - REAL Variable (Output) - Specified value of exoatmospheric temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	GETVAR
CHARACTER*1	UPCASE
EXTERNAL	GETVAR, DEVCBD, RDLINE, IGTINT, UPCASE, PARSE

Local Variable Declarations:

INTEGER	I, NAP
CHARACTER*1	ACTION
CHARACTER*20	VARS(7)
CHARACTER*255	VARIAB, VARS1

COMMON Blocks: None

SUBROUTINE GETGLC

Argument Declarations:

INDX - INTEGER Variable (Input) - Index for number of coefficients
 XMU - DOUBLE PRECISION Vector (Len = Unspecified) (Output) -
 Gauss-Legendre abscissa values
 WT - DOUBLE PRECISION Vector (Len = Unspecified) (Output) -
 Gauss-Legendre weights
 N - INTEGER Variable (Output) - Number of coefficients

INTRINSIC and EXTERNAL Declarations:

EXTERNAL GLCFBD

Local Variable Declarations:

INTEGER M, I, IP

COMMON Blocks: /GAUSSL/

SUBROUTINE GETPOS

Argument Declarations:

XLAT - REAL Variable (Output) - Latitude (+ North/- South) (deg)
 XLONG - REAL Variable (Output) - Longitude (+ East/- West) (deg)
 IDAY - INTEGER Variable (Output) - Day of the month
 IMONTH - INTEGER Variable (Output) - Month of the year
 IYEAR - INTEGER Variable (Output) - Year
 TIME - REAL Variable (Output) - Time (HH.MMSSSS)
 ITIME - INTEGER Variable (Output) - Time index
 ITIME = 0 implies Local Standard Time
 ITIME = 1 implies Greenwich Mean Time
 ITIME = 2 implies Local Daylight Savings Time
 ICOREF - INTEGER Variable (Output) - Coordinate reference index

PARAMETER Declarations:

INTEGER MOLMAX
 PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT, MONTH
 REAL GETVAR
 CHARACTER*1 LWCASE
 CHARACTER*3 UPCASE
 INTRINSIC REAL, INT, ABS, MOD, INDEX, LEN
 EXTERNAL GETVAR, DEVCBD, IGTINT, RDLIN, MONTH, CALEND,
 LWCASE, UPCASE, CHTIME

Local Variable Declarations:

INTEGER IHR, IMN, IDAYX, ITYP1, ICH, ICM, LN
 REAL XMIN, SEC, YEAR
 CHARACTER*255 VARIAB

COMMON Blocks: /DEVICE/

SUBROUTINE GETSLR

Argument Declarations:

ISOLAR - INTEGER Variable (Output) - Solar index
 ISMPLS - INTEGER Variable (Output) - Type of solar calculation
 SOLEV - REAL Variable (Output) - Solar elevation (deg)
 SOLAZ - REAL Variable (Output) - Solar azimuth (deg)
 SOLDIS - REAL Variable (Output) - Relative solar distance
 XLATSL - REAL Variable (Output) - Sub-solar point latitude (deg)
 XLONSL - REAL Variable (Output) - Sub-solar point longitude (deg)
 ILUNAR - INTEGER Variable (Output) - Lunar index
 ISMPLL - INTEGER Variable (Output) - Type of lunar calculations
 XLUNEV - REAL Variable (Output) - Lunar elevation (deg)
 XLUNAZ - REAL Variable (Output) - Lunar azimuth (deg)
 PHLUNR - REAL Variable (Output) - Lunar phase (deg)
 XLNDIS - REAL Variable (Output) - Relative lunar distance
 XLATLN - REAL Variable (Output) - Sub-lunar point latitude (deg)
 XLONLN - REAL Variable (Output) - Sub-lunar point longitude (deg)
 ISLANG - INTEGER Variable (Output) - Elevation/zenith angle index
 ISLPOS - INTEGER Variable (Output) - Position index
 IEPHEM - INTEGER Variable (Output) - Ephemeris index
 XLAT - REAL Variable (Input) - Reference latitude (deg)
 XLON - REAL Variable (Input) - Reference longitude (deg)

PARAMETER Declarations:

INTEGER MOLMAX
 PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

REAL GETVAR
 CHARACTER*1 UPCASE
 INTRINSIC ACOS, COS, ABS, SIGN, ATAN2, TAN, SIN, REAL, DBLE
 EXTERNAL GETVAR, DEVCBD, RDLINE, SPTRIG, UPCASE

Local Variable Declarations:

INTEGER I
 REAL BETA, XSLR(3), XLNR(3), DOTPR
 DOUBLE PRECISION RSOLAR, RLUNAR, RE
 CHARACTER*2 ACTION
 CHARACTER*255 VARIAB, VARS1, VARS2, VARS3, VARS4, VARS5, VARS6,
 VARS7

COMMON Blocks: /CONSTN/, /DEVICE/

REAL FUNCTION GETVAR

Argument Declarations:

VARIAB - CHARACTER*(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
INTRINSIC	INDEX, LEN
EXTERNAL	IOERR

Local Variable Declarations:

INTEGER	ICNT, IOS
REAL	DEFAULT
CHARACTER*7	FMTSTR

COMMON Blocks: None

SUBROUTINE GETVEC

Argument Declarations:

VARIAB - CHARACTER*(*) Variable (Input) - Input string
X - REAL Vector (Len = Unspecified) (Output) - Vector string
N - INTEGER Variable (Output) - Length of vector string
NMAX - INTEGER Variable (Input) - Maximum length of vector string

INTRINSIC and EXTERNAL Declarations:

INTEGER	LENSTR
CHARACTER*72	IOERR
EXTERNAL	IOERR, LENSTR, LCTRIM

Local Variable Declarations:

INTEGER	I, IM, IP, LNMAX, ISW, IOS
REAL	DEFAULT
CHARACTER*7	FMTSTR

COMMON Blocks: None

SUBROUTINE H2OCNT

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
T - REAL Variable (Input) - Temperature (K)
SH2O - REAL Variable (Output) - Self-broadened coefficient
FH2O - REAL Variable (Output) - Foreign-broadened coefficient

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, INT, REAL, TANH, EXP
EXTERNAL H2OBD

Local Variable Declarations:

INTEGER I, N, NP
REAL SBCOEF(2), XI, FAC, RADFN, FBCOEF, FDG

COMMON Blocks: /CONTNS/

REAL FUNCTION HAZE

Argument Declarations:

H - REAL Variable - Altitude (km)
IHAZE - INTEGER Variable - Index for haze profiles
ISEASN - INTEGER Variable - Index for season
IUPPER - INTEGER Variable - Index for upper atmosphere profile
VIS - REAL Variable - Sea-level visible range (km)
ZVSA - REAL Vector (Len = Unspecified) - Altitude array for vertical structure (km)
ZVSAMX - REAL Variable - Maximum altitude for which vertical structure is valid (km)
HZVSA - REAL Vector (Len = Unspecified) - Extinction coefficients for the vertical structure (km^{-1})
HBCK - REAL Variable - Altitude of the terrain (km)
HTRO - REAL Variable - Altitude of the tropopause (km)
HSTR - REAL Variable - Altitude of the stratopause (km)

PARAMETER Declarations:

INTEGER MLMAX, NASMAX, NGMAX, NVSA, NZBNDR, NZTROP,
NZSTRA, NZUPR, ISMX, MOLMAX
PARAMETER (MLMAX=140, NASMAX=15, NGMAX=15)
PARAMETER (NVSA=9, NZBNDR=3, NZTROP=9, NZSTRA=17)
PARAMETER (NZUPR=14, MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, HLOWT
INTRINSIC MAX
EXTERNAL XTERP, HAZEBD, HLOWT

Local Variable Declarations:

INTEGER ITRP0, I, N, NUPPER, IHZ, ITRP1
REAL H1, H2, H3, H4, FACV, AHZ1, AHZ2, FACH, HP, HL, HB2, HTRL,
HSTL

COMMON Blocks: /FLAGS/, /HZDATA/, /USERDF/

REAL FUNCTION HEYMS

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, EXP, MAX, MIN

Local Variables

REAL TC

COMMON Blocks: None

REAL FUNCTION HLOWT

Argument Declarations:

ALT - REAL Variable - Altitude (km)
HBACK - REAL Variable - Terrain altitude (km)

Local Variable Declarations:

REAL HREF

COMMON Blocks: None

SUBROUTINE HOREQU

Argument Declarations:

AZ - REAL Variable (Input) - Azimuthal direction (deg)
North is 0.0 degrees
EL - REAL Variable (Input) - Elevation angle (deg)
XLATIT - REAL Variable (Input) - Latitude (deg)
TIME - REAL Variable (Input) - Sidereal time (deg)
ALPHA - REAL Variable (Output) - Equatorial azimuth (deg)
DELTA - REAL Variable (Output) - Equatorial elevation (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS, ATAN2, ABS

Local Variable Declarations:

REAL CSA, SNA, CSE, SNE, CSL, SNL, DUM1, DUM2, DUM3, T, CST,
SNT, D

COMMON Blocks: /CONSTN/

SUBROUTINE HORIZN

Argument Declarations:

L1 - INTEGER Variable (Input) - Initial altitude index
 L2 - INTEGER Variable (Input) - Final altitude index
 LBKGD - INTEGER Variable (Input) - Background altitude index
 SLRNG - REAL Variable (Input) - Slant range (km)
 BETA - REAL Variable (Input) - Earth center angle (deg)
 LENP - INTEGER Variable (Output) - Short/long path index
 PHOS - REAL Variable (Output) - Horizon elevation angle (rad)
 RHOS - REAL Variable (Output) - Horizon slant range (km)
 BHOS - REAL Variable (Output) - Horizon earth center angle (rad)
 SRMAX - REAL Variable (Output) - Maximum slant range (km)
 BETMAX - REAL Variable (Output) - Maximum earth center angle (deg)
 IBKGD - INTEGER Variable (Input) - Background index
 IERR - INTEGER Variable (Output) - Error switch
 IERR = -1 implies fatal errors in geometry
 IERR = 0 implies no errors in geometry
 IPRINT - INTEGER Variable (Input) - Print switch for warning message
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX,MLMX2
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL RAYPTH

Local Variable Declarations:

INTEGER IOSB(MLMX2),KL,LX,LY,LEN0,JBKGD
 REAL R(MLMX2),PHI(MLMX2),THETA(MLMX2),RHR,BHR,RHT,
 BHT,HTNGT
 DOUBLE PRECISION PHI0

COMMON Blocks: /CONSTN/

SUBROUTINE HTBLNC

Argument Declarations:

RFDSP - REAL Variable (Input) - Direct solar flux at T=0 (W/m²)
 RFDS - REAL Variable (Input) - Direct solar flux at T=DELTIM (W/m²)
 ABSSLR - REAL Variable (Input) - Solar absorptivity
 EMSTRM - REAL Variable (Input) - Thermal emissivity
 HTCLYR - REAL Vector (Len = 0:Unspecified) (Input) - Conductance coefficient (W/m²/K)
 CHARLN - REAL Variable (Input) - Surface characteristic length (m)
 SPHLYR - REAL Vector (Len = 0:Unspecified) (Input) - Specific heat (W-sec/gm/K)
 DENLYR - REAL Vector (Len = 0:Unspecified) (Input) - Density (gm/m³)
 DELTIM - REAL Variable (Input) - Time increment (dec. hour)
 TAIRLP - REAL Variable (Input) - Local air temperature at T=0 (K)
 TAIRLC - REAL Variable (Input) - Local air temperature at T=DELTIM (K)
 PRESSP - REAL Variable (Input) - Local air pressure at T=0 (mb)
 PRESS - REAL Variable (Input) - Local air pressure at T=DELTIM (mb)
 WINDTP - REAL Variable (Input) - Wind speed at T=0 (m/sec)
 WINDT - REAL Variable (Input) - Wind speed at T=DELTIM (m/sec)
 DSWP - REAL Variable (Input) - Downward short-wave flux at T=0 (W/m²)
 DSW - REAL Variable (Input) - Downward short-wave flux at T=DELTIM (W/m²)
 DLWP - REAL Variable (Input) - Downward long-wave flux at T=0 (W/m²)
 DLW - REAL Variable (Input) - Downward long-wave flux at T=DELTIM (W/m²)
 TLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Temperatures in conducting subsurface (K)
 ZLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Layer depth (m)
 NLAYER - INTEGER Variable (Input) - Number of layers
 IHTFLG - INTEGER Variable (Input) - Heat calculation index
 IHTFLG = 0 implies no heat calculations
 IHTFLG = 1 implies heat calculations with evaporation
 IHTFLG = 2 implies heat calculations without evaporation
 DUMLYR - REAL Array (Dim = 2 x Unspecified) (Input) - Dummy value for each layer moved outside of routine for efficiency
 ZSRILR - REAL Variable (Input) - Surface material thickness (m)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL, MIN, ABS, EXP
EXTERNAL	SRFLUX

Local Variable Declarations:

INTEGER	L, NTIME, ITM, NCYCLE, NCYCMX, NTIMIN
REAL	FAC, RFDST, TAIRT, PRESST, WINDTT, DSWT, DLWT, DELTS, B, C, DTIMIN, DTEMP, TEMP(0:21), H, TS, ALPH, PERIOD

COMMON Blocks: /CONSTN/

SUBROUTINE HYDROM

Argument Declarations:

L - INTEGER Variable (Input) - Altitude index
 ICLD - INTEGER Variable (Input) - Cloud index
 ICLDRN - INTEGER Variable (Input) - Cloud and rain index
 EXTCLD - REAL Variable (Output) - Extinction coefficient in cloud (km^{-1})
 EXTICE - REAL Variable (Output) - Extinction coefficient for ice clouds (km^{-1})
 ICIRUS - INTEGER Variable (Input) - Cirrus cloud index
 HCIRBS - REAL Variable (Input) - Cirrus base altitude (km)
 DELCIR - REAL Variable (Input) - Cirrus thickness (km)
 CIRICE - REAL Variable (Input) - Cirrus equivalent liquid water content (gm/m^3)
 EXTCIR - REAL Variable (Input/Output) - Extinction coefficient for cirrus (km^{-1})
 IRAIN - INTEGER Variable (Input) - Rain index
 EXTRN - REAL Variable (Output) - Extinction coefficient for rain (km^{-1})
 ISNOW - INTEGER Variable (Input) - Snow type index
 EXTSN - REAL Variable (Output) - Extinction coefficient for snow (km^{-1})
 TEMP - REAL Variable (Input) - Temperature (K)
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NWLAER, NWLCLD, NANG, MAXLAT, MAXLON,
 NGMAX, MOLMAX
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
 PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL RAINEX, SNOWEX, SATUR, XTERP, CIREX
 INTRINSIC MIN
 EXTERNAL RAINEX, SNOWEX, SATUR, CLDRBD, XTERP, PROFAC, CIREX,
 ARSABD, ARSLBD, ARSXBD

Local Variable Declarations:

INTEGER I, ICLAER, IC, KTPW, KTPPW, KTPI, KTPPI, KK, LL, ITRP0,
 ITYPE
 REAL FACTW, FACTI

COMMON Blocks: /AEROSL/, /AERSCC/, /AERSLA/, /AERSLX/, /CLDRN/ ,
 /CLDUSR/, /INITAL/

INTEGER FUNCTION IBKCNV

Argument Declarations:

ISCENE - INTEGER Variable - Ecosystem index

Local Variable Declarations: None

INTRINSIC and EXTERNAL Declarations:

EXTERNAL ECOSBD

COMMON Blocks: /ECOCNV/

INTEGER FUNCTION IBNSRC

Argument Declarations:

X0 - REAL Variable - Value of X for which location is to be found
X - REAL Vector (Len = Unspecified) - X-array (must be monotonic and
either increasing or decreasing)
N - INTEGER Variable - DIMENSION of X-array
KEY - INTEGER Variable - Position in X-array for which search for
adjacent points to the X0-value starts

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, REAL, ABS, INT

Local Variable Declarations:

INTEGER I, M, M1, M2
REAL FAC

COMMON Blocks: None

INTEGER FUNCTION IDAERO

Argument Declarations:

IBKGD - INTEGER Variable - Terrain background index
HBCK - REAL Variable - Terrain altitude (km)

Local Variable Declarations:

INTEGER IAER(-4:63)

COMMON Blocks: None

INTEGER FUNCTION IGTINT

Argument Declarations:

VARIAB - CHARACTER*(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC INDEX, LEN
EXTERNAL IOERR

Local Variable Declarations:

INTEGER ICNT, IOS, IDFALT
CHARACTER*5 FMTSTR

COMMON Blocks: None

SUBROUTINE IGTVEC

Argument Declarations:

VARIAB - CHARACTER*(*) Variable (Input) - Input string
ISTR - INTEGER Vector (Len = N) (Output) - Vector string
N - INTEGER Variable (Output) - Length of vector string
NMAX - INTEGER Variable (Input) - Maximum length of vector string

INTRINSIC and EXTERNAL Declarations:

INTEGER LENSTR
CHARACTER*72 IOERR
EXTERNAL IOERR, LENSTR

Local Variable Declarations:

INTEGER I, IP, IM, LNMAX, ISW, IOS, IDFALT
CHARACTER*5 FMTSTR

COMMON Blocks: None

COMPLEX FUNCTION INDEXI

Argument Declarations:

WL - REAL Variable - Wavelength (μm)
TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC CMPLX
EXTERNAL XTERP, ICEBD

Local Variable Declarations:

INTEGER I, ITRPO
REAL EMW, EMWT(4), CAYW, CAYWT(4)

COMMON Blocks: /ICEREF/

COMPLEX FUNCTION INDEXW

Argument Declarations:

WL - REAL Variable - Wavelength (μm)
 TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NWLWTR, NFRQ
 PARAMETER (NWLWTR=169, NFRQ=28)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC CMPLX, SQRT
 EXTERNAL XTERP, WTRBD

Local Variable Declarations:

INTEGER ITRPO
 REAL EMW, CAYW, DIELR, DIELI, ES, RLS, EW, EINF, V, FREQ

COMMON Blocks: /INDXWR/

SUBROUTINE INDXBK

Argument Declarations:

IBKGD - INTEGER Variable (Input) - Scene/Background index
 MONTH - INTEGER Variable (Input) - Month index (1 = Jan)
 HOUR - REAL Variable (Input) - Time of day (LST) (dec. hr.)
 XLAT - REAL Variable (Input) - Latitude (deg.)
 XLON - REAL Variable (Input) - Longitude (deg.)
 TAIR - REAL Variable (Input/Output) - Surface air temperature (K)
 CLDCVR - REAL Vector (Len = Unspecified) (Output) - Cloud cover
 0 - Total
 1 - Low etage
 2 - Middle etage
 3 - High etage
 ISCENE - INTEGER Variable (Output) - Scene index
 TMIDN - REAL Variable (Output) - Air temperature at midnight (K)
 TNOON - REAL Variable (Output) - Air temperature at noon (K)
 TPROF - REAL Variable (Input) - Profile temperature (K)
 FRSNW - REAL Variable (Output) - Percentage snow (%)
 FRICE - REAL Variable (Output) - Percentage ice (%)
 FRWTR - REAL Variable (Output) - Percentage water (%)

PARAMETER Declarations:

INTEGER NSCEN
 PARAMETER (NSCEN=35)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL GBLBCK

Local Variable Declarations:

REAL ALTIT

COMMON Blocks: None

INTEGER FUNCTION INDXSC

Argument Declarations:

ISCENE - INTEGER Variable - Scene/Background index

Local Variable Declarations: None

COMMON Blocks: None

SUBROUTINE INICPL

Argument Declarations:

NPTS - INTEGER Variable (Output) - Number of points in exponential sum fit
NMOLEC - INTEGER Variable (Input) - Number of molecules

PARAMETER Declarations:

INTEGER	MLMAX, NBAND, ISMX, NANG, MAXLAT, MAXLON, NGMAX, NAZMAX, NASMAX, NZSMAX, NVSMAX, MOLMAX
PARAMETER	(MLMAX=140, NBAND=16, NANG=65)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

REAL	BETA, BETAU
INTRINSIC	SIN, ABS, MAX, MIN
EXTERNAL	ESFIT, UDLAY, BETA, BETAU, SRTLAY

Local Variable Declarations:

INTEGER	I, K, L, LM, LP, KK, LL
REAL	OPDPHTH(ISMX), OPTI, ALBI, ALPHAD(ISMX), B, BUS, BUL, DZ, PS, TS, P0, T0, EXPDEP, XMU0S, XMU0L, SCTDEP

COMMON Blocks: /ARSLSC/, /CONSTN/, /FLAGS/, /HEADER/, /INITAL/,
/LYRSTO/, /MSPARM/, /PRBNDA/, /PRBNDB/

SUBROUTINE INIGEO

Argument Declarations:

L1 - INTEGER Variable (Input) - Indicates location in profile
 array of initial point of path
 L2 - INTEGER Variable (Input) - Indicates location in profile
 array of final point of path
 SLRNG - REAL Variable (Input) - Slant range (km)
 BETA - REAL Variable (Input) - Earth center angle (deg)
 PHI1 - REAL Variable (Input) - Elevation angle at point L1 (rad)
 PHI2 - REAL Variable (Input) - Elevation angle at point L2 (rad)
 LENP - INTEGER Variable (Input) - Index for the type of path in case
 of any ambiguity
 LENP = 0 implies shorter path
 LENP = 1 implies longer path
 RHOS - REAL Variable (Input) - Slant range from L1 to tangent point at
 L2 (km)
 BHOS - REAL Variable (Input) - Earth-center angle from L1 to tangent
 point at L2 (rad)
 PHOS - REAL Variable (Input) - Elevation angle at L1 for L2 to be at
 the tangent point (rad)
 SRMAX - REAL Variable (Input) - Maximum slant range between L1 and
 L2 (km)
 BETMAX - REAL Variable (Input) - Maximum earth center angle
 between L1 and L2 (deg)
 P - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Source
 elevation angles for ray path. Three values correspond to an
 upper limit, a lower limit, and the best estimate value (rad)
 VAR - REAL Vector (Len = Unspecified) (Output) - Either slant or earth
 center angle or source elevation angle corresponding to the
 three values of P (km or deg or rad)
 VAR0 - REAL Variable (Output) - Either slant or earth center angle
 corresponding to the input value (km or deg)
 JTPGM - INTEGER Variable (Input) - Index for type of geometry
 JTPGM = 1 implies the slant range is defined
 JTPGM = 2 implies the earth center angle is defined
 JTPGM = 3 implies the source elevation angle is defined
 JTPGM = 4 implies the observer elevation angle is defined
 IERR - INTEGER Variable (Output) - Error switch
 IERR = -1 implies fatal errors in geometry
 IERR = 0 implies no errors in geometry
 IERR = 1 implies warning in geometry

PARAMETER Declarations:

INTEGER	MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, NAZMAX, NASMAX, NZSMAX, NVSMAX, MOLMAX
PARAMETER	(MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	COS, SIN, ACOS, ASIN, ABS, ATAN2, MAX, MIN, DBLE, REAL, SIGN

Local Variable Declarations:

INTEGER	KK, LL
REAL	DELH, VAR0, G, RH1, RH2, FAC(3), XMHAV1, XMHAV2, XMHAVB, ATMFAC (MAXLAT, MAXLON)
DOUBLE PRECISION	R1, R2, DR2, XR, MHP1, MHPB, PMIN, PMAX

COMMON Blocks: /CONSTN/, /HEADER/, /INITAL/

SUBROUTINE INITL

Argument Declarations:

LENP - INTEGER Vector (Len = Unspecified) (Output) - Index for short or long path. Only needed when an ambiguity exists.
 ISHINE - INTEGER Vector (Len = Unspecified) (Output) - Sky/earthshine index
 HXTRA - REAL Vector (Len = Unspecified) (Output) - Extra altitudes for profile grid (km)
 NXTRA - INTEGER Variable (Output) - Number of extra altitudes
 NXMAX - INTEGER Variable (Input) - Dimension of HXTRA
 HEADNG - CHARACTER*(*) Variable (Output) - User-defined heading
 FILERT - CHARACTER*(*) Variable (Input) - File root
 IFLTR - INTEGER Variable (Input) - Filter index
 ISMARY - INTEGER Variable (Output) - Summary index
 ISLPOS - INTEGER Variable (Output) - Solar/lunar position index

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NAZMAX, NASMAX, NGMAX, NZSMAX, NANTMX,
 MAXLAT, MAXLON, NL, NMATL, NVSMAX, NVSA, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8, NVSA=9)
 PARAMETER (NANTMX=25)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (NL=50)
 PARAMETER (NMATL=28)

INTRINSIC and EXTERNAL Declarations:

INTEGER MDLATM
 REAL GETVAR, EXOTMP
 CHARACTER*1 UPCASE
 CHARACTER*3 LWCASE
 CHARACTER*72 IOERR
 INTRINSIC MIN, REAL, SIGN, ATAN2, ACOS, COS, SIN, TAN, MOD, AINT,
 ABS, MAX, INT
 EXTERNAL DFLT8, GETVAR, GETVEC, SETFLG, ISRAEL, DEVCBD, VSA,
 GETSLR, RDLINE, GETATM, GETCLD, GETBCK, MDLATM,
 CALEND, USRDEF, GETPOS, PARSE, INPTBD, BEAUFT,
 BINFIL, MIEINP, DEFALT, EXOATM, STGEOM, CIRRUS,
 ZROHDR, UPCASE, LWCASE, IOERR, GBLBCK, GETASP,
 DFLT2, FILOPN, FILRT, ATMSBD, BKGDBD, GETEXO,
 EXOTMP

Local Variable Declarations:

INTEGER I, K, L, M, ITYPE, NVAR, IDAYX, NXTRAP, IOS, ISUB,
 ISWINP(17), IXOTMP, KK, LL, NTX, IZERO, ITYP0,
 ISCENE, JSHINE, NXTRP, IT, M1, M2
 CEXO INTEGER KP, ISNSPT
 REAL HCLDBS, DELCLD, DYEAR, TINF0, TDUM(2), TMIDN, TNOON,
 FRSNWP, FRICEP, TAIRP, CLDCVP(0:3), HBK, WIND0, TAIR0,
 ABSLAT, FACLAT, FRWTRP
 CEXO REAL F, FBAR
 CEXO LOGICAL FLEXO
 CHARACTER*1 DOT
 CHARACTER*20 VRDATA(14)
 CHARACTER*50 VARSUB
 CHARACTER*80 DUMMY, FILENM(17)
 CHARACTER*255 VARIAB

COMMON Blocks: /ANTECD/, /ATMDAT/, /BACKGD/, /CONSTN/, /DEVICE/, /FLAGS/,
 /HEADER/, /INITAL/, /INPTDT/, /OUTPUT/, /VSADTA/

SUBROUTINE INTEG

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 FLTR - REAL Variable (Input) - Filter weighting factor
 BW - REAL Variable (Input/Output) - Band width (cm^{-1})
 BWL - REAL Variable (Input/Output) - Band width (μm)
 NAZ - INTEGER Variable (Input) - Number of observer/source azimuths
 NASPCT - INTEGER Variable (Input) - Number of earth/skyshine elevation angles
 NAZSH - INTEGER Variable (Input) - Number of earth/skyshine azimuth angles
 NSRCE - INTEGER Variable (Input) - Location of source in ray
 NBNKD - INTEGER Variable (Input) - Location of background in ray
 BKSUMV - REAL Array (Dim = 6 x NMATL x Unspecified) (Input/Output) - Spectral background radiance for each material ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 SIGMEP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) - Scintillation along path
 TAUSCP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) - In-scattered transmittance along path
 RADSLP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) - Solar irradiance along path ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 RADLNP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) - Lunar irradiance along path ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 RADPTH - REAL Array (Dim = NAZMAX x MLMX2 x Unspecified) (Input/Output) - Emitted path radiance along path ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 DRADP - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) - Emitted path radiance along path ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 RDSLSP - REAL Array (Dim = NAZMAX x MLMX2 x Unspecified) (Input/Output) - Scattered radiance along path ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 TAULR - REAL Array (Dim = NAZMAX x Unspecified) (Input/Output) - Transmittance along path
 IGEO - INTEGER Variable (Input) - Geometry index

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, MLMAX, MLMX2, NZSMAX, NMATL, MAXLAT, MAXLON, NGMAX
PARAMETER	(NAZMAX=30, NASMAX=15, NZSMAX=4, NGMAX=15)
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX)
PARAMETER	(NMATL=28, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER	K, M, MM, LB
REAL	DBW

COMMON Blocks: /BCKDAT/, /INTSTO/

SUBROUTINE INTR2D

Argument Declarations:

X0 - REAL Variable (Input) - X-component of point to be evaluated
 Y0 - REAL Variable (Input) - Y-component of point to be evaluated
 X - REAL Vector (Len = Unspecified) (Input) - X-component of grid
 NX - INTEGER Variable (Input) - Number of X grid points
 NXMAX - INTEGER Variable (Input) - Maximum number of X grid points
 Y - REAL Vector (Len = Unspecified) (Input) - Y-component of grid
 NY - INTEGER Variable (Input) - Number of Y grid points
 FAC - REAL Array (Dim = NXMAX x Unspecified) (Output) - Interpolation weights

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, ABS

Local Variable Declarations:

INTEGER I, J, IX, IXP, IY, IYP
 REAL FX, FY

COMMON Blocks: None

CHARACTER*72 FUNCTION IOERR

Argument Declarations:

IOS - INTEGER Variable - Value returned by IOSTAT

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 GERROR
 CLAH EXTERNAL IOSTAT_MSG
 EXTERNAL GERROR

Local Variable Declarations:

CVAX CHARACTER*48 CHERRV(68)
 CLAH CHARACTER*152 MESSAG
 CIBM INTEGER*2 I2(2)
 CIBM INTEGER I

COMMON Blocks: None

SUBROUTINE ISRAEL

Argument Declarations:

ISMX - INTEGER Variable (Input) - First DIMENSION of MC
 MA - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Model atmosphere index
 MP - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Pressure profile index
 MT - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Temperature profile index
 MC - INTEGER Array (Dim = ISMX x MAXLAT x Unspecified)
 (Input/Output) - Molecular concentrations profile index
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER NGMAX, MAXLAT
 PARAMETER (NGMAX=15, MAXLAT=3)

Local Variable Declarations:

INTEGER K, KK, LL

COMMON Blocks: /FLAGS/

INTEGER FUNCTION ISTAER

Argument Declarations:

IAERO1 - INTEGER Variable - Boundary layer aerosol type
 IAERO2 - INTEGER Variable - Stratospheric aerosol type
 ITRPAU - INTEGER Variable - Tropopause index
 ITRPAU = 0 implies that Z is below the tropopause
 ITRPAU = 1 implies that Z is above the tropopause
 ISTPAU - INTEGER Variable - Stratopause index
 ISTPAU = 0 implies that Z is below the stratopause
 ISTPAU = 1 implies that Z is above the stratopause
 Z - REAL Variable - Altitude (km)
 HB - REAL Variable - Terrain altitude (km)
 IHAZE - INTEGER Variable - Haze profile index

PARAMETER Declarations:

INTEGER MLMAX, NASMAX, ISMX, MOLMAX
 PARAMETER (MLMAX=140, NASMAX=15)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL HLOWT
 EXTERNAL HLOWT

Local Variable Declarations:

INTEGER L, ILYR

COMMON Blocks: /USERDF/

SUBROUTINE KDISTR

Argument Declarations: None

PARAMETER Declarations:

INTEGER	NAZMAX, MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, NASMAX, NZSMAX, NVSMAX, MOLMAX, MLIDMX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20, MLIDMX=45)

Local Variable Declarations:

INTEGER	J, L, KK, LL
REAL	SCATM, EXTNCM

COMMON Blocks: /BCKDAT/, /HEADER/, /KDISDT/, /MOLECP/, /PRBNDA/,
/PRBNDB/

SUBROUTINE LAYLW

Argument Declarations:

X - REAL Array (Dim = 10 x Unspecified) (Input/Output) -
Optical path or path-weighted temperature matrix

Local Variable Declarations:

INTEGER	I, J

COMMON Blocks: None

SUBROUTINE LCTRIM

Argument Declarations:

CHRSTR - CHARACTER*(*) Variable (Input/Output) - CHARACTER String

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	LEN

Local Variable Declarations:

INTEGER	I, K, ISTART, IMAXLN

COMMON Blocks: None

INTEGER FUNCTION LENSTR

Argument Declarations:

CHRSTR - CHARACTER*(*) Variable - Input CHARACTER string

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LEN

Local Variable Declarations:

INTEGER I, IMXLEN

COMMON Blocks: None

CHARACTER*(*) FUNCTION LWCASE

Argument Declarations:

STRING - CHARACTER*(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LEN, INDEX

Local Variable Declarations:

INTEGER I, LOC
CHARACTER*26 UPPER, LOWER

COMMON Blocks: None

SUBROUTINE LYRINT

Argument Declarations:

TSRF - REAL Variable (Input) - Initial surface temperature (K)
TLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Temperatures in
 conducting subsurface (K)
TSSL - REAL Variable (Input) - Initial sub-surface temperature (K)
ZLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Layer depth (m)
NLAYER - INTEGER Variable (Input) - Number of layers
SPHEAT - REAL Vector (Len = Unspecified) (Input) - Specific heat (W-sec/gm/K)
DENSTY - REAL Vector (Len = Unspecified) (Input) - Density (gm/m³)
HTCOND - REAL Vector (Len = Unspecified) (Input) - Conductance coefficient
 (W/m²/K)
ZHLR - REAL Vector (Len = Unspecified) (Input) - Material layer

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP, REAL, COS

Local Variable Declarations:

INTEGER L, LS
REAL DAMPD, PERIOD, DZ

COMMON Blocks: /CONSTN/

SUBROUTINE MARINE

Argument Declarations:

- VIS - REAL Variable (Output) - Meteorological range (km)
- WIND - REAL Variable (Input) - Current wind speed (m/sec)
- WHH - REAL Variable (Input) - 24-hour average wind speed (m/sec)
- ICSTL - INTEGER Variable (Input) - Air mass character index
 - ICSTL = 1 implies open ocean
 - ICSTL = 10 implies strong continental influence
 - Values in between represent varying degrees of continental influence.
- BEXT - REAL Vector (Len = Unspecified) (Output) - Extinction coefficient (km^{-1})
- BABS - REAL Vector (Len = Unspecified) (Output) - Absorption coefficient (km^{-1})
- RH - REAL Variable (Input) - Relative humidity

PARAMETER Declarations:

INTEGER	NWLAER, NWLCLD, NANG
PARAMETER	(NWLAER=47, NWLCLD=79, NANG=65)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL, MAX, MIN
EXTERNAL	MARNBD, PROFAC, ARSABD, ARSLBD, ARSXBD

Local Variable Declarations:

INTEGER	I, J, K, JRH, JRHP
REAL	A(3), PISC, WS, WH, FAC, TOTAL, QE, EXT55, C, TXV, TAV, F, RHX

COMMON Blocks: /AEROSL/, /AERSLA/, /AERSLX/, /CONSTN/, /NAVMAR/

INTEGER FUNCTION MDLATM

Argument Declarations:

ITYPE - INTEGER Variable - Latitude index
 ISEASN - INTEGER Variable - Season index

Local Variable Declarations:

INTEGER	LATIT, KSEASN

COMMON Blocks: None

SUBROUTINE MIE

Argument Declarations:

RADIUS - REAL Variable (Input) - Particle radius (μm)
 WL - REAL Variable (Input) - Wavelength (μm)
 XNP - COMPLEX Variable (Input) - Complex index of refraction
 RNB - COMPLEX Variable (Input) - Complex index of refraction of the medium
 NSANGL - INTEGER Variable (Input) - Number of scattering angles
 QABSP - REAL Variable (Output) - Absorption coefficient (km^{-1} per (particles cm^{-3}))
 QSCAT - REAL Variable (Output) - Absorption coefficient (km^{-1} per (particles cm^{-3}))
 GQSCAT - REAL Variable (Output) - Asymmetry coefficient times QSCAT

PARAMETER Declarations:

C**** For extremely large particles, NMAX may have to be increased.
 If Error No. 86 is encountered, then increase NMAX accordingly.

INTEGER NXMIE, NMAX
 PARAMETER (NXMIE=101, NMAX=20000)

INTRINSIC and EXTERNAL Declarations:

INTEGER NCYCLE
 INTRINSIC CMPLX, INT, REAL, DBLE, ABS, MAX, CONJG, COS, SIN
 EXTERNAL NCYCLE

Local Variable Declarations:

INTEGER J, N, NMX, NSTOP, N1, N2, M1, M2, M3, NS2, JJ
 REAL CHI(3), FN, TAU1, P, T, X, DUM, QEXT
 DOUBLE PRECISION PSI(3)
 COMPLEX D(NMAX), Y, XI(3), AN(2), BN(2), REFREL

COMMON Blocks: /CONSTN/, /MIECOT/

SUBROUTINE MIEINP

Argument Declarations:

IMATRL - INTEGER Variable (Input) - Material index

PARAMETER Declarations:

INTEGER	NWLMX, MOLMAX
PARAMETER	(NWLMX=100, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	GETVAR
CHARACTER*1	UPCASE
CHARACTER*3	LWCASE
CHARACTER*72	IOERR
INTRINSIC	CMPLX
EXTERNAL	GETVAR, IGTINT, GETVEC, RDLINE, PARSE, UPCASE, LWCASE, IOERR, DEVCBD

Local Variable Declarations:

INTEGER	I, J, N, IOS, NVAR, ICOL0, ICOL40, NVAR8, NVAR1, NVAR2, NVAR3, NVAR50
REAL	DUM(4), XNR(3), XNI(3)
CHARACTER*1	DOT, MTYPE(3)
CHARACTER*20	VRDATA(8)
CHARACTER*80	TITLE, DUMMY
CHARACTER*255	VARIAB

COMMON Blocks: /DEVICE/, /MATERL/

SUBROUTINE MIEPHS

Argument Declarations:

WL - REAL Variable (Input) - Wavelength (μm)
 QABSP - REAL Variable (Output) - Absorption coefficient (km^{-1} per
 particles cm^{-3})
 QSCAT - REAL Variable (Output) - Absorption coefficient (km^{-1} per
 particles cm^{-3})
 G - REAL Variable (Output) - Asymmetry coefficient
 THETA - REAL Vector (Len = Unspecified) (Input) - Scattering angles (deg)
 PHASE - REAL Array (Dim = 4 x Unspecified) (Output) - Phase function
 NANG - INTEGER Variable (Input) - Number of scattering angles
 TEMP - REAL Variable (Input) - Temperature (K)
 IMATRL - INTEGER Variable (Input) - Particle index

PARAMETER Declarations:

INTEGER NXMIE
 PARAMETER (NXMIE=101)

INTRINSIC and EXTERNAL Declarations:

REAL DNDR
 COMPLEX INDEXI, INDEXW, EMTREF
 INTRINSIC CMPLX, REAL, COS, LOG10, MAX, MIN, ABS, DPROD, AIMAG
 EXTERNAL DNDR, COAT, PROFAC, INDEXI, INDEXW, EMTREF, MIE

Local Variable Declarations:

INTEGER I, J, K, KEY, KEYP, ISWTCH(5), NINCL1
 REAL RADCOR, QABSI, QSCATI, GI, AREA, SUM, CHKA, DELR, RADN,
 RADNP, WT, DRL, FAC, PCTP(5), X
 COMPLEX RNB, XNJ(3), XNP(2)

COMMON Blocks: /CONSTN/, /MATERL/, /MIECOT/

SUBROUTINE MLSCAT

Argument Declarations:

L - INTEGER Variable (Input) - Altitude index
 RTH - REAL Variable (Output) - Scattered thermal radiance (W/sr/cm²/cm⁻¹)
 RSL - REAL Variable (Output) - Scattered solar radiance (W/sr/cm²/cm⁻¹)
 TAU - DOUBLE PRECISION Variable (Input) - Transmittance
 DRKM - REAL Variable (Input) - Incremental path lengths along raypath (km)
 PHI - REAL Variable (Input) - Elevation angle (deg)
 IZL - INTEGER Variable (Input) - Altitude layer index
 PTHFAC - REAL Array (Dim = MAXLAT x Unspecified) - Proportionality factor for multiple atmospheres
 NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of PTHFAC

PARAMETER Declarations:

INTEGER MLMAX, NBAND, NANG, MAXLAT, MAXLON
 PARAMETER (MLMAX=140, NBAND=16, NANG=65)
 PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL RADTRY, BETAU
 INTRINSIC ABS, SIN, DPROD, DBLE
 EXTERNAL BETAU, RADTRY

Local Variable Declarations:

INTEGER KK, LL
 REAL XMU, BU, FU, SCTOT, ASYMT, HMT(2), HPT(2)
 DOUBLE PRECISION DELTAU, SCT1, SCT2, SCT3, SCT4, DDRKM, DUM, TAUP

COMMON Blocks: /ARSLSC/, /CONSTN/, /LYRSTO/

SUBROUTINE MODBCK

Argument Declarations:

FRACT - REAL Vector (Len = Unspecified) (Input/Output) - Fraction of scene materials
 INDEXB - INTEGER Vector (Len = Unspecified) (Input/Output) - Index of scene materials
 KMATL - INTEGER Variable (Input/Output) - Number of materials in scene
 SNOW - REAL Variable (Input) - Percent of scene that is snow (%)
 ICE - REAL Variable (Input) - Percent of scene that is ice (%)
 WATER - REAL Variable (Input) - Percent of scene that is water (%)
 TEMP - REAL Variable (Input) - Air temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN

Local Variable Declarations:

INTEGER K, IS, IX(12)
 REAL SNW, FX(12), FRDUM, XICE, XWTR

COMMON Blocks: None

INTEGER FUNCTION MONTH

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Month identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*3	UPCASE
EXTERNAL	LCTRIM,UPCASE

Local Variable Declarations:

INTEGER	I,J
CHARACTER*3	CHMNTN(12,2),CHVARP

COMMON Blocks: None

PROGRAM MOSART

PARAMETER Declarations:

INTEGER	NGMAX,NXMAX,NAZMAX,NASMAX,MAXLAT,MAXLON,NVSMAX, ISMX,MLMAX,NZSMAX,MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, NXMAX=100)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

REAL	SLPOS
CHARACTER*72	IOERR
EXTERNAL	CNSTNT,DEV CBD,TITLCR,EQUABS,INITL,CALCUL,SLPOS, RDFLTR,DBINIT,EPHEMS,CONFIG,PROMPT,IOERR

Local Variable Declarations:

INTEGER	LENP(NGMAX), ISMARY, ISHINE(NGMAX), NXTRA, IFLTR, IOS, ISLPOS
REAL	HXTRA(NXMAX)
CHARACTER*24	TFLTR
CHARACTER*40	HEADNG, FILERT
CHARACTER*80	TITLE

COMMON Blocks: /DEVICE/, /FLAGS/, /HEADER/, /INITAL/

SUBROUTINE MRNDFL

Argument Declarations:

ICSTL - INTEGER Variable (Input/Output) - Air mass character index
ICSTL = 1 implies open ocean
ICSTL = 10 implies strong continental influence
Values in between represent varying degrees of continental influence
ELPST - REAL Variable (Input) - Elapsed time since air parcel left land (days)
RADON - REAL Variable (Input) - Current radon 222 concentration (pCi/m³)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, EXP

INTEGER FUNCTION NCHAER

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Aerosol model identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*5 UPCASE
EXTERNAL LCTRIM, UPCASE

Local Variable Declarations:

INTEGER I, J
CHARACTER*5 CHAER(0:20,2), CHVARP

COMMON Blocks: None

INTEGER FUNCTION NCHATM

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Model atmosphere identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*6 UPCASE
EXTERNAL LCTRIM, UPCASE

Local Variable Declarations:

INTEGER I, J
CHARACTER*6 CHATM(0:11,2), CHVARP

COMMON Blocks: None

INTEGER FUNCTION NCHAZE

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Season identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*6	UPCASE
EXTERNAL	LCTRIM,UPCASE

Local Variable Declarations:

INTEGER	I,J
CHARACTER*6	CHAZE(-1:10,2),CHVARP

COMMON Blocks: None

INTEGER FUNCTION NCHSEA

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Season identifier

INTRINSIC and EXTERNAL Declarations:

CHARACTER*6	UPCASE
EXTERNAL	LCTRIM,UPCASE

Local Variable Declarations:

INTEGER	I,J
CHARACTER*6	CHSEA(0:11,2),CHVARP

COMMON Blocks: None

INTEGER FUNCTION NCYCLE

Argument Declarations:

N	- INTEGER Variable - Argument
NMOD	- INTEGER Variable - Modulus

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	MOD

Local Variable Declarations:

INTEGER	M

COMMON Blocks: None

SUBROUTINE NXXPAU

Argument Declarations:

ZL - REAL Vector (Len = Unspecified) (Input) - Altitudes (km)
 PL - REAL Vector (Len = Unspecified) (Input) - Pressure profile (mb)
 TL - REAL Vector (Len = Unspecified) (Input) - Temperature
 profile (K) nxx
 ML - INTEGER Variable (Input) - Number of altitude/temperature/
 pressure values
 NTRPAU - INTEGER Variable (Output) - Location of tropopause
 NSTPAU - INTEGER Variable (Output) - Location of stratopause
 NMSPAU - INTEGER Variable (Output) - Location of mesopause

INTRINSIC and EXTERNAL Declarations:

INTEGER	IBNSRC
REAL	XTERP
INTRINSIC	MIN
EXTERNAL	XTERP, IBNSRC, PROFAC

Local Variable Declarations:

INTEGER	L, MLM, LP, LPP, LX, LCHECK, KEY, ITRP0
REAL	DZ, DT, DTDZ, Z1, Z2, T1, T2, DTDZAV, DZX, DTDZX, TMAX, FAC

COMMON Blocks: None

REAL FUNCTION O2CNT

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	INT, REAL, MIN, EXP
EXTERNAL	O2CBD

Local Variable Declarations:

INTEGER	I, IP
REAL	TD, FAC, VX, O2C1, O2C2

COMMON Blocks: /O2C/

SUBROUTINE OPATH

Argument Declarations:

T - REAL Vector (Len = Unspecified) (Input) - Temperature (K)
P - REAL Vector (Len = Unspecified) (Input) - Pressure (mb)
ZP - REAL Vector (Len = Unspecified) (Input) - Altitude (m)
UP - REAL Vector (Len = Unspecified) (Input) - H2O density (PS*TS*ppmv)
VP - REAL Vector (Len = Unspecified) (Input) - CO2 density (PS*TS*ppmv)
WP - REAL Vector (Len = Unspecified) (Input) - O3 density (PS*TS*ppmv)
ARSLAS - REAL Vector (Len = Unspecified) (Input) - Aerosol absorption in
the solar region (km^{-1})
ARSLSS - REAL Vector (Len = Unspecified) (Input) - Aerosol scattering in
the solar region (km^{-1})
ARSLAT - REAL Vector (Len = Unspecified) (Input) - Aerosol absorption in
the thermal region (km^{-1})
ARSLST - REAL Vector (Len = Unspecified) (Input) - Aerosol scattering in
the thermal region (km^{-1})
CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
1 - Low etage
2 - Middle etage
3 - High etage

INTRINSIC and EXTERNAL Declarations:

REAL	SATUR
INTRINSIC	MAX, MIN
EXTERNAL	SATUR, LAYLW, TRANLW

Local Variable Declarations:

INTEGER	I, J, K, JM, JP, ITYPE
REAL	CU, CV, CW, CX(2), CY, CZ(2), CTU, CTV, CTW, CTX, DQ1, DQ2, DQ3, DZ, UNORM, VNORM, WNORM, XNORM, YNORM, ZNORM, P0, T0, DENS

COMMON Blocks: /CLIMAT/, /OMATLW/

SUBROUTINE OPNSCR

Argument Declarations:

IFSCR - INTEGER Variable (Input/Output) - Scratch file device
number
LABEL - CHARACTER*(*) Variable (Input) - File label

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
EXTERNAL	IOERR

Local Variable Declarations:

INTEGER	I, IOS

COMMON Blocks: None

SUBROUTINE PARSE

Argument Declarations:

VARIN - CHARACTER*(*) Variable (Input) - Input string
VAROUT - CHARACTER*(*) Vector (Output) (Len = Unspecified) - Vector
 output string
N - INTEGER Variable (Output) - Length of vector string
NMAX - INTEGER Variable (Input) - Maximum length of vector string

INTRINSIC and EXTERNAL Declarations:

INTEGER	LENSTR
INTRINSIC	LEN, MIN
EXTERNAL	LCTRIM, LENSTR

Local Variable Declarations:

INTEGER I, IM, IP, LINMAX, LOUTMX, ISW

COMMON Blocks: None

REAL FUNCTION PARTIT

Argument Declarations:

```

TEMP    - REAL Variable - Temperature (K)
MOLEC   - INTEGER Variable - Molecular index
          MOLEC = 1 implies Water vapor (H2O)
          MOLEC = 2 implies Carbon dioxide (CO2)
          MOLEC = 3 implies Ozone (O3)
          MOLEC = 4 implies Nitrous oxide (N2O)
          MOLEC = 5 implies Carbon monoxide (CO)
          MOLEC = 6 implies Methane (CH4)
          MOLEC = 7 implies Oxygen (O2)
          MOLEC = 8 implies Nitric oxide (NO)
          MOLEC = 9 implies Sulfur dioxide (SO2)
          MOLEC = 10 implies Nitrogen dioxide (NO2)
          MOLEC = 11 implies Ammonia (NH3)
          MOLEC = 12 implies Nitric acid (HNO3)
          MOLEC = 13 implies Hydroxyl radical (OH)
          MOLEC = 14 implies Hydrogen fluoride (HF)
          MOLEC = 15 implies Hydrogen chloride (HCl)
          MOLEC = 16 implies Hydrogen bromide (HBr)
          MOLEC = 17 implies Hydrogen iodide (HI)
          MOLEC = 18 implies Chlorine monoxide (ClO)
          MOLEC = 19 implies Carbonyl sulfide (OCS)
          MOLEC = 20 implies Formaldehyde (H2CO)
          MOLEC = 21 implies Hypochlorous acid (HOCl)
          MOLEC = 22 implies Nitrogen (N2)
          MOLEC = 23 implies Hydrogen cyanide (HCN)
          MOLEC = 24 implies Methyl chloride (CH3Cl)
          MOLEC = 25 implies Hydrogen peroxide (H2O2)
          MOLEC = 26 implies Acetylene (C2H2)
          MOLEC = 27 implies Ethane (C2H6)
          MOLEC = 28 implies Phosphine (PH3)
          MOLEC = 29-32 are for future growth
          MOLEC = 33 implies CFC-11 (CCl3F)
          MOLEC = 34 implies CFC-12 (CCl2F2)
          MOLEC = 35 implies CFC-13 (CClF3)
          MOLEC = 36 implies CFC-14 (CF4)
          MOLEC = 37 implies CFC-22 (CHF2Cl)
          MOLEC = 38 implies CFC-113 (C2Cl3F3)
          MOLEC = 39 implies CFC-114 (C2Cl2F4)
          MOLEC = 40 implies CFC-115 (C2ClF5)
          MOLEC = 41 implies ClONO2
          MOLEC = 42 implies HNO4
          MOLEC = 43 implies CHCl2F
          MOLEC = 44 implies CCl4
          MOLEC = 45 implies N2O5

```

PARAMETER Declarations:

```

INTEGER      MLIDMX
PARAMETER    (MLIDMX=45)

```

INTRINSIC and EXTERNAL Declarations:

```

INTRINSIC    EXP, DPROD, REAL, DBLE
EXTERNAL     MOLPBD

```

Local Variable Declarations:

```

INTEGER      I
REAL         TREF
DOUBLE PRECISION QROT, QVIB, QV, QV0

```

```

COMMON Blocks:      /MOLDAT/

```

REAL FUNCTION PFR

Argument Declarations:

T - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, EXP

Local Variable Declarations:

INTEGER J
REAL VIB(3), QJ, T1, T2, T1S, T2S, V, T11, T22

COMMON Blocks: None

SUBROUTINE PHFUNC

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 IAERO - INTEGER Variable (Input) - Index for aerosol type
 ICLD - INTEGER Variable (Input) - Index for water cloud type
 ICLDRN - INTEGER Variable (Input) - Index for cloud and rain
 IIICE - INTEGER Variable (Input) - Index for ice cloud type
 ICIRUS - INTEGER Variable (Input) - Index for cirrus cloud type
 RNRATE - REAL Variable (Input) - Rain rate (mm/hr)
 SNRATE - REAL Variable (Input) - Snowfall rate (mm/hr in equiv. water)
 L - INTEGER Variable (Input) - Altitude index
 SCTM - REAL Variable (Input) - Molecular single-scattering coefficient (km^{-1})
 SCTA - REAL Variable (Input) - Aerosol single-scattering coefficient (km^{-1})
 SCTC - REAL Variable (Input) - Water cloud single-scattering coefficient (km^{-1})
 SCTI - REAL Variable (Input) - Ice cloud single-scattering coefficient (km^{-1})
 SCTR - REAL Variable (Input) - Rain single-scattering coefficient (km^{-1})
 SCTS - REAL Variable (Input) - Snow single-scattering coefficient (km^{-1})
 SCTCI - REAL Variable (Input) - Cirrus cloud single-scattering coefficient (km^{-1})
 TEMP - REAL Variable (Input) - Temperature (K)
 KK - INTEGER Variable (Input) - Latitude index
 LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER MLMAX, NWLAER, NWLCLD, NANG, MAXLAT, MAXLON, NSTTMP
 PARAMETER (MLMAX=140, NSTTMP=16)
 PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
 PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL CSPHFN
 INTRINSIC MIN, ABS
 EXTERNAL PROFAC, PHFGBD, PHSTBD, PHTRBD, ARSLBD, PHMABD, CSPHFN, PHYDRO, PHURBD, PHRUBD, PHOCBD, BKSTBD

Local Variable Declarations:

INTEGER JWLP(8), JWL(8), I, JTMP, JTMPP
 REAL FACWL(8), WLX, ASYWC, ASYIC, ASYMR, ASYMS, P1, P2, ASYMM, SCTSUM, FACTMP, ASYDUM, ASYCI, WLY

COMMON Blocks: /AEROSL/, /AERSCA/, /AERUSR/, /ARSLSC/, /BSTAER/, /CONSTN/, /PHFFOG/, /PHFMAR/, /PHFOCE/, /PHFRUR/, /PHFSTR/, /PHFTRP/, /PHFURB/

REAL FUNCTION PHMLSC

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 PHI - REAL Variable - Scattering angle (deg)

INTRINSIC and EXTERNAL Declarations:

REAL DEPOL
 INTRINSIC COS
 EXTERNAL DEPOL

Local Variable Declarations:

REAL WL,DPL

COMMON Blocks: /CONSTN/

SUBROUTINE PHYDRO

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 ICLOUD - INTEGER Variable (Input) - Index for water cloud type
 ICLDRN - INTEGER Variable (Input) - Index for cloud and rain
 SCTC - REAL Variable (Input) - Scattering coefficient for clouds (km^{-1})
 IIICE - INTEGER Variable (Input) - Index for ice cloud type
 SCTI - REAL Variable (Input) - Scattering coefficient for ice clouds (km^{-1})
 ICIRUS - INTEGER Variable (Input) - Index for cirrus cloud type
 SCTCI - REAL Variable (Input) - Scattering coefficient for cirrus (km^{-1})
 RNRATE - REAL Variable (Input) - Rain rate (mm/hr)
 SCTR - REAL Variable (Input) - Scattering coefficient for rain (km^{-1})
 SNRATE - REAL Variable (Input) - Snowfall rate (mm/hr in equiv. water)
 SCTS - REAL Variable (Input) - Scattering coefficient for snow (km^{-1})
 ASYWC - REAL Variable (Output) - Water cloud asymmetry factor
 ASYIC - REAL Variable (Output) - Ice cloud asymmetry factor
 ASYMR - REAL Variable (Output) - Rain asymmetry factor
 ASYMS - REAL Variable (Output) - Snow asymmetry factor
 ASYCI - REAL Variable (Output) - Cirrus cloud asymmetry factor
 TEMP - REAL Variable (Input) - Temperature (K)

PARAMETER Declarations:

INTEGER NWLAER,NWLCLD,NANG
 PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)

INTRINSIC and EXTERNAL Declarations:

REAL CSPHFN,XTERP
 INTRINSIC MIN,ABS
 EXTERNAL PROFAC,PHHYBD,CSPHFN,CIRRBD,XTERP,ARSLBD

Local Variable Declarations:

INTEGER KWL,KWLP,KRT,KRTP,I,KTP,KTPP,JCIR,ITRPO
 REAL FACWL,WLX,WLY,FACRT,FACTP,ASYM1,ASYM2

COMMON Blocks: /AEROSL/, /CLDUSR/, /CONSTN/, /CRASYM/, /PHHYDR/

REAL FUNCTION PLANCK

Argument Declarations:

TEMP - REAL Variable - Temperature (K)
V - REAL Variable - Wavenumber (cm^{-1})
DV - REAL Variable - Wavenumber increment (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, EXP, DPROD, LOG

Local Variable Declarations:

INTEGER I
REAL VP
DOUBLE PRECISION X, Y, C1, C2, XMU(3), WT(3), DPLNCK

COMMON Blocks: /CONSTN/

SUBROUTINE PLANET

Argument Declarations:

CENT - DOUBLE PRECISION Variable (Input) - Universal time in centuries
from 1900.0
LABSUN - DOUBLE PRECISION Variable (Input) - Mean longitude
ANOMN - DOUBLE PRECISION Variable (Input) - Mean anomaly
PERTUB - DOUBLE PRECISION Variable (Output) - Planetary nutation and
longitude perturbations
PERVEN - DOUBLE PRECISION Variable (Output) - Latitude perturbations of sun
by Venus
PERJUP - DOUBLE PRECISION Variable (Output) - Latitude perturbations of sun
by Jupiter
XMNLAT - DOUBLE PRECISION Variable (Output) - Moon mean argument of latitude
OBLNUT - DOUBLE PRECISION Variable (Output) - Nutation in obliquity

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MOD, SIN, COS

Local Variable Declarations:

DOUBLE PRECISION DDCIR, ANOMLN, ELONLN, ANOMVN, PERT, ANOMAR, ANOMJP,
ANOMSA, XNUTLN, PERINE, ASCNOD, XLONLN

COMMON Blocks: /CONSTN/

SUBROUTINE PLMSUB

Argument Declarations:

XN - REAL Array (Dim = NGAS x Unspecified) (Output) - Optical depth
 ACNP - REAL Array (Dim = NGAS x Unspecified) (Output) - Summing variable
 for Lorentz line width
 ACND - REAL Array (Dim = NGAS x Unspecified) (Output) - Summing variable
 for Doppler Line width
 COMA - REAL Array (Dim = NGAS x Unspecified) (Output) - Optical depth
 for each atmospheric gas specie and each line group
 TAUL - REAL Vector (Len = Unspecified) (Output) - Optical depth for
 each atmospheric gas specie
 COMAE - REAL Variable (Output) - Optical depth for aerosols
 SLTSC - REAL Variable (Output) - Optical depth due to aerosol and
 molecular scattering
 CNTCO2 - REAL Variable (Output) - Optical depth due to CO2 continuum
 CNTH2O - REAL Variable (Output) - Optical depth due to H2O continuum
 MM - INTEGER Variable (Input) - Azimuth index

PARAMETER Declarations:

INTEGER MLMAX, MLMX2, NAZMAX, NGAS, NNNMAX, ISMX, MAXLAT,
 MAXLON, NGMAX, MOLMAX, MLIDMX
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX, MLIDMX=45)
 PARAMETER (NGAS=6, NNNMAX=5, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (NGMAX=15, NAZMAX=30)
 PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL COMFNC
 EXTERNAL COMFNC, MOLPBD

Local Variable Declarations:

INTEGER I, K, L, KL, IV, MLC, KK, LL
 REAL PO, PS, DUMA, DUMB, DUMF, DUMG, DUMX, SDX, CDX, CDY, ADX,
 ALX, CD1, CD2

COMMON Blocks: /INITAL/, /MOLCON/, /MOLECP/, /PATH1/, /PATH1A/,
 /PLMDAT/, /PRBNDA/, /PRBNDB/

DOUBLE PRECISION FUNCTION POLY

Argument Declarations:

X - DOUBLE PRECISION Variable - Argument
 C - DOUBLE PRECISION Vector (Len = Unspecified) - Coefficients
 N - INTEGER Variable - Length of C

Local Variable Declarations:

INTEGER I

COMMON Blocks: None

SUBROUTINE PRALT

Argument Declarations:

PRESS - REAL Variable (Input) - Atmospheric pressure (mb)
ALT - REAL Variable (Output) - Pressure altitude (km)
IERR - INTEGER Variable (Output) - Error flag
IERR = 0 implies no error
IERR = 1 implies PRESS is greater than 1777.6 mb
IERR = 2 implies PRESS is less than 0.0044568 mb

INTRINSIC and EXTERNAL Declarations:

INTEGER	IBNSRC
INTRINSIC	MIN, LOG
EXTERNAL	IBNSRC

Local Variable Declarations:

INTEGER	KEY, KEYP
REAL	Z(58), P(58), FAC

COMMON Blocks: None

SUBROUTINE PRCALC

Argument Declarations:

IFSCRI - INTEGER Variable (Input) - File number for source skyshine
 solar path data
 INITV - INTEGER Variable (Input) - Initial value for spectral loop. For
 standard calculations, INITV = 1. For restart calculations, it
 provides the value at which to restart.
 INITGM - INTEGER Variable (Input) - Initial value for geometry loop. For
 standard calculations, INITGM = 1. For restart calculations,
 it provides the value at which to restart.
 IV - INTEGER Variable (Input) - Spectral interval number
 HEADNG - CHARACTER*(*) Variable (Input) - File heading
 TITLE - CHARACTER*(*) Variable (Input) - File title
 IFLTR - INTEGER Variable (Input) - Filter index
 TFLTR - CHARACTER*(*) Variable (Input) - Filter title
 ISMARY - INTEGER Variable (Input) - Summary index
 ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Switch
 for model atmospheres

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGAS, NNNMAX, MLMAX, ISMX, MLMX2, ISTMAX, NBAND, NGMAX, NZSMAX, NMATL, NWLAER, NWLCLD, NANG, MAXLAT, MAXLON, NL, NVSMAX, MOLMAX, MLIDMX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER	(ISTMAX=30000)
PARAMETER	(NBAND=16, NNNMAX=5, NGAS=6, NMATL=28)
PARAMETER	(NWLAER=47, NWLCLD=79, NANG=65)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(NL=50)

INTRINSIC and EXTERNAL Declarations:

REAL	SOLAR, SLUNAR, SCINTL, PLANCK, DPLDT, FILTER
CHARACTER*72	IOERR
INTRINSIC	MAX, MIN, REAL, SQRT, LOG
EXTERNAL	BNDPAR, SOLAR, BNTPTH, PLANCK, BCKGND, SOLRAD, PHTAU, RESOLV, SCINTL, DEVCBD, ARSLBD, RSHINE, PTHOSB, SMPCAL, SLUNAR, TERMPR, PLMSUB, IOERR, MOLPBD, COUPLE, MLSCAT, DPLDT, XPNDAR, INTEG, INDXBK, KDISTR, ATMPRN, BCKPRN, FILTER, ZROINT, ATMSBD, DISPRN

SUBROUTINE PRCALC (continued)

Local Variable Declarations:

```

INTEGER      I,K,L,M,N,MM,IZ,KL,LB,IOS,ITYP1,MM1,NLNTOT,
              KSCENE(MAXLAT,MAXLON),LPS,LPL,KK,LL,NVP,IP,
              KDV1,KDV2,LLB,ISTOR1,IGEOM,NLOCAT,NSLTOT
REAL         XN(NGAS,NNNMAX),RDSLSP(NAZMAX,MLMX2,2),V,
              ACNP(NGAS,NNNMAX),ACND(NGAS,NNNMAX),TNOON,
              COMA(NGAS,NNNMAX),FLTR,TAUPLM(NGAS),V1P,V2P,
              S1(ISMX),S2(ISMX),S3(ISMX),SOLX,S4(ISMX),
              S5(ISMX),S1T(ISMX),S2T(ISMX),RTH,RSL,SLTSC,
              DRADP2,S3T(ISMX),S4T(ISMX),TAUX,AZL,XLUN,
              S5T(ISMX),RADSLP(NAZMAX,MLMX2),DV,TMIDN,
              RADLNP(NAZMAX,MLMX2),PROJS(6,NAZMAX,NGMAX),
              PROJL(6,NAZMAX,NGMAX),HSKYSH,HSCATT,COMAE,
              DRADP(NAZMAX,MLMX2),RADPTH(NAZMAX,MLMX2,2),
              SIGMEP(NAZMAX,MLMX2),TAUSCP(NAZMAX,MLMX2),
              PHIBM(NAZMAX),SOLAZP,AZS,BW,BWL,RDSCVS,
              CNTCO2,CC,RDSCVL,RR2X(NAZMAX),CNTH2O,RDLNSP,
              TAULR(NAZMAX,MLMX2),BKSUMV(6,NMATL,NAZMAX),
              ALNTAU,BLNTAU,TAUUMG,TAUTRC,TAUHSC,TAUHAB,
              TSLS,TSLB,AZO,RADSLS(NZSMAX,NASMAX),
              RADLNS(NZSMAX,NASMAX),S6(ISMX),S6T(ISMX),
              AZIMP(NAZMAX),SHDWS(NAZMAX,NGMAX),
              SHDWL(NAZMAX,NGMAX)
DOUBLE PRECISION XS(ISMX),XST(ISMX),SCT1S,SCT1L,SCT3S,SCT3L,
              TAUL(MLMX2),TAULA(MLMX2)
LOGICAL      FLBCKZ(NGMAX),FLTRUE

COMMON Blocks:  /AEROSL/,/ARSLSC/,/ATMDAT/,/BCKDAT/,/CONSTN/,
                /CURGDA/,/CURGDB/,/CURGDC/,/DEVICE/,/FLAGS/,
                /INITAL/,/INTSTO/,/HEADER/,/KDISDT/,/LYRSTO/,
                /MOLCON/,/MOLECP/,/MSPARM/,/OPTDEP/,/PATH1/,
                /PATH1A/,/PATH4/,/PATH5A/,/PATH5B/,/PATH5C/,
                /PATH5D/,/PATH6/,/PATH8/,/TRANSP/

```

SUBROUTINE PRETEM

Argument Declarations:

T - REAL Vector (Len = Unspecified) (Output) - Temperature (K)
 P - REAL Vector (Len = Unspecified) (Output) - Pressure (mb)
 ZP - REAL Vector (Len = Unspecified) (Output) - Altitude (m)
 versus pressure
 UP - REAL Vector (Len = Unspecified) (Output) - H₂O density
 (scaled LOWTRAN units) versus pressure
 VP - REAL Vector (Len = Unspecified) (Output) - CO₂ density
 (scaled LOWTRAN units) versus pressure
 WP - REAL Vector (Len = Unspecified) (Output) - O₃ density
 (scaled LOWTRAN units) versus pressure
 HB - REAL Variable (Input) - Terrain altitude (km)
 CLALTB - REAL Vector (Len = Unspecified) (Input) - Cloud base altitudes (km)
 1 - Low etage
 2 - Middle etage
 3 - High etage
 CLALTT - REAL Vector (Len = Unspecified) (Input) - Cloud top altitudes (km)
 1 - Low etage
 2 - Middle etage
 3 - High etage
 TAIRLC - REAL Variable (Input) - Surface air temperature (K)
 PAIRLC - REAL Variable (Input) - Surface air pressure (mb)
 CH2OLC - REAL Variable (Input) - Surface water vapor content (ppmv)
 KK - INTEGER Variable (Input) - Latitude index
 LL - INTEGER Variable (Input) - Longitude index

PARAMETER Declarations:

INTEGER MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX, MLIDMX
 PARAMETER (MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT, LOG, MAX, MIN, ABS
 EXTERNAL MOLPBD

Local Variable Declarations:

INTEGER J, K, IP, IP1, IP2, IL, J2, JMAX, JPMAX
 REAL ALTLAY(10), HP, DELZ, DELZIP, P0, T0, DENSJ, DENSJP,
 DP, T1, P1, H1, T2, P2, H2, FAC

COMMON Blocks: /CLIMAT/, /CONSTN/, /INITAL/, /MOLCON/

SUBROUTINE PROFAC

Argument Declarations:

X0 - REAL Variable (Input) - Value of X for which interpolation will be performed
X - REAL Vector (Len = Unspecified) (Input) - X-array (must be monotonically increasing)
N - INTEGER Variable (Input) - Dimension of X-array
KEY - INTEGER Variable (Output) - Position in X-array for which the X0-value is adjacent
FAC - REAL Variable (Output) - The proportional factor for interpolation

INTRINSIC and EXTERNAL Declarations:

INTEGER	IBNSRC
INTRINSIC	MAX, MIN, ABS
EXTERNAL	IBNSRC

Local Variable Declarations:

INTEGER	KEYP
REAL	DX

COMMON Blocks: /CONSTN/

SUBROUTINE PROMPT

Argument Declarations:

STRING - CHARACTER*(*) Variable - Prompt request

Local Variable Declarations: None

COMMON Blocks: None

SUBROUTINE PRTHDR

Argument Declarations:

NFILE - INTEGER Variable (Input) - Device number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
 NVSMAX, MOLMAX
PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER K, L, M, IOS, KK, LL, MM, IV, IGEOM

COMMON Blocks: /HEADER/

SUBROUTINE PTHOSB

Argument Declarations:

L - INTEGER Variable (Input) - Location in integration
 TAUL - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Transmittance
 along observer-source-background path
 TAULA - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Transmittance
 due to absorption along the observer-source-background path
 RADPTH - REAL Variable (Output) - Path thermal radiance ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 DRADB2 - REAL Variable (Output) - Variance in path thermal radiance
 ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)²
 RR2X - REAL Variable (Input/Output) - Second integral in EXPIRT for
 scattering case ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 TAUSCP - REAL Variable (Input/Output) - Transmittance, including scattered
 out of the beam, but still received by the observer
 PTHFAC - REAL Array (Len = MAXLAT x Unspecified) (Input) - Proportionality
 factor for multiple atmospheres
 NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for
 non-zero elements of PTHFAC

PARAMETER Declarations:

INTEGER	MLMAX, MLMX2, NAZMAX, NBAND, ISMX, NANG, MAXLAT, MAXLON, NGMAX, NASMAX, NZSMAX, NVSMAX, MOLMAX, MLIDMX
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX, NAZMAX=30, NGMAX=15)
PARAMETER	(NBAND=16, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(NASMAX=15, NZSMAX=4, NANG=65, MLIDMX=45)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

REAL	RADTRX
INTRINSIC	REAL, DPROD, ABS, COS, SQRT, DBLE, ATAN2, EXP, MAX
EXTERNAL	RADTRX

Local Variable Declarations:

INTEGER	K, KL, KLM, KK, LL, LX
REAL	DUM, ACCZ, DUMP, ASYMT, SCTZ1, SCTZ2
DOUBLE PRECISION	PLK1, PLK2, DPLK1, DPLK2, DELTAU, SUMP, SUM

COMMON Blocks: /ARSLSC/, /CONSTN/, /CURGDC/, /HEADER/, /INITAL/,
 /LYRSTO/, /MOLECP/, /PATH1/, /PRBND/

SUBROUTINE PTHTAU

Argument Declarations:

N - INTEGER Variable (Input) - Number of increments along path
 ITL - INTEGER Vector (Len = Unspecified) (Input) - Point in altitude grid for each path increment
 DR - REAL Vector (Len = Unspecified) (Input) - Length of each incremental path segment (km)
 XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
 S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Lorentz halfwidth times line density
 S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density
 S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable for line density
 S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable for the continuum
 S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable for scattering
 S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable for (Lorentz halfwidth)² times line density
 TAU - REAL Variable (Output) - Transmittance for the whole path
 TAU - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Transmittances at each point along path (i.e., an incremental set of transmittances)
 TAU - DOUBLE PRECISION Vector (Len = Unspecified) (Output) - Transmittance due to absorption
 ITYPE - INTEGER Variable (Input) - Calculation index
 ITYPE = 0 implies that only the final transmittance is calculated
 ITYPE = 1 implies that incremental transmittance is calculated
 ISTORE - INTEGER Variable (Input) - Storage index
 ISTORE = 0 implies no intermediate storage
 ISTORE = 1 implies intermediate storage required
 PTHFAC - REAL Array (Dim = MAXLAT MAXLON x Unspecified) (Input) - Proportionality factor for path
 NPETH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of PTHFAC
 FLTRN - LOGICAL Variable (Input) - Flag for storing component transmission values
 N0 - INTEGER Variable (Input) - Increment for which transmission values are to be stored
 MM - INTEGER Variable (Input) - Azimuth index
 DV - REAL Variable (Input) - Wavenumber increment (cm⁻¹)

PARAMETER Declarations:

INTEGER MLMAX, MLMX2, ISMX, MAXLAT, MAXLON, MOLMAX, MLIDMX
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
 PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, REAL, DPROD
 EXTERNAL TRNSMT, BNTPTH

Local Variable Declarations:

INTEGER K, L, LM, KL, KLM, KK, LL
 REAL S1P(ISMX), S2P(ISMX), S3P(ISMX), S4P(ISMX), DUM3, S5P(ISMX), DELTAU, DUMSD, DUMCD, DUMSC, DUM1, DUM2, DR2, DUM4, S6P(ISMX)
 DOUBLE PRECISION XSP(ISMX), TAUD, SCFD
 LOGICAL FLAG

COMMON Blocks: /CONSTN/, /CGWTS/, /CURGDA/, /CURGDB/, /CURGDC/, /MOLECP/, /OPTDEP/, /PRBNDA/, /PRBNDB/

SUBROUTINE PUTCLD

Argument Declarations: None

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
EXTERNAL	CHRCBD, DEVCBD, CLDRBD, IOERR

Local Variable Declarations:

INTEGER	IOS, K, KK, LL

COMMON Blocks: /CHRCNM/, /CLDRN/, /DEVICE/, /HEADER/

SUBROUTINE PUTHDR

Argument Declarations:

INITV - INTEGER Variable (Input) - Initial value for spectral loop. For standard calculations, INITV = 1. For restart calculations, it provides the value at which to restart.

LATST - REAL Vector (Len = Unspecified) (Input) - Latitude grid

LONST - REAL Vector (Len = Unspecified) (Input) - Longitude grid

MTIME - INTEGER Variable (Input) - Number of temporal variables

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGAS, MLMAX, ISMX, NGMAX, NZSMAX, NBAND, MAXLAT, MAXLON, NVSMAX, MOLMAX, MLIDMX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MLIDMX=45)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8, NGAS=6, NBAND=16)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
INTRINSIC	REAL
EXTERNAL	PRTHDR, IOERR, DEVCBD, MOLPBD

Local Variable Declarations:

INTEGER	L, NVARA (NGMAX), NVARB (NGMAX), NVARP (NGMAX), KK, LL, NVARM (NGMAX), NVARH (NGMAX), NVART (NGMAX), IG, NVH (NVSMAX), NHDR (2), NHDRB (2), NHDRM (2), ITP, NHDRH (2), IZ, IOS, IGEOM, NGEOMH, NVSETH

COMMON Blocks: /BCKDAT/, /DEVICE/, /HEADER/, /INITAL/, /MOLCON/, /MOLECP/

SUBROUTINE PUTSLR

Argument Declarations: None

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL	SLRCNT
CHARACTER*72	IOERR
EXTERNAL	SLRCNT, DEVCBD, IOERR

Local Variable Declarations:

INTEGER	IOS
REAL	SLRC
CHARACTER*8	LOCAT(2)

COMMON Blocks: /DEVICE/, /FLAGS/, /HEADER/

REAL FUNCTION RAB

Argument Declarations:

R1	- REAL Variable - Diffuse reflection coefficient, layer 1
R1S	- REAL Variable - Directional reflection coefficient, layer 1
R2	- REAL Variable - Diffuse reflection coefficient, layer 2
R2S	- REAL Variable - Directional reflection coefficient, layer 2
R3	- REAL Variable - Diffuse reflection coefficient, layer 3
T2	- REAL Variable - Transmission, layer 2
T3	- REAL Variable - Transmission, layer 3
G	- REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL	T, TT

COMMON Blocks: None

REAL FUNCTION RADFLD

Argument Declarations:

TEMP - REAL Variable - Temperature (K)
V - REAL Variable - Wavenumber (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DPROD, EXP

Local Variable Declarations:

REAL TREF
DOUBLE PRECISION DUM, DUM0

COMMON Blocks: None

REAL FUNCTION RADTRX

Argument Declarations:

Y1 - DOUBLE PRECISION Variable - Value of Y(X1)
X1 - DOUBLE PRECISION Variable - Initial point of integration
Y2 - DOUBLE PRECISION Variable - Value of Y(X2)
X2 - DOUBLE PRECISION Variable - Final point of integration

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LOG, ABS, MAX, MIN, REAL

Local Variable Declarations:

DOUBLE PRECISION DX1, DX2, DY1, DY2, XLNX, XLNY

COMMON Blocks: /CONSTN/

REAL FUNCTION RADTRY

Argument Declarations:

Y1 - DOUBLE PRECISION Variable - Value of Y(X1)
Y2 - DOUBLE PRECISION Variable - Value of Y(X2)
DX - DOUBLE PRECISION Variable - Increment of integration

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LOG, ABS, REAL, MAX

Local Variable Declarations:

DOUBLE PRECISION DY1, DY2, XLNY

COMMON Blocks: /CONSTN/

REAL FUNCTION RAINEX

Argument Declarations:

RATE - REAL Variable - Rain rate (mm/hr)
 ITYPE - INTEGER Variable - Type of distribution
 ITYPE = 1 implies a Marshall-Palmer distribution
 ITYPE = 2 implies a Drizzle (Joss and Waldvogel)
 ITYPE = 3 implies a Widespread rain (Joss and Waldvogel)
 ITYPE = 4 implies a Thunderstorm (Joss and Waldvogel)
 ITYPE = 5 implies a Thunderstorm (Sekhon and Srivastava)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL RAINBD

Local Variable Declarations:

REAL XN, ALPH

COMMON Blocks: /CONSTN/, /RAINTP/

SUBROUTINE RAINSP

Argument Declarations:

WL - REAL Variable (Input) - Wavelength (μm)
 RATE - REAL Variable (Input) - Rain rate (mm/hr)
 TEMP - REAL Variable (Input) - Temperature (K)
 IRAIN - INTEGER Variable (Input) - Type of rain distribution
 IRAIN = 1 implies a Marshall-Palmer Distribution
 IRAIN = 2 implies a drizzle (Joss and Waldvogel)
 IRAIN = 3 implies a widespread rain (Joss and Waldvogel)
 IRAIN = 4 implies a thunderstorm (Joss and Waldvogel)
 IRAIN = 5 implies a thunderstorm (Sekhon and Srivastava)
 RNABS - REAL Variable (Output) - Normalized absorption coefficient
 RNSCT - REAL Variable (Output) - Normalized scattering coefficient

PARAMETER Declarations:

INTEGER NWLCLD
 PARAMETER (NWLCLD=79)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC MIN
 EXTERNAL PROFAC, XTERP, CLDRBD, RAINBD

Local Variable Declarations:

INTEGER KEYWL, KEYWLP, ITYPE, KEYTP, KEYTPP, NVAR7, ITRP0
 REAL RATEFF, RA1, RA2, RX1, RX2, FACWL, FACTP, RA11, RA12,
 RA21, RA22, RX11, RX12, RX21, RX22

COMMON Blocks: /CLDRN/, /RAINTP/, /RAINWL/

SUBROUTINE RAYPTH

Argument Declarations:

L1 - INTEGER Variable (Input) - Altitude index for the initial point of the ray
 L2 - INTEGER Variable (Input) - Altitude index for the final point of the ray
 PHI1 - DOUBLE PRECISION Variable (Input) - Elevation angle at the initial point of the ray (rad)
 LENP - INTEGER Variable (Input) - Index for path length
 LENP = 0 implies the short path
 LENP = 1 implies the long path (if it exists)
 R - REAL Vector (Len = Unspecified) (Output) - Array of cumulative slant ranges along the ray (km)
 PHI - REAL Vector (Len = Unspecified) (Output) - Array of elevation angles along the ray (rad)
 THETA - REAL Vector (Len = Unspecified) (Output) - Array of earth-center angles along the ray (rad)
 IZ - INTEGER Vector (Len = Unspecified) (Output) - Array of altitude indices along the ray
 KL - INTEGER Variable (Output) - Number of elements in the arrays R, PHI, THETA, and IZ
 KLMAX - INTEGER Variable (Input) - DIMENSION of R, PHI, THETA, and IZ
 IBKGD - INTEGER Variable (Output) - Background index
 Note - If ray path terminates at a point other than L2, the input value is changed so that IBKGD = -3 if the ray terminates in space, and IBKGD = -4 if the ray terminates on the earth (i.e., L = 1)
 HTNGT - REAL Variable (Input/Output) - Tangent altitude (km)
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER	MLMAX, ISMX, MAXLAT, MAXLON, NGMAX, MOLMAX
PARAMETER	(MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MAXLAT=3, MAXLON=1, NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL, INT, COS, ACOS, SIN, DBLE, SIGN, ABS, MAX, MIN
EXTERNAL	TANGPT

Local Variable Declarations:

INTEGER	J, K, JP, JM, JMM, ICHK, IDRCT, KLAT, KLON
DOUBLE PRECISION	SNELL, PX1, PX2, MH, MHP, XDRCT, RD, RX, TD, DZ, DPHI1, DPHI2, PX0, DFAC, XMH0, DXMH1, DXMH2

COMMON Blocks: /INITAL/

REAL FUNCTION RBE

Argument Declarations:

R1 - REAL Variable - Diffuse reflection coefficient, layer 1
 R1S - REAL Variable - Directional reflection coefficient, layer 1
 R2 - REAL Variable - Diffuse reflection coefficient, layer 2
 R2S - REAL Variable - Directional reflection coefficient, layer 2
 R3 - REAL Variable - Diffuse reflection coefficient, layer 3
 R3S - REAL Variable - Directional reflection coefficient, layer 3
 T3 - REAL Variable - Transmission, layer 3
 T2 - REAL Variable - Transmission, layer 2
 G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL T, TT

COMMON Blocks: None

SUBROUTINE RDFLTR

Argument Declarations:

IFLTR - INTEGER Variable (Input/Output) - Filter index
 For now, it is 1 for all user-defined filters.
 TFLTR - CHARACTER*(*) Variable (Output) - Name of filter response
 This name is printed out on the ASCII printout.

PARAMETER Declarations:

INTEGER MOLMAX
 PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER LENSTR
 REAL GETVAR
 CHARACTER*2 LWCASE
 CHARACTER*3 UPCASE
 CHARACTER*72 IOERR
 INTRINSIC MIN
 EXTERNAL DEVCBD, RDLINE, PARSE, GETVAR, UPCASE, IOERR, INFLBD,
 LCTRIM, LENSTR, LWCASE

Local Variable Declarations:

INTEGER I, IOS, NDATA, ICOL0, ICOL40, NVAR3, KODE, NW, NF, IFT,
 IPRINT, NLOW, NEW, LENF, IFWV
 REAL TEMP
 CHARACTER*1 DOT
 CHARACTER*20 VRDATA(3), IDFIL
 CHARACTER*80 TITLE, DUMMY
 CHARACTER*255 VARIAB

COMMON Blocks: /DEVICE/, /FLTRDT/, /INFLTR/

SUBROUTINE RDGBL

Argument Declarations:

XLAT - REAL Variable (Input) - Latitude (deg)
 XLONG - REAL Variable (Input) - Longitude (deg)
 MONTH - INTEGER Variable (Input) - Month of year
 GMT - REAL Array (Dim = 2 x Unspecified) (Output) - Time (GMT dec. hr.)
 TSRF - REAL Array (Dim = 2 x Unspecified) (Output) - Surface temperature (K)
 CLCV - REAL Array (Dim = 2 x 0:3 x Unspecified) (Output) - Cloud cover (%)
 CIRR - REAL Variable (Output) (Output) - Percentage cirrus clouds (%)
 CLDRAD - REAL Array (Dim = 2 x 3 x Unspecified) (Output) - Cloud radiance ($\mu\text{W}/\text{cm}^2/\text{sr}$)
 FRSNW - REAL Variable (Output) (Output) - Percentage snow cover (%)
 FRICE - REAL Variable (Output) (Output) - Percentage ice (%)

PARAMETER Declarations:

INTEGER MOLMAX
 PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

REAL SEAICE
 CHARACTER*72 IOERR
 INTRINSIC MOD, INT, INDEX, LEN
 EXTERNAL DEV CBD, IOERR, SEAICE
 CIBMV EXTERNAL FILEINF

Local Variable Declarations:

INTEGER I, J, K, IREC, NREC(40), IOS, IPRINT, IXM
 CIBMV INTEGER IERR
 REAL YLONG, YLAT(41), DLON(40), ZLAT, ZLONG, TERR
 LOGICAL FLGBL
 CHARACTER*120 NFILE

COMMON Blocks: /DEV CNM/, /DEVICE/

SUBROUTINE RDLINE

Argument Declarations:

IUNIT - INTEGER Variable (Input) - Unit number
ISKIP - INTEGER Variable (Input) - Number of characters to be
skipped on initial READ
OUTBUF - CHARACTER*(*) Variable (Output) - Buffer for output

INTRINSIC and EXTERNAL Declarations:

INTEGER	LENSTR
CHARACTER*72	IOERR
INTRINSIC	MAX, MIN, LEN
EXTERNAL	LCTRIM, LENSTR, IOERR

Local Variable Declarations:

INTEGER	I, K, ISTART, IEND, IMAXLN, IBUFLN, IOS, JMAXLN, KMAX, JSKIP
CHARACTER*80	IBUFFR, TBUFFR
LOGICAL	FIRST, CONTNU

COMMON Blocks: None

SUBROUTINE RDSCN

Argument Declarations:

XLAT - REAL Variable (Input) - Latitude (deg)
 XLONG - REAL Variable (Input) - Longitude (deg)
 ALT - REAL Variable (Output) - Altitude (m)
 IBK - INTEGER Variable (Output) - Scene index
 FRWTR - REAL Variable (Output) - Fraction surface water in scene

PARAMETER Declarations:

INTEGER MOLMAX
 PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

	INTEGER	IBKCNV
CIBM	INTEGER	IBITS
CVAX	INTEGER	JIBITS
CLAH	INTEGER	JIBITS
	CHARACTER*72	IOERR
	INTRINSIC	MOD, INT, MAX, MIN, INDEX, ABS, LEN
CMIL	INTRINSIC	IBITS
CVAX	INTRINSIC	JIBITS
CLAH	EXTERNAL	JIBITS
CIBM	EXTERNAL	IBITS
	EXTERNAL	DEV CBD, IOERR, IBKCNV, CITIES
CIBMV	EXTERNAL	FILEINF

Local Variable Declarations:

	INTEGER	I, J, IREC, IOS, NLAT, LAT, LON, IPRINT, IXM, LATMIN, LONMIN, IECD
CMIL	INTEGER	IFLD(6,6), IFLDV
	INTEGER*1	JBK(6,6), IWTR(6,6)
CINT2	INTEGER*2	JBK(6,6), IWTR(6,6)
	INTEGER*2	IALT(6,6)
CINT4	INTEGER	JBK(6,6), IWTR(6,6), IALT(6,6)
CIBMV	INTEGER	IERR
	REAL	YLONG
	LOGICAL	FLSCN, FLURB
	CHARACTER*120	NFILE, URBNAM

COMMON Blocks: /DEV CNM/, /DEVICE/

COMPLEX FUNCTION REFEET

Argument Declarations:

REFL - REAL Variable - Normal reflection coefficient

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SQRT, CMPLX, ABS, MAX

Local Variable Declarations:

REAL N, K, DUM

COMMON Blocks: /CONSTN/

DOUBLE PRECISION FUNCTION REFRAC

Argument Declarations:

PRESS - REAL Variable - Atmospheric pressure (mb)
 TEMP - REAL Variable - Atmospheric temperature (K)
 WH2O - REAL Variable - Volume mixing ratio, water vapor (ppm)
 WCO2 - REAL Variable - Volume mixing ratio, carbon dioxide (ppm)
 WO2 - REAL Variable - Volume mixing ratio, oxygen (ppm)
 WL - REAL Variable - Wavelength (μm)
 REARTH - DOUBLE PRECISION Variable - Radius of the earth (km)
 ALT - REAL Variable - Altitude (km)
 If refractivity is desired, input ALT = 0.0; otherwise
 modified refractivity is returned.

INTRINSIC and EXTERNAL Declarations:

REAL	SUPK, PFR
INTRINSIC	EXP, DBLE, SQRT
EXTERNAL	SUPK, PFR, REFRBD

Local Variable Declarations:

INTEGER	L, N2
REAL	PH2O, PCO2, PO2, PNRT, V, WCD, CT, CA, SA, GA, PHI, XIF, PRFL, GAMMA, GAMNR, FREQ
DOUBLE PRECISION	N0(3), RTOT, DISP, EPS, S, DENS0(3), DENS

COMMON Blocks: /MMWREF/

REAL FUNCTION RELHUM

Argument Declarations:

CH2O - REAL Variable - Water vapor concentration (ppmv)
 PRESS - REAL Variable - Pressure (mb)
 TEMP - REAL Variable - Temperature (K)
 ITYPE - INTEGER Variable - Type of saturation
 ITYPE = 0 implies water vapor
 ITYPE = 1 implies ice

INTRINSIC and EXTERNAL Declarations:

REAL	SATUR
EXTERNAL	SATUR

Local Variable Declarations:

REAL	R, RW, EW, RATIO, WH2O, WAIR

COMMON Blocks: None

SUBROUTINE RESOLV

Argument Declarations:

VI - REAL Variable (Input) - Initial wavenumber (cm^{-1})
VF - REAL Variable (Input/Output) - Final wavenumber (cm^{-1})
DVI - REAL Variable (Input) - Initial wavenumber increment (cm^{-1})
IDV - INTEGER Variable (Input) - Wavenumber/wavelength index
 IDV = 1 implies wavenumber (cm^{-1})
 IDV = 2 implies wavelength (micron)
 IDV = 3 implies frequency (GHz)
DWL - REAL Variable (Input) - Wavelength increment (micron)
DV - REAL Variable (Output) - Wavenumber increment (cm^{-1})
IV - INTEGER Variable (Input/Output) - Index for VF
ITYPE - INTEGER Variable (Input) - Calculation index
 ITYPE = 1 implies that DV and IV are calculated for VF
 ITYPE = 2 implies that DV and VF are calculated for IV
 (See note below)

INTRINSIC and EXTERNAL Declarations:

REAL DVINCR
EXTERNAL DVINCR

Local Variable Declarations:

INTEGER I
REAL VX, DVP

COMMON Blocks: None

SUBROUTINE RSHINE

Argument Declarations:

IFSCR - INTEGER Variable (Input) - File number for skyshine solar path data
 If IFSCR = 0, file is not OPEN
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
 SOLX - REAL Variable (Input) - Exoatmospheric solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 XLUN - REAL Variable (Input) - Exoatmospheric lunar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
 S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Lorentz halfwidth times line density
 S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable for Doppler halfwidth times line density
 S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable for line density
 S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable for the continuum
 S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable for scattering
 S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable for (Lorentz halfwidth)² times line density
 SOLXM - REAL Array (Dim = NAZSMX x Unspecified) (Output) - Apparent solar radiance as a function of azimuth ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 XLNXM - REAL Array (Dim = NAZSMX x Unspecified) (Output) - Apparent lunar radiance as a function of azimuth ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 NAZSMX - INTEGER Variable (Input) - Maximum number of azimuths
 V - REAL Variable (Input) - Wavenumber (cm^{-1})
 IGEOM - INTEGER Variable (Input) - Geometry number

PARAMETER Declarations:

INTEGER MLMAX, MLMX2, ISMX, NBAND, NZSMAX, NWLAER, NWLCLD, NANG, MAXLAT, MAXLON, NAZMAX, NASMAX, NMATL, NGMAX, NVSMAX, ISTMAX, MOLMAX
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NBAND=16, NMATL=28)
 PARAMETER (NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)
 PARAMETER (NGMAX=15, NVSMAX=20, MAXLAT=3, MAXLON=1)
 PARAMETER (ISTMAX=30000)

INTRINSIC and EXTERNAL Declarations:

REAL RADTRX
 CHARACTER*72 IOERR
 INTRINSIC DPROD
 EXTERNAL SOLRAD, RADTRX, BNTPTH, ARSLBD, PTHTAU, MLSCAT, BCKGND, TERMPR, IOERR

Local Variable Declarations:

INTEGER K, L, M, KK, LL, KL, MM, IOS, LPS, LPL, ITYP1, ISTOR1, IGEOMP, MASP, NSHM
 REAL S1P(ISMX), S2P(ISMX), S3P(ISMX), S4P(ISMX), RADSDM, S5P(ISMX), RADSCM, RDSCML, DRSTOR, DSTORS, DSTORL, RTHSH, RSLSH, DUMSUM(6, NMATL), RDSCV, CC, SOLAZP, HSKYSH, HSCATT, PROJSH(6, 1), PHISHD(1), AZS, AZL, PROJLH(6, 1), S6P(ISMX), SHDWS(1), SHDWL(1)
 DOUBLE PRECISION XSP(ISMX), TAU(MLMX2), TAULA(MLMX2), DELTAU, PLK1, PLK2, SCT1S, SCT1L, SCT3S, SCT3L

COMMON Blocks: /AEROSL/, /ARSLSC/, /CONSTN/, /CURGDA/, /CURGDB/, /CURGDC/, /FLAGS/, /HEADER/, /INITAL/, /INTSTO/, /LYRSTO/, /OPTDEP/, /PATH2/, /PATH2A/, /PATH2B/, /PATH2C/, /PATH2D/, /PATH4/

REAL FUNCTION SATUR

Argument Declarations:

PRESS - REAL Variable - Pressure (mb)
TEMP - REAL Variable - Temperature (K)
ITYPE - INTEGER Variable - Type of saturation
 ITYPE = 0 implies water vapor
 ITYPE = 1 implies ice

INTRINSIC and EXTERNAL Declarations:

INTRINSIC DBLE, REAL, LOG10

Local Variable Declarations:

REAL T0, TS, EI0, EWS, EX
DOUBLE PRECISION DTEMP

COMMON Blocks: /CONSTN/

REAL FUNCTION SCINTL

Argument Declarations:

VARX - REAL Variable - Path-averaged turbulence (km)
V - REAL Variable - Wavenumber (cm⁻¹)
APERT - REAL Variable - Aperture diameter (m)
Z - Real Variable - Distance over which turbulence is averaged (km)

PARAMETER Declarations:

INTEGER NPTS, MPTS
PARAMETER (NPTS=10, MPTS=14)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
INTRINSIC MAX, MIN, EXP, SQRT
EXTERNAL PROFAC, XTERP

Local Variable Declarations:

INTEGER I, KEY, KEYP, ITRP1
REAL VAR, VAREX, CL0(NPTS), DNORM(MPTS), D0, XK, VAR0,
 THETA(NPTS, MPTS), FACD, T1, T2, THETAD

COMMON Blocks: /CONSTN/

SUBROUTINE SCNRIO

Argument Declarations:

LENP - INTEGER Variable (Input/Output) - Index for desired ray path in the case of any ambiguity
 LENP = 0 implies the shorter path
 LENP = 1 implies the longer path
 IGEOM - INTEGER Variable (Input) - Geometry number
 IERR - INTEGER Variable (Output) - Error index
 ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Switch for model atmospheres

PARAMETER Declarations:

INTEGER MLMAX, MLMX2, ISMX, NAZMAX, NASMAX, ISTMAX, MLIDMK,
 NGMAX, NZSMAX, NL, MAXLAT, MAXLON, NVSMAX, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
 PARAMETER (ISTMAX=30000)
 PARAMETER (NL=50)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, MAX, MIN, ABS, DBLE, TAN, COS, ACOS, SIN, MOD
 EXTERNAL GEOM, RAYPTH, CALEND, HOREQU, EQUECL, ECLGAL, HORIZN,
 TURBUL, SPTRIG, DEFBCK, INTR2D, ATMSBD, MOLPBD,
 SHNGEO

Local Variable Declarations:

INTEGER KL, K, L, LM, IDAYX, LENB, JBKGD, LTERM, ITP, KK, LL,
 KLMAXP, LB, IHORSB, KSW, NLOCAT, MM, LINIT, IPRINT,
 MLAT, MLON, ITYP0
 REAL DYEAR, PHOS, RHOS, BHOS, SRMAX, THD, BETMAX, PHIOR,
 PHISR, XLEQUT, BEQUT, AZP, SOLAZP, RSOLAR,
 RLUNAR, ELP, HSEND, XLT, AZDUM (NAZMAX), MHP
 DOUBLE PRECISION PHITX

COMMON Blocks: /ATMDAT/, /BCKDAT/, /CONSTN/, /FLAGS/, /HEADER/,
 /INITAL/, /MOLCON/, /MOLECP/, /PATH1/, /PATH1A/,
 /PATH4/, /PATH5A/, /PATH5B/, /PATH5C/, /PATH5D/

REAL FUNCTION SEAICE

Argument Declarations:

XLAT - REAL Variable - Latitude (deg)
XLON - REAL Variable - Longitude (deg)
IMONTH - INTEGER Variable - Month of year

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	MOD, INT, MAX, MIN
EXTERNAL	SICEBD

Local Variable Declarations:

INTEGER	L, LAT, LON, IM, IX
REAL	FRICE(12), YLONG

COMMON Blocks: /SICEDT/

REAL FUNCTION SEATMP

Argument Declarations:

MONTH - INTEGER Variable - Month of year (MONTH = 1 implies Jan)
XLAT - REAL Variable - Latitude (+ North, - South) (deg)
XLONG - REAL Variable - Longitude (+ East, - West) (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	INT, MAX, MIN
EXTERNAL	OCNTBD

Local Variable Declarations:

INTEGER	ISEASN(12), ILAT, ILON
REAL	YLONG

COMMON Blocks: /TMPOCN/

COMPLEX FUNCTION SEAWTR

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
TEMP - REAL Variable - Temperature (K)

Local Variable Declarations:

INTEGER	N, M
REAL	T0(4), WAVE, DEL1(4), DELB, SIG1(4), SIGB, EP, A, FREQ
COMPLEX	IX, JX

COMMON Blocks: None

SUBROUTINE SETALT

Argument Declarations:

ZP - REAL Vector (Len = Unspecified) (Input/Output) - Basic altitude grid (km)
 NLP - INTEGER Variable (Input/Output) - Number of points in basic grid
 HXTRA - REAL Vector (Len = Unspecified) (Input/Output) - Extra altitudes in altitude grid (km)
 NXTRA - INTEGER Variable (Input/Output) - Dimension of HXTRA
 HRI - REAL Vector (Len = Unspecified) (Input) - Observer altitude (km)
 HTI - REAL Vector (Len = Unspecified) (Input) - Source altitude (km)
 NGEOM - INTEGER Variable (Input) - Number of geometry conditions
 HBCK - REAL Variable (Input) - Terrain altitude (km)
 ICLDRN - INTEGER Variable (Input) - Cloud index
 ZCLD - REAL Vector (Len = Unspecified) (Input) - Cloud altitude grid (km)
 CLDBS - REAL Variable (Input) - Cloud base altitude (km)
 CLDTP - REAL Variable (Input) - Cloud top altitude (km)
 HPRF - REAL Vector (Len = Unspecified) (Input) - Beginning and ending altitudes for background (km)
 ZBCK - REAL Vector (Len = Unspecified) (Output) - Background altitude points (km)
 TBCK - REAL Array (Dim = MLMX x MAXLAT x Unspecified) (Output) - Background temperatures (K)
 LBCK - INTEGER Vector (Len = Unspecified) (Output) - Background altitude indices (km)
 NBCKZ - INTEGER Variable (Output) - Number of background altitude points
 MT - INTEGER Array (Dim = MAXLAT x Unspecified) (Input) - Model temperature profile index
 MLMX - INTEGER Variable (Input) - Maximum number of altitude layers for TBCK
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER MLMX, ISMX, NASMAX, NL, MAXLAT, MAXLON, NGMAX, NLUPR, NTEXO, MOLMAX
 PARAMETER (MLMAX=140, NASMAX=15, NL=50)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MAXLAT=3, MAXLON=1, NGMAX=15, NLUPR=8)
 PARAMETER (NTEXO=11)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
 INTRINSIC MAX, MIN, ABS, REAL, DBLE
 EXTERNAL XTERP, UPPRBD, ATMSBD

Local Variable Declarations:

INTEGER I, J, L, NLX, KK, LL, ITRP0, MTX
 REAL H1, ZPX

COMMON Blocks: /ATMDAT/, /CONSTN/, /INITAL/, /UPRATM/, /USERDF/

SUBROUTINE SETBCK

Argument Declarations:

ITYPE - INTEGER Variable (Input) - Scene index
 Refer to User Reference Manual for definition
 SNOW - REAL Variable (Input) - Percentage snow (%)
 ICE - REAL Variable (Input) - Percentage ice (%)
 WATER - REAL Variable (Input) - Percentage water (%)

PARAMETER Declarations:

INTEGER NMATL, NSCEN, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT,
 MAXLON, ISMX, NVSMAX, NL, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (NMATL=28, NSCEN=35, NL=50)

INTRINSIC and EXTERNAL Declarations:

EXTERNAL BKGDBD, SCENBD, MODBCK, INTR2D, ATMSBD

Local Variable Declarations:

INTEGER I, ISTORE, KK, LL
 REAL FRCTN, TAIRP, PTHFAC (MAXLAT, MAXLON)

COMMON Blocks: /ATMDAT/, /BACKGD/, /HEADER/, /SCENES/

SUBROUTINE SETFLG

Argument Declarations:

ISOLAR - INTEGER Variable (Input) - Solar index
 ILUNAR - INTEGER Variable (Input) - Lunar index
 IEPHEM - INTEGER Variable (Input) - Ephemeris index
 ISMPLS - INTEGER Variable (Input) - Type of solar calculation
 ISMPLL - INTEGER Variable (Input) - Type of lunar calculation
 IVSA - INTEGER Variable (Input) - Vertical structure index
 IFATM - INTEGER Variable (Input) - Atmosphere file number
 IFBCK - INTEGER Variable (Input) - Background file number
 IFBSW - INTEGER Variable (Input) - Fore/Background altitude switch
 IGMSW - INTEGER Variable (Input) - Geometry type index
 IFMSC - INTEGER Variable (Input) - Multiple scattering index

PARAMETER Declarations:

INTEGER NGMAX
 PARAMETER (NGMAX=15)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /FLAGS/

SUBROUTINE SETUP

Argument Declarations:

L1 - INTEGER Variable (Output) - Location of start of ray in altitude array
 LSH - INTEGER Variable (Output) - Location of termination of ray in altitude array
 PHISHR - DOUBLE PRECISION Variable (Output) - Initial elevation angle for ray (rad)
 ITERM - INTEGER Variable (Output) - Terminator index
 Refer to User Reference Manual for definition
 LBKGD - INTEGER Variable (Input) - Location of background altitude in altitude array
 LTRGT - INTEGER Variable (Input) - Location of target altitude in altitude array
 PHISH - REAL Variable (Input) - Initial elevation angle for ray (deg)
 PHIHOR - REAL Variable (Input) - Elevation angle to horizon (deg)
 IBKGD - INTEGER Variable (Input) - Background index
 Refer to User Reference Manual for definition
 ML - INTEGER Variable (Input) - Number of altitudes in altitude array

INTRINSIC and EXTERNAL Declarations:

INTRINSIC DBLE
 COMMON Blocks: /CONSTN/

REAL FUNCTION SHADOW

Argument Declarations:

PHI1 - REAL Variable - Incident elevation angle (deg)
 PHI2 - REAL Variable - Reflected elevation angle (deg)
 THETA - REAL Variable - Azimuth (deg)
 SLOPE - REAL Variable - Mean slope of the roughness

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION DERF
 INTRINSIC SQRT, EXP, COS, SIN, ABS, REAL, DBLE, MOD, MAX
 EXTERNAL DERF

Local Variable Declarations:

DOUBLE PRECISION A1, A2, B1, B2, X1, X2, SLOPE1, SLOPE2, DUM, THETP, DUMM

COMMON Blocks: /CONSTN/

SUBROUTINE SHNGEO

Argument Declarations:

SRC - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Vector to sun/moon from earth center
 SCTPT - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Vector to scattering point from earth center
 ELEV - REAL Variable (Input) - Elevation angle of ray at scattering point (deg)
 AZIM - REAL Variable (Input) - Azimuth angle of ray at scattering point (deg)
 XLAT - REAL Variable (Input) - Latitude of scattering point (deg)
 XLON - REAL Variable (Input) - Longitude of scattering point (deg)
 IZL - INTEGER Variable (Input) - Altitude index of scattering point
 LSRC - INTEGER Variable (Input) - Altitude index of sun/moon
 SCTANG - REAL Variable (Output) - Scattering angle (deg)
 NDXSR - INTEGER Variable (Input) - Index for starting position of a given ray in the IZLSH and DRZLSH vectors
 NTBSR - INTEGER Variable (Output) - Number of elements in the IZLSH and DRZLSH vectors for each ray
 IZLSH - INTEGER Vector (Len = Unspecified) (Output) - Altitude indices for the ray
 DRZLSH - REAL Vector (Len = Unspecified) (Output) - Path length segments for the ray (km)
 ISTMAX - INTEGER Variable (Input) - Dimension of IZLSH and DRZLSH
 SRCEV - REAL Variable (Output) - Elevation angle of source at the background (deg)
 IAZREF - INTEGER Variable (Input) - Azimuth reference index
 SOLAZ - REAL Variable (Input) - Solar azimuth (deg)
 SOLFAC - REAL Array (Dim = MAXLAT x MAXLON x Unspecified) (Output) - Proportionality factor for the ray
 IBKGD - INTEGER Variable (Input) - Background index
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes
 ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Switch for model atmospheres
 NSOLFC - INTEGER Array (Dim = 2 x Unspecified) (Input/Output) - Array limits for non-zero values of SOLFAC

PARAMETER Declarations:

INTEGER	MLMAX, MLMX2, ISMX, MAXLAT, MAXLON, NGMAX, NL, MOLMAX
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX)
PARAMETER	(MAXLAT=3, MAXLON=1, NGMAX=15, NL=50)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	COS, SIN, REAL, DBLE, SQRT, ACOS, ASIN, MAX, MIN
EXTERNAL	RAYPTH, HOREQU, SPTRIG, INTR2D, ATMSBD

Local Variable Declarations:

INTEGER	I, L1, L2, LT, LTM, MLP, ISRC, LENS, ITDUM(MLMX2), KK, LL
REAL	R(MLMX2), PHI(MLMX2), THETA(MLMX2), ALPHA, DELTA, XLOS(3), AZP, PTHLAT, PTHLON, BETA, HTNGT
DOUBLE PRECISION	SOLE, DRX, RX, SNSEL, CSSCAT, DSC

COMMON Blocks: /ATMDAT/, /CONSTN/, /INITAL/

SUBROUTINE SKYNOI

Argument Declarations:

- Z - REAL Variable (Input) - Altitude (km)
- P - REAL Variable (Input) - Pressure at Z (mb)
- T - REAL Variable (Input) - Temperature at Z (K)
- CMOL - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at Z (ppm)
- ZM - REAL Variable (Input) - Altitude just below Z (km)
- PM - REAL Variable (Input) - Pressure at ZM (mb)
- TM - REAL Variable (Input) - Temperature at ZM (K)
- CMOLM - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at ZM (ppm)
- ZP - REAL Variable (Input) - Altitude just above Z (km)
- PP - REAL Variable (Input) - Pressure at ZP (mb)
- TP - REAL Variable (Input) - Temperature at ZP (K)
- CMOLP - REAL Vector (Len = Unspecified) (Input) - Molecular concentrations at ZP (ppm)
- CN2 - REAL Variable (Input) - Refractivity structure constant ($m^{-2/3}$)
- CT2 - REAL Variable (Output) - Temperature structure constant ($K^2/m^{2/3}$)
- CSM2 - REAL Variable (Output) - Molecular scatter structure constant divided by the molecular scatter coefficient squared ($m^{-2/3}$)
- CSA2 - REAL Variable (Output) - Aerosol scatter structure constant divided by the aerosol scatter coefficient squared ($m^{-2/3}$)
- XL0 - REAL Variable (Output) - Turbulence scale length (m)
- SKYFAC - REAL Vector (Len = Unspecified) (Output) - Factor used in evaluating sky noise
 - 1 - Thermal sky noise
 - 2 - Molecular scatter
 - 3 - Aerosol scatter
- HB - REAL Variable (Input) - Terrain altitude (km)

INTRINSIC and EXTERNAL Declarations:

```
DOUBLE PRECISION REFRAC
INTRINSIC          MAX,ABS,LOG,SQRT,REAL
EXTERNAL           REFRAC
```

Local Variable Declarations:

```
INTEGER           K
REAL              DNDT,DNDP,DZ,DZ1,DZ2,DTDZ,DPDZ,DQDZ,DNDQDZ,
                  DNDHDZ,DNDQ(3),DT,DSMDN,DSADN
DOUBLE PRECISION AN,XN1,XN2
```

```
COMMON Blocks:    /CONSTN/
```

REAL FUNCTION SLPOS

Argument Declarations:

XLAT0 - REAL Variable - Reference latitude (in degrees and fractions of degrees, is north)
 XLON0 - REAL Variable - Reference longitude (in degrees and fractions of degrees, is east)
 XLAT - REAL Variable - Latitude (in degrees and fractions of degrees, is north)
 XLON - REAL Variable - Longitude (in degrees and fractions of degrees, is east)
 SOLEV - REAL Variable - Default (geometric) value of solar elevation (deg)
 LBKGD - INTEGER Variable - Background altitude index
 LSOLAR - INTEGER Variable - Solar/lunar altitude index
 NLAT - INTEGER Variable - Number of latitudes
 NLON - INTEGER Variable - Number of longitudes

PARAMETER Declarations:

INTEGER MLMAX,MLMX2
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC COS,ACOS,SIN,REAL,DBLE
 EXTERNAL HORIZN,GEOM

Local Variable Declarations:

INTEGER IZ(MLMX2),LENP,IBKGD,IERR,KL,ITPGM,IPRINT,
 LBKGD0,LSOLR0,MLAT,MLON
 REAL SRRS,BETAS,PHI1,PHI2,SRMAX,BETMAX,RHOS,BHOS,
 PHOS,R(MLMX2),PHI(MLMX2),THETA(MLMX2),
 HTNGT,HSEND

COMMON Blocks: /CONSTN/

REAL FUNCTION SLRCNT

Argument Declarations:

SOLDIS - REAL Variable - Normalized solar distance

INTRINSIC and EXTERNAL Declarations:

CXX REAL SOLAR
 CXX INTRINSIC REAL,DPROD
 CXX EXTERNAL SOLAR
 EXTERNAL SOLRBD

Local Variable Declarations:

CXX INTEGER I
 REAL V,DV,DUM
 CXX DOUBLE PRECISION SUM

COMMON Blocks: /SOLIR1/

REAL FUNCTION SLUNAR

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 DV - REAL Variable - Wavenumber increment (cm^{-1})
 PHLUNR - REAL Variable - Phase of the moon (deg)
 SOLDIS - REAL Variable - Normalized solar distance
 SOLDIS = 1.0 implies a solar constant of 1353 W/m^2
 XLUNDS - REAL Variable - Normalized lunar distance

PARAMETER Declarations:

INTEGER NEL, NALB
 PARAMETER (NALB=30, NEL=37)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, SOLAR
 INTRINSIC COS, SIN
 EXTERNAL XTERP, SOLAR

Local Variable Declarations:

INTEGER ITRP0
 REAL ALBED (NALB), WLL (NALB), CORREC (NEL), ELONG (NEL),
 THETA, SPHERE, ERTHMN, RMOON, WL

COMMON Blocks: /CONSTN/

SUBROUTINE SMPCAL

Argument Declarations:

ML - INTEGER Variable (Input) - Number of lines-of-sight
 MLMX2 - INTEGER Variable (Input) - Maximum DIMENSION of several arrays
 NL - INTEGER Vector (Len = Unspecified) (Input) - Number of altitude layers for each line-of-sight
 ITL - INTEGER Array (Dim = MLMX2 x Unspecified) (Input) - Altitude index of each path
 DRL - REAL Array (Dim = MLMX2 x Unspecified) (Input) - Path increments of each path length (km)
 SOLFAC - REAL Array (Dim = MAXLAT x MAXLON x MLMX2 x Unspecified) (Input) - Proportionality factor for multiple atmospheres
 NSOLFAC - INTEGER Array (Dim = 2 x 2 x Unspecified) (Input) - Limits for the non-zero elements of SOLFAC
 RADINT - REAL Variable (Input) - Initial (exoatmospheric) irradiance ($W/cm^2/cm^{-1}$)
 RADSMP - REAL Vector (Len = Unspecified) (Output) - Irradiance at the various altitudes ($W/cm^2/cm^{-1}$)
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})

PARAMETER Declarations:

INTEGER	MLMAX, ISMX, MAXLAT, MAXLON, MOLMAX
PARAMETER	(MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL
EXTERNAL	PTHETAU

Local Variable Declarations:

INTEGER	K, L, KL, ITYPE, ISTORE, MM1
REAL	S1 (ISMX), S2 (ISMX), S3 (ISMX), S4 (ISMX), S5 (ISMX), S6 (ISMX), TAUx
DOUBLE PRECISION	XS (ISMX), TAUl (MLMAX), TAUlA (MLMAX)
LOGICAL	FLTRN

COMMON Blocks: None

REAL FUNCTION SNOWEX

Argument Declarations:

SRATE - REAL Variable - Snow rate, expressed in terms of water content (mm/hr)
 TEMP - REAL Variable - Temperature (K)
 ITYPE - INTEGER Variable - Type of snow
 ITYPE = 0 implies no snow
 ITYPE = 1 implies needle crystals
 ITYPE = 2 implies plain dendritic crystals
 ITYPE = 3 implies spatial dendritic crystals
 ITYPE = 4 implies powder snow
 ITYPE = 5 implies crystal with droplet
 ITYPE = 6 implies graupel

PARAMETER Declarations:

INTEGER NBIN
 PARAMETER (NBIN=21)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, INT, REAL, SQRT, ABS, EXP
 EXTERNAL SNOWBD

Local Variable Declarations:

INTEGER I, ITMP, ITMP1, ICRYS
 REAL XTMP, FACTMP, RHOW, QEXT, DUM, R32, DREFF, R, DCRYS,
 VOL, AREA, ARTOT, VOLTOT, RC, ALPHA, GAMMA, FRAD, VEL

COMMON Blocks: /CONSTN/, /SNWDAT/

SUBROUTINE SNOWSP

Argument Declarations:

WL - REAL Variable (Input) - Wavelength (μm)
 TEMP - REAL Variable (Input) - Temperature (K)
 ISNOW - INTEGER Variable (Input) - Snow index
 SNABS - REAL Variable (Output) - Normalized absorption coefficient
 SNSCT - REAL Variable (Output) - Normalized scattering coefficient

PARAMETER Declarations:

INTEGER NWLCLD
 PARAMETER (NWLCLD=79)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MIN
 EXTERNAL PROFAC, RAINBD

Local Variable Declarations:

INTEGER KEYWL, KEYWLP, KTP, KTPP
 REAL FACWL, DUM1, DUM2, FACTP

COMMON Blocks: /RAINWL/

SUBROUTINE SOIL

Argument Declarations:

WATER - COMPLEX Variable (Input) - Dielectric constant of water
ICE - COMPLEX Variable (Input) - Dielectric constant of ice
MV - REAL Variable (Input) - Volumetric moisture in vegetation
EM - COMPLEX Variable (Output) - Mean dielectric constant of soil
DEL - REAL Variable (Output) - Standard deviation of the dielectric constant of soil

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	ABS, CMPLX
EXTERNAL	EMISBD

Local Variable Declarations:

REAL	WP, GAM, WT, SAND, CLAY, P
COMPLEX	EX, AIR, ROCK

COMMON Blocks: None

REAL FUNCTION SOLAR

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
DV - REAL Variable - Wavenumber increment over which irradiance is averaged (cm^{-1})
SOLDIS - REAL Variable - Solar distance (in terms of mean distance)

INTRINSIC and EXTERNAL Declarations:

LOGICAL	EVEN
INTRINSIC	REAL, INT, MOD
EXTERNAL	SLR1BD, SLR2BD, SLR3BD, SLR4BD, SLR5BD, EVEN

Local Variable Declarations:

INTEGER	I, IV, IDV, IP
REAL	P, WL0, V0, VP, WT, DVREF
LOGICAL	EVN

COMMON Blocks: /SOLIR1/, /SOLIR2/, /SOLIR3/, /SOLIR4/, /SOLIR5/

SUBROUTINE SOLBND

Argument Declarations:

Z - REAL Vector (Len = Unspecified) (Input) - Altitude (m) vs.
 pressure (10 mb increment) array
 FUO - REAL Variable (Input) - Exo-atmospheric solar flux times UO
 UO - REAL Variable (Input) - Cosine of solar zenith angle
 UD - REAL Vector (Len = Unspecified) (Output) - Upward diffuse
 shortwave flux (W/m^2) at each layer boundary
 DD - REAL Vector (Len = Unspecified) (Output) - Downward diffuse
 shortwave flux (W/m^2) at each layer boundary
 SD - REAL Vector (Len = Unspecified) (Output) - Downward beam
 shortwave flux (W/m^2) at each layer boundary
 ALBS - REAL Variable (Input) - Solar band diffuse reflectance
 CLDP - REAL Vector (Len = Unspecified) (Input) - Cloud cover (%)
 1 - Low etage
 2 - Middle etage
 3 - High etage

INTRINSIC and EXTERNAL Declarations:

REAL	BBO3
INTRINSIC	ABS, SQRT, EXP
EXTERNAL	BBO3, BRBNBD, SRAT, CLDLR, SRTLAY, SPROD, SWAT

Local Variable Declarations:

INTEGER	I, J, IB, IK
REAL	R(9), T(9), US(9), DS(9), X(9), S(9), TRY(9), AMAG(9), UP(9), UDB(10), DDB(10), SDB(10), G0, UOO, UOT, SO, B, BU, CLA, OMC, TAU, G, TAUB, WO, WOB, TT, TC, TCB, WC, WCB, DCL, RCL, TCL, UCL, A, DTCB, DTUB, TS

COMMON Blocks: /INITL/, /OMATLW/, /SWPARM/

SUBROUTINE SOLRAD

Argument Declarations:

TAUL - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Transmittances at each point along path (i.e., an incremental set of transmittance)
 L - INTEGER Variable (Input) - Layer index at which calculations are to be made
 KL - INTEGER Variable (Input) - Altitude index at which calculations are to be made
 SOLXM - REAL Variable (Output) - Apparent solar irradiance as a function of azimuth ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 RDSOLR - REAL Variable (Input/Output) - Running integral along path of scattered solar and lunar radiation ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 RDSVAR - REAL Variable (Input/Output) - Running integral along path of variance scattered solar and lunar radiation ($(\text{W}/\text{cm}^2/\text{cm}^{-1})^2$)
 XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input/Output) - Optical depth
 S1 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for Lorentz halfwidth times line density
 S2 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for Doppler halfwidth times line density
 S3 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for line density
 S4 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for the continuum
 S5 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for scattering
 S6 - REAL Vector (Len = Unspecified) (Input/Output) - Summing variable for (Lorentz halfwidth)² times line density
 ANGLE - REAL Vector (Len = Unspecified) (Input) - Array of scattering angles (deg)
 SCATTR - REAL Array (Dim = NANG x MAXLAT x Unspecified) (Input) - Angle dependent scattering parameters, including the phase function and albedo (sr^{-2})
 SCTVAR - REAL Array (Dim = NANG x MAXLAT x Unspecified) (Input) - Angle dependent variance of the scattering parameters, including the phase function and albedo (sr^{-2})
 NANG - INTEGER Variable (Input) - First DIMENSION of ANGLE, SCATTR, and SCTVAR
 SOLX - REAL Variable (Input) - Exoatmospheric spectral solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 NSL - INTEGER Variable (Input) - Number of layers in solar path
 ISL - INTEGER Vector (Len = Unspecified) (Input) - Altitude indices for the solar paths
 DRSL - REAL Vector (Len = Unspecified) (Input) - Path length increments for the paths (km)
 SCTANG - REAL Variable (Input) - Solar scattering angels (deg)
 SOLYR - REAL Array (DIM = MLMX2 x MAXLAT x Unspecified) (Input) - Solar irradiance at each altitude ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 NDXSL - INTEGER Variable (Input) - Index providing the starting point the ISL and DRSL arrays for the appropriate paths
 FLSLR - LOGICAL Variable (Input) - Switch for solar calculations.
 FLSMP - LOGICAL Variable (Input) - Switch for type of calculations.
 LP - INTEGER Variable (Input/Output) - Secondary altitude index
 SCT1 - DOUBLE PRECISION Variable (Input/Output) - Scattering term storage
 SCT3 - DOUBLE PRECISION Variable (Input/Output) - Scattering variance storage
 DRKM - REAL Variable (Input) - Incremental ranges along solar scattered path (km)
 PTHFAC - REAL Array (Dim = MAXLAT x MAXLON x Unspecified) (Input) - Proportionality factor for the multiple atmospheres
 NPTH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits for non-zero elements of PTHFAC
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})

SUBROUTINE SOLRAD (continued)

PARAMETER Declarations:

INTEGER	MLMAX, MLMX2, MAXLAT, MAXLON
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP, RADTRY
INTRINSIC	REAL, DPROD, DBLE
EXTERNAL	PTHETAU, XTERP, RADTRY

Local Variable Declarations:

INTEGER	KK, LL, MM1, ITRP1, ITYPE, ISTORE
REAL	SCTDM2, SCTDM4, TAUSLR
DOUBLE PRECISION	TAUX (MLMX2), TAUXA (MLMX2), SCT2, SCT4, DELTAU,
	DDRKM
LOGICAL	FLTRN

COMMON Blocks: None

SUBROUTINE SPCLYR

Argument Declarations:

TSRF - REAL Variable (Input) - Initial surface temperature (K)
TSSL - REAL Variable (Input) - Initial sub-surface temperature (K)
MT - INTEGER Variable (Input) - Material index
TLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) -
Temperatures in conducting subsurface (K)
ZLAYER - REAL Vector (Len = 0:Unspecified) (Input/Output) - Layer depth (m)
NLAYER - INTEGER Variable (Input) - Number of layers
SPHLYR - REAL Vector (Len = 0:Unspecified) (Output) - Specific heat
at each layer (W-sec/gm/K)
DENLYR - REAL Vector (Len = 0:Unspecified) (Output) - Density
at each layer (gm/m³)
HTCLYR - REAL Vector (Len = 0:Unspecified) (Output) - Conductance
coefficient at each layer (W/m²/K)
FLINI - LOGICAL Variable (Input) - Initialization flag
PRESS - REAL Variable (Input) - Atmospheric pressure (mb)
CMOL - REAL Vector (Len = 0:Unspecified) (Input) - Atmospheric
molecular concentrations (ppmv)

PARAMETER Declarations:

INTEGER NMATL, MAXLAT, MAXLON
PARAMETER (NMATL=28, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

REAL THCICE, THCSNW, SPHICE, DENWTR, THCWTR, SPHWTR,
DENAIR, THCAIR, SPHAIR
INTRINSIC MAX, MIN, SQRT, EXP, REAL, COS
EXTERNAL THCICE, THCSNW, SPHICE, DENWTR, THCWTR, SPHWTR,
BKGBD, DENAIR, THCAIR, SPHAIR

Local Variable Declarations:

INTEGER K, L
REAL PERIOD, DAMPD, DZ

COMMON Blocks: /BACKGD/

REAL FUNCTION SPHAIR

Argument Declarations:

CH2O - REAL Variable - Water vapor content (ppmV)

INTRINSIC and EXTERNAL Declarations: None

Local Variable Declarations: None

COMMON Blocks: None

REAL FUNCTION SPHICE

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NSPH
PARAMETER (NSPH=11)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRP0
REAL T(NSPH), SPH(NSPH), TC

COMMON Blocks: None

REAL FUNCTION SPHWTR

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

PARAMETER Declarations:

INTEGER NSPH
PARAMETER (NSPH=19)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER ITRP0
REAL T(NSPH), SPH(NSPH), TC

COMMON Blocks: None

SUBROUTINE SPROD

Argument Declarations:

SO - REAL Variable (Input) - Incident solar flux times cosine zenith angle (W/m^2)
 UO - REAL Variable (Input) - Cosine zenith angle
 TAU - REAL Variable (Input) - Optical depth
 W - REAL Variable (Input) - Single scattering albedo
 B - REAL Variable (Input) - Hemisphere average backscattering fraction
 BU - REAL Variable (Input) - Zenith angle dependent backscattering fraction
 R - REAL Variable (Input) - Diffuse reflection coefficient
 T - REAL Variable (Input) - Diffuse transmission coefficient
 U - REAL Variable (Output) - Upward diffuse flux (W/m^2) scattered from the solar beam
 D - REAL Variable (Output) - Downward diffuse flux (W/m^2) scattered from the solar beam
 CLA - REAL Variable (Input) - Cloud fraction

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, EXP, DBLE, DPROD

Local Variable Declarations:

DOUBLE PRECISION DWM, A, E, G, DD, SS

COMMON Blocks: None

SUBROUTINE SPTRIG

Argument Declarations:

XLAT - REAL Variable (Output) - Final latitude (deg.)
 XLON - REAL Variable (Output) - Final longitude (deg.)
 XLAT0 - REAL Variable (Input) - Initial latitude (deg.)
 XLON0 - REAL Variable (Input) - Initial longitude (deg.)
 AZIM - REAL Variable (Input) - Azimuth of angular distance measured at initial point. 0.0 implies North, 90.0 implies East. (deg.)
 BETA - REAL Variable (Input) - Angular extent of distance measured from the center of the earth (deg)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, ATAN2, ASIN, SIN, COS, ACOS, DBLE

Local Variable Declarations:

DOUBLE PRECISION DUMX, DUMY, AZIMP, DLON, DBETA

COMMON Blocks: /CONSTN/

SUBROUTINE SRAT

Argument Declarations:

UO - REAL Variable (Input) - Cosine of plane parallel solar zenith angle
 I - INTEGER Variable (Input) - Index of layer (1 - top to 9 - bottom)
 Z - REAL Vector (Len = Unspecified) (Input) - Array of altitudes (m) vs. pressure (10 mb)
 UP - REAL Variable (Output) - Modified cosine of solar zenith angle for a spherical geometry
 UOT - REAL Variable (Output) - Modified cosine of solar zenith angle at the next layer for a spherical correction

INTRINSIC and EXTERNAL Declarations:

INTRINSIC SIN, COS, ASIN, ACOS, SQRT, REAL, DBLE, ABS

Local Variable Declarations:

REAL RZ, DZ
 DOUBLE PRECISION TO, TP, RE, R, RDZ

COMMON Blocks: /CLIMAT/

SUBROUTINE SRCFLX

Argument Declarations:

PTHFAC - REAL Array (Dim = MXLAT x MXLON x MLMX2 x Unspecified) - Proportionality factor at source
 NPTH - INTEGER Array (Dim = 2 x 2 x Unspecified) - Limits of non-zero values of PTHFAC
 MXLAT - INTEGER Variable (Input) - Maximum number of latitudes
 MXLON - INTEGER Variable (Input) - Maximum number of longitudes
 MLMX2 - INTEGER Variable (Input) - Maximum number of path segments
 NSRC - INTEGER Variable (Input) - Source index for path segments
 IGEOM - INTEGER Variable (Input) - Geometry number
 MTIME - INTEGER Variable (Input) - Number of temporal values

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, NZSMAX, NTIME, MAXLAT, MAXLON, NVSMAX, ISMX, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (NTIME=97)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, INT

Local Variable Declarations:

INTEGER L, LEVD, LEVU, IT, ITM, MM, KK, LL
 REAL FAC, FACT

COMMON Blocks: /BRBNDT/, /HEADER/

SUBROUTINE SRCGEO

Argument Declarations:

NSRC - INTEGER Vector (Len = Unspecified) (Output) - Number of points in altitude-source path
 ITSRC - INTEGER Array (Len = MLMX2 x Unspecified) (Output) - Index of altitude grid points for background-source path for simple calculations
 DRSRC - REAL Array (Len = MLMX2 x Unspecified) (Output) - Path length segments for background-source path for simple calculations (km)
 PHIL - REAL Variable (Output) - Elevation angles along simple path (deg)
 LSRC - INTEGER Variable (Input) - Source altitude index
 XLAT - REAL Variable (Input) - Latitude (deg)
 XLON - REAL Variable (Input) - Longitude (deg)
 SOLFAC - REAL Array (Dim = MAXLAT x MAXLON x MLMX2 x Unspecified) (Output) - Proportionality factor for background-source path for simple calculations
 NLAT - INTEGER Variable (Input) - Number of latitudes
 NLON - INTEGER Variable (Input) - Number of longitudes
 ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) - Switch for model atmospheres
 NSOLFC - INTEGER Array (Dim = 2 x 2 x Unspecified) (Input/Output) - Array limits for non-zero values of SOLFAC
 XLATSR - REAL Variable (Input) - Source latitude (deg)
 XLONSR - REAL Variable (Input) - Source longitude (deg)

PARAMETER Declarations:

INTEGER	MLMAX, MLMX2, NAZMAX, ISMX, MAXLAT, MAXLON, NGMAX, NL, MOLMAX
PARAMETER	(MLMAX=140, MLMX2=2*MLMAX, NAZMAX=30)
PARAMETER	(MAXLAT=3, MAXLON=1, NGMAX=15, NL=50)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL, COS, SIN, MAX, MIN, DBLE
EXTERNAL	GEOM, SPTRIG, INTR2D, ATMSBD, HORIZN

Local Variable Declarations:

INTEGER	ITDUM(MLMX2), LS, LSX, LSP, L1, L2, L, ISRC, LENS, MM, KL, KK, LL
REAL	R(MLMX2), PHI(MLMX2), THETA(MLMX2), HMIN, BETA, AZP, XLATP, XLONP, ELEV, PTHLAT, PTHLON, DTDPAV, SOLAZP
DOUBLE PRECISION	SOLE, SRC(3), SCTPT(3)

COMMON Blocks: /ATMDAT/, /CONSTN/, /INITAL/

SUBROUTINE SRCIRR

Argument Declarations:

IFSCR - INTEGER Variable (Input/Output) - File number for scratch
 file for solar path data
 If IFSCR = 0, file is not OPENed.
 ISHINE - INTEGER Variable (Input) - Sky/earthshine index
 Refer to User Reference Manual for definition.
 IGEOM - INTEGER Variable (Input) - Geometry index
 ISWATM - INTEGER Array (Dim = MAXLAT x Unspecified) (Input/Output) -
 Switch for model atmospheres

PARAMETER Declarations:

INTEGER MLMAX, MLMX2, ISMX, ISTMAX, NAZMAX, NASMAX, NGMAX,
 NZSMAX, MAXLAT, MAXLON, NVSMAX, NL, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, MLMX2=2*MLMAX)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (ISTMAX=30000)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, NL=50)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 INTRINSIC MAX, SIN, COS, MIN, DBLE
 EXTERNAL RAYPTH, CALEND, HOREQU, EQUECL, ECLGAL, SETUP, IOERR,
 ASPECT, SHNGEO, INDXBK, SPTRIG, HORIZN, INTR2D,
 ATMSBD

Local Variable Declarations:

INTEGER I, L, L1, LM, LSH, M, MM, IDAYX, LENS, KK, LL, IOS, KL, IERR
 REAL R (MLMX2), THETA (MLMX2), ELEV, BETA, DYEAR, XLEQUT,
 BEQUT, PHIHOR, THD, XLATP, XLONP, TAIRP,
 CLDCVP (0:3), TMIDN, TNOON, AZP, SOLAZP, SRMAX,
 BETMAX, RHRT, BHRT, HTNGT
 DOUBLE PRECISION PHISHR, SOL (3), XLN (3), SCTPT (3)

COMMON Blocks: /ATMDAT/, /CONSTN/, /FLAGS/, /HEADER/, /INITAL/,
 /PATH2/, /PATH2A/, /PATH2B/, /PATH2C/, /PATH2D/,
 /PATH4/

SUBROUTINE SRFLUX

Argument Declarations:

RFDS - REAL Variable (Input) - Direct solar flux (W/m^2)
 DSW - REAL Variable (Input) - Downward short-wave flux (W/m^2)
 DLW - REAL Variable (Input) - Downward long-wave flux (W/m^2)
 ABSSLR - REAL Variable (Input) - Solar absorptivity
 EMSTRM - REAL Variable (Input) - Thermal emissivity
 HTCOND - REAL Variable (Input) - Conductance coefficient ($W/m^2/K$)
 CHARLN - REAL Variable (Input) - Surface characteristic length (m)
 TAIR - REAL Variable (Input) - Air temperature (K)
 PRESS - REAL Variable (Input) - Air pressure (mb)
 WINDT - REAL Variable (Input) - Wind speed (m/sec)
 TLAYER - REAL Vector (Len = 0:Unspecified) (Input) - Temperatures in each layer (K)
 ZLAYER - REAL Vector (Len = 0:Unspecified) (Input) - Layer depth (m)
 H - REAL Variable (Input) - Effective depth of heat storage (m)
 IHTFLG - INTEGER Variable (Input) - Heat calculation index
 IHTFLG = 0 implies no heat calculations
 IHTFLG = 1 implies heat calculations with evaporation
 IHTFLG = 2 implies heat calculations without evaporation
 A - REAL Variable (Output) - Coefficient for the T^4 term
 B - REAL Variable (Output) - Coefficient for the T term
 C - REAL Variable (Output) - Coefficient for the constant term

INTRINSIC and EXTERNAL Declarations:

REAL	EVAPOR, SATUR
INTRINSIC	ABS
EXTERNAL	EVAPOR, SATUR

Local Variable Declarations:

INTEGER	ITYPE
REAL	SIGMA, CP, GAM, REC, P0, WAIR, WH2O, RATIO, TREF, XMU, DENS, T0, HCFORC, HCFREE, RLATEN, FLUXD, FLUXU, DT
CXX REAL	FLUXD, FLUXU, RI, RO, RCONV, R2TDZ2, DTDZ1, DTDZ2

COMMON Blocks: None

SUBROUTINE SRTLAY

Argument Declarations:

R - REAL Variable (Output) - Spherical reflection coefficient
T - REAL Variable (Output) - Spherical transmission coefficient
G - REAL Variable (Input) - Asymmetry factor
W - REAL Variable (Input) - Scattering albedo
TAU - REAL Variable (Input) - Layer optical depth
RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
ZM - REAL Variable (Input) - Prior altitude (km)
Z - REAL Variable (Input) - Altitude of interest (km)
ZP - REAL Variable (Input) - Next altitude (km)

INTRINSIC and EXTERNAL Declarations:

REAL BETAU
INTRINSIC REAL
EXTERNAL DRTLAY, BETAU, GETGLC

Local Variable Declarations:

INTEGER I, N, INDX
REAL BU, RMU, RWT, RU, TU
DOUBLE PRECISION XMU(12), WT(12)

COMMON Blocks: /CONSTN/

REAL FUNCTION STARAD

Argument Declarations:

XL - REAL Variable - Galactic azimuth (deg)
B - REAL Variable - Galactic elevation (deg)
V - REAL Variable - Wavenumber (cm^{-1})
DV - REAL Variable - Wavenumber increment (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

REAL PLANCK
INTRINSIC EXP, ABS
EXTERNAL PLANCK

Local Variable Declarations:

INTEGER I
REAL C0, C(2,4), CP(2), T0, AL, PHI

COMMON Blocks: /CONSTN/

SUBROUTINE STGEOM

Argument Declarations:

STRING - CHARACTER*(*) Variable - Character string
 HOBS - REAL Variable (Output) - Observer altitude (km)
 HSRC - REAL Variable (Output) - Source altitude (km)
 SLRNG - REAL Variable (Output) - Slant range (km)
 BETA - REAL Variable (Output) - Earth center angle (deg)
 PHIOBS - REAL Variable (Output) - Observer look angle (deg)
 PHISRC - REAL Variable (Output) - Source look angle (deg)
 LENP - INTEGER Variable (Output) - Length switch
 0 - Short path
 1 - Long path
 VRDATA - CHARACTER*(*) Vector (Len = Unspecified) (Input) - Values to be read in.
 ITPGM - INTEGER Variable (Output) - Calculation type
 0 - At-Source
 1 - S/B/C: Slant Range
 2 - S/B/C: Earth Center angle
 3 - S/B/C: Source Look Angle or L: Tangent Height
 4 - S/B/C/L: Observer Look Angle
 5 - S/B/C: Observer Look Angle with Slant Range
 6 - S/B/C: Observer Look Angle with Earth Center Angle
 7 - Horizontal: Range
 8 - Horizontal: Earth Center Angle
 9 - Limb: Tangent Latitude/Longitude
 IGMSW - INTEGER Variable (Output) - Geometry label index
 1 - At-Source
 2 - Source (only)
 3 - Background (only)
 4 - Contrast (source and background)
 5 - Limb path
 6 - Horizontal path
 IANGSW - INTEGER Variable (Output) - Angle label index
 1 - Elevation angle
 2 - Zenith angle
 3 - Latitude and longitude

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	GETVAR
CHARACTER*1	UPCASE, LWCASE
INTRINSIC	ABS, REAL, DBLE
EXTERNAL	GETVAR, IGTINT, UPCASE, LWCASE

Local Variable Declarations:

REAL	ALTMAX
DOUBLE PRECISION	RE

COMMON Blocks: /CONSTN/

REAL FUNCTION STRCN2

Argument Declarations:

- Z - REAL Variable - Altitude (km)
- HB - REAL Variable - Terrain altitude (km)
- HTRPAU - REAL Variable - Tropopause altitude (km)
- CN2SRF - REAL Variable - Surface value of Cn^2 ($m^{-2/3}$)
- WINDHI - REAL Variable - Average windspeed (m/sec)
- PRESS - REAL Variable - Pressure (mb)
- TEMP - REAL Variable - Temperature (K)
- WH2O - REAL Variable - Water vapor concentration (ppm)
- WCO2 - REAL Variable - Carbon dioxide concentration (ppm)
- WO2 - REAL Variable - Oxygen concentration (ppm)
- WL - REAL Variable - Wavelength (μm)

PARAMETER Declarations:

INTEGER	MLMAX, NASMAX, ISMX, MOLMAX
PARAMETER	(MLMAX=140, NASMAX=15)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
DOUBLE PRECISION	REFRAC
INTRINSIC	ABS, EXP, REAL
EXTERNAL	XTERP, REFRAC

Local Variable Declarations:

INTEGER	ITRP1
REAL	WLO, ALT, ZP, ZTRPAU, ZINF, FAC, AVALLY, VV0, CN2BCK, WND, CN2X55, P1, T1, W1
DOUBLE PRECISION	DN0XP, DN0XT, DN0XW1, XNOPT, XNWL, DNDN0, REARTH

COMMON Blocks: /CONSTN/, /USERDF/

SUBROUTINE SUMFIL

Argument Declarations:

FILERT - CHARACTER*(*) Variable (Input) - File root name or file name
 HEADNG - CHARACTER*(*) Variable (Input) - Heading
 TITLE - CHARACTER*(*) Variable (Input) - Title

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
 NVSMAX, MOLMAX, MLIDMX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

INTEGER LENSTR
 CHARACTER*72 IOERR
 INTRINSIC INT, ABS, MAX, MIN, LEN, REAL
 EXTERNAL CHRCBD, DEVCBD, PUTCLD, PUTSLR, CHTIME, LENSTR, IOERR

Local Variable Declarations:

INTEGER I, K, LSTR, IHR, IMN, IOS, KA, KK, LL, ISEC, ITYP0
 REAL YLAT, YLONG, SEC, XSEC, PH1, PH2
 LOGICAL FLUSR
 CHARACTER*1 GMTYPE(6), ANTYPE(3)
 CHARACTER*3 TTIME(2), MONTH(12)
 CHARACTER*4 LONG
 CHARACTER*5 LAT

COMMON Blocks: /CHRCNM/, /DEVCMN/, /DEVICE/, /FLAGS/, /HEADER/,
 /MOLECP/, /USERNM/

REAL FUNCTION SUPK

Argument Declarations:

V - REAL Variable - Wavenumber (cm^{-1})
 V0 - REAL Variable - Center wavenumber (cm^{-1})
 C - REAL Variable -
 N - INTEGER Variable -

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS

Local Variable Declarations:

REAL XNORM, VM, X, TEN, XX, CXI

COMMON Blocks: /CONSTN/

SUBROUTINE SWAT

Argument Declarations:

RO - REAL Vector (Len = Unspecified) (Input) - Layer reflection functions
 TO - REAL Vector (Len = Unspecified) (Input) - Layer transmission functions
 US - REAL Vector (Len = Unspecified) (Input) - Layer up diff fluxes from solar beam
 DS - REAL Vector (Len = Unspecified) (Input) - Layer down diff fluxes from solar beam
 S - REAL Vector (Len = Unspecified) (Input) - Depleted solar beam fluxes at layer boundaries
 AB - REAL Variable (Input) - Solar band ground diffuse reflectance
 UD - REAL Vector (Len = Unspecified) (Output) - Upward diffuse solar band fluxes at layer boundaries
 DD - REAL Vector (Len = Unspecified) (Output) - Downward diffuse solar band fluxes at layer boundaries

INTRINSIC and EXTERNAL Declarations:

REAL	GAM,RAB,RBE,DDIF,UDIF
EXTERNAL	GAM,RAB,RBE,DDIF,UDIF

Local Variable Declarations:

REAL	RA,RB,RC,RAS,RBS,RCS,TA,TB,TC,G,GA,GB,GC, RR1,RR2,R1,R2,RS,RS1,RS2,TT,US1,US2,DS1,DS2, DAS,DBS,DCS,DTS,UAS,UBS,UCS,UTS,DSA,DSB, USA,USB,RRS1,RRS2

COMMON Blocks: None

SUBROUTINE TANGPT

Argument Declarations:

R - REAL Vector (Len = Unspecified) (Input/Output) - Array of slant ranges along the ray (km)
 PHI - REAL Vector (Len = Unspecified) (Input/Output) - Array of elevation angles along the ray (rad)
 THETA - REAL Vector (Len = Unspecified) (Input/Output) - Array of earth center angles along the ray (rad)
 IZ - INTEGER Vector (Len = Unspecified) (Input/Output) - Array of altitude indices along the ray
 KL - INTEGER Variable (Input/Output) - Number of data points along the ray
 HTNGT - REAL Variable (Input/Output) - Tangent altitude (km)

PARAMETER Declarations:

INTEGER MLMAX, ISMX, NNNMAX, NAZMAX, NASMAX, NGAS, NGMAX,
 NZSMAX, MAXLAT, MAXLON, NVSMAX, NVSA, MOLMAX,
 MLIDMX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, NNNMAX=5, NGAS=6)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20, NVSA=9)

INTRINSIC and EXTERNAL Declarations:

INTEGER ISTAER
 REAL STRCN2, XTERP, HAZE
 INTRINSIC REAL, DBLE, MAX, MIN, COS, SQRT, ABS
 EXTERNAL STRCN2, XTERP, EQABS, ISTAER, MOLPBD, AERSOL, HYDROM,
 HAZE, CLDRBD

Local Variable Declarations:

INTEGER I, L, LMN, IZL, IZLP, MLP, ITRPAU (MAXLAT, MAXLON), KK,
 LL, ISTPAU (MAXLAT, MAXLON), KLAT, KLON, IPRINT,
 ITRPO, MLX
 REAL WL, PHI1, PHI2, XMHMIN, DELXMH, FAC, VISX, VI, VF, DUM,
 TAV, FACICE, FACSNO, ZLP
 DOUBLE PRECISION MH, SNELL
 LOGICAL DUPLIC

COMMON Blocks: /CLDRN/ , /HEADER/ , /INITAL/ , /MOLCON/ , /MOLECP/ ,
 /PLMDAT/ , /VSADTA/

SUBROUTINE TERMPR

Argument Declarations:

SOLEV - REAL Variable (Input) - Solar elevation (deg)
 SOLAZ - REAL Variable (Input) - Solar azimuth (deg)
 XLUNEV - REAL Variable (Input) - Lunar elevation (deg)
 XLUNAZ - REAL Variable (Input) - Lunar azimuth (deg)
 PHI - REAL Vector (Len = Unspecified) (Input) - Elevation angle
 background (deg)
 PROJS - REAL Array (Dim = 6 x Unspecified) (Output) - Solar projection
 factors
 SHDWS - REAL Vector (Len = Unspecified) (Output) - Self-shadowing factor
 for sun
 PROJL - REAL Array (Dim = 6 x Unspecified) (Output) - Lunar projection
 factors
 SHDWL - REAL Vector (Len = Unspecified) (Output) - Self-shadowing factor
 for moon
 NPTS - INTEGER Variable (Input) - Number of points
 ISCN - INTEGER Vector (Len = Unspecified) (Input) - Scene index

PARAMETER Declarations:

INTEGER	NGMAX, NSCEN, NMATL
PARAMETER	(NSCEN=35, NMATL=28)
PARAMETER	(NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL	SHADOW
INTRINSIC	MAX, SIN, SQRT, ATAN2, ABS
EXTERNAL	SHADOW, SCENBD

Local Variable Declarations:

INTEGER	I, L, M, IBK
REAL	XNORM(6,3), XLOS(3), SLOS(3), LLOS(3), PROJ1, PROJ2, AZS, AZL, SLOPE

COMMON Blocks: /CONSTN/, /FLAGS/, /SCENES/

REAL FUNCTION THCAIR

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations: None

Local Variable Declarations: None

COMMON Blocks: None

REAL FUNCTION THCICE

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
EXTERNAL	XTERP

Local Variable Declarations:

INTEGER	NT, ITRP0
REAL	T(11), THC(11), TC

COMMON Blocks: None

REAL FUNCTION THCSNW

Argument Declarations:

DENSTY - REAL Variable - Density (gm/m³)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	REAL, DBLE

REAL FUNCTION THCWTR

Argument Declarations:

TEMP - REAL Variable - Temperature (K)

INTRINSIC and EXTERNAL Declarations:

REAL	XTERP
EXTERNAL	XTERP

Local Variable Declarations:

INTEGER	ITRP0, NT
REAL	T(11), THC(11), TC

COMMON Blocks: None

SUBROUTINE TITLCR

Argument Declarations:

TITLE - CHARACTER*(*) Variable (Output) - Title

INTRINSIC and EXTERNAL Declarations:

	CHARACTER*24	FDATE
CVAX	INTRINSIC	TIME,DATE
CIBM	INTRINSIC	REAL
CRS6	INTRINSIC	TIME,LOCALTIME
CF90	INTRINSIC	TIME_AND_DATE
	EXTERNAL	FDATE
CPRI	EXTERNAL	TIME\$A,DATE\$A
CCDC	EXTERNAL	TIME,DATE
CIBM	EXTERNAL	DATIMX
CRS6	EXTERNAL	ADDARR
CLAH	EXTERNAL	TIME,DATE

Local Variable Declarations:

CIBM	INTEGER	NOW(14)
CRS6	INTEGER	SNCEPH,TMADDR,TM(9)
CIBM	REAL	SEC
CIBM	CHARACTER*3	DAY(7),MONTH(12)
CPRI	CHARACTER*8	BUFTP
CVAX	CHARACTER*8	BUFTV
CLAH	CHARACTER*8	BUFTL
CF90	CHARACTER*8	BUFD90
CVAX	CHARACTER*9	BUFDV
CF90	CHARACTER*9	BUFT90
CCDC	CHARACTER*10	BUFTC,BUFGC
CCDC	CHARACTER*10	TIME,DATE
CLAH	CHARACTER*11	BUFDL
CPRI	CHARACTER*16	BUFGP
	CHARACTER*24	BUFGTU
CRS6	CHARACTER*24	BUFRS6
CIBM	CHARACTER*26	BUFIBM
	CHARACTER*40	BLANKS
	CHARACTER*49	MOSART

COMMON Blocks: None

CRS6 SUBROUTINE ADDARR

Argument Declarations:

ADDRSS - INTEGER Vector (Len = N) (Input) - Address locations
 ARRAY - INTEGER Vector (Len = N) (Output) - Array containing address
 N - INTEGER Variable (Input) - Number of addresses

Local Variable Declarations:

CRS6 IMPLICIT INTEGER (A-Z)

CRS6 ARRAY(I)=ADDRSS(I)

COMMON Blocks: None

REAL FUNCTION TMPCLD

Argument Declarations:

CLDRAD - INTEGER Variable - Cloud radiance ($\mu\text{W}/\text{cm}^2/\text{sr}$)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LOG

Local Variable Declarations:

INTEGER I
REAL A(8), T, R

COMMON Blocks: None

SUBROUTINE TRANLW

Argument Declarations:

KDX - INTEGER Variable (Input) - First index of element of matrix to be processed
JDX - INTEGER Variable (Input) - Second index of element of matrix to be processed

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LOG10, MAX, EXP
EXTERNAL BRBNBD

Local Variable Declarations:

INTEGER I, J, M, IDXO(4), IDXT(4)
REAL OP(4), TOP(4), D(4), T1(4), T2(4), O1(4), O2(4),
EU, EV, EW, EX, OPD

COMMON Blocks: /FLXTAB/, /OMATLW/

SUBROUTINE TRNSMT

Argument Declarations:

TAU - DOUBLE PRECISION Variable (Output) - Transmission
 TAU A - DOUBLE PRECISION Variable (Output) - Transmittance due to
 absorption
 XS - DOUBLE PRECISION Vector (Len = Unspecified) (Input) - Optical depth
 S1 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for Lorentz halfwidth times line density
 S2 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for Doppler halfwidth times line density
 S3 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for line density
 S4 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for the continuum
 S5 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for scattering
 S6 - REAL Vector (Len = Unspecified) (Input) - Summing variable
 for (Lorentz halfwidth)² times line density
 QA - REAL Vector (Len = Unspecified) (Input) - LOWTRAN
 exponential parameter
 IBAND - INTEGER Vector (Len = Unspecified) (Input) - Band model index
 ISPECS - INTEGER Variable (Input) - DIMENSION of XS, S1, S2, S3,
 S4, S5, S6, and QA
 DV - REAL Variable (Input) - Spectral increment of transmittance
 calculations (cm⁻¹)
 FLAG - LOGICAL Variable (Input) - Flag for storing of component
 transmittances
 MM - INTEGER Variable (Input) - Azimuth index

PARAMETER Declarations:

INTEGER ISMX, NAZMAX, MOLMAX
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, NAZMAX=30)

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION BAND
 INTRINSIC DBLE, EXP, REAL
 EXTERNAL BAND

Local Variable Declarations:

INTEGER K
 DOUBLE PRECISION TAUSC, TAUP

COMMON Blocks: /TRANSP/

SUBROUTINE TURBUL

Argument Declarations:

NBKGD - INTEGER Variable (Input) - Number of path increments
 between observer and background
 CN2 - REAL Array (Dim = MLMAX x MAXLAT x Unspecified) (Input) -
 Structure constant profile ($m^{-2./3.}$)
 RSCINT - REAL Vector (Len = Unspecified) (Input) - Path lengths for
 path between observer and background (km)
 IOSB - REAL Vector (Len = Unspecified) (Input) - Altitude index for path
 increments between observer, source, and background in
 altitude array
 PTHFAC - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Proportionality
 factor
 NPETH - INTEGER Array (Dim = 2 x Unspecified) (Input) - Limits on
 non-zero components of PTHFAC
 VARXZ - REAL Vector (Len = Unspecified) (Output) - Scintillation of
 points along raypath at observer
 MLMAX - INTEGER Variable (Input) - Maximum number of altitude points

PARAMETER Declarations:

INTEGER	MAXLAT
PARAMETER	(MAXLAT=3)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC	MAX

Local Variable Declarations:

INTEGER	L, LB, KL, KK, LL
REAL	XDUM, PWR, DR, CN2AV

COMMON Blocks: None

REAL FUNCTION UDIF

Argument Declarations:

U1 - REAL Variable - Upward flux, layer 1
 U2 - REAL Variable - Upward flux, layer 2
 U3 - REAL Variable - Upward flux, layer 3
 D1 - REAL Variable - Downward flux, layer 1
 D2 - REAL Variable - Downward flux, layer 2
 R2 - REAL Variable - Diffuse reflection coefficient, layer 2
 R2S - REAL Variable - Directional reflection coefficient, layer 2
 R3 - REAL Variable - Diffuse reflection coefficient, layer 3
 T1 - REAL Variable - Transmission, layer 1
 T2 - REAL Variable - Transmission, layer 2
 G - REAL Variable - Composite R and T from FUNCTION GAM

Local Variable Declarations:

REAL	T, R, RR

COMMON Blocks: None

SUBROUTINE UDLAY

Argument Declarations:

U - REAL Variable (Output) - Diffuse Upward reflectance
D - REAL Variable (Output) - Diffuse Downward reflectance
ALBEDO - REAL Variable (Input) - Single scattering albedo
EXTENC - REAL Variable (Input) - Extinction coefficient (km^{-1})
PHI - REAL Variable (Input) - Elevation angle at surface (deg)
B - REAL Variable (Input) - Average backscatter fraction
BU - REAL Variable (Input) - Backscatter fraction at PHI
RE - DOUBLE PRECISION Variable (Input) - Radius of the earth (km)
ZM - REAL Variable (Input) - Prior altitude (km)
Z - REAL Variable (Input) - Altitude of interest (km)
ZP - REAL Variable (Input) - Next altitude (km)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, EXP, SIN, ABS, REAL, DBLE, LOG, SQRT
EXTERNAL DRTLAY

Local Variable Declarations:

REAL XMU0, TAU, GAMMA, DELTA, SIGMA, DUM, R, T

COMMON Blocks: /CONSTN/

CHARACTER*(*) FUNCTION UPCASE

Argument Declarations:

STRING - CHARACTER*(*) Variable - Input string

INTRINSIC and EXTERNAL Declarations:

INTRINSIC LEN, INDEX

Local Variable Declarations:

INTEGER I, LOC
CHARACTER*26 UPPER, LOWER

COMMON Blocks: None

SUBROUTINE USRBCK

Argument Declarations:

IBKGD - INTEGER Variable (Output) - Background index

PARAMETER Declarations:

INTEGER	NMATL, NSCEN, MAXLAT, MAXLON, MOLMAX
PARAMETER	(NMATL=28, NSCEN=35, MAXLAT=3, MAXLON=1)
PARAMETER	(MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	GETVAR
CHARACTER*3	UPCASE
CHARACTER*72	IOERR
EXTERNAL	IGTINT, GETVAR, GETVEC, IGTVEC, RDLINE, PARSE, BKGBD, SCENBD, UPCASE, IOERR, CHRCBD, DEVCBD

Local Variable Declarations:

INTEGER	I, J, K, IOS, N, JBCK, NVAR, ICOL0, ICOL40, JBCK2, NVAR4
REAL	DUMVEC(4), SLPSD
CHARACTER*1	DOT
CHARACTER*20	VRDATA(5)
CHARACTER*80	DUMMY
CHARACTER*255	VARIAB

COMMON Blocks: /BACKGD/, /CHRCNM/, /DEVICE/, /SCENES/

SUBROUTINE USRCLD

Argument Declarations:

CLDBSU - REAL Variable (Output) - Cloud base altitude (km)
CLDTPU - REAL Variable (Output) - Cloud top altitude (km)

PARAMETER Declarations:

INTEGER	MOLMAX
PARAMETER	(MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	GETVAR
CHARACTER*3	UPCASE
CHARACTER*72	IOERR
EXTERNAL	IGTINT, GETVAR, RDLINE, PARSE, UPCASE, IOERR, CLDRBD, DEVCBD

Local Variable Declarations:

INTEGER	I, IOS, NVAR, ICOL0, ICOL40, NVAR6, NVAR8
CHARACTER*1	DOT
CHARACTER*20	VRDATA(8)
CHARACTER*80	TITLE, DUMMY
CHARACTER*255	VARIAB

COMMON Blocks: /CLDRN/, /CLDUSR/, /DEVICE/

SUBROUTINE USRDEF

Argument Declarations:

NFILE - INTEGER Variable (Input) - Device number
 HXTRA - REAL Vector (Len = Unspecified) (Input/Output) - Extra altitudes (km)
 NXTRA - INTEGER Variable (Input/Output) - Number of extra altitudes
 RE - DOUBLE PRECISION Variable (Output) - Earth radius (km)
 ISWTCH - INTEGER Variable (Input) - Switch for different files

PARAMETER Declarations:

INTEGER MLMAX, NASMAX, NL, MAXLAT, MAXLON, NAZMAX, NGMAX,
 NZSMAX, ISMX, NVSMAX, MOLMAX, MLIDMX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, NL=50, MAXLAT=3, MAXLON=1)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
 PARAMETER (NVSMAX=20)

INTRINSIC and EXTERNAL Declarations:

INTEGER IGTINT, MDLATM
 REAL XMCONV, GETVAR, XTERP
 CHARACTER*1 LWCASE
 CHARACTER*3 UPCASE
 CHARACTER*72 IOERR
 INTRINSIC MAX, SQRT, COS, SIN, DBLE, MIN, ABS, INT, REAL
 EXTERNAL ATMSBD, XMCONV, RDLINE, GETVAR, XTERP, PARSE, MDLATM,
 IGTINT, EXMLBD, STMLBD, UPCASE, LWCASE, GBLBCK,
 IOERR

Local Variable Declarations:

INTEGER K, L, IOS, NDATA, ICOL0, ICOL40, ITRP0, ITRP1, KK, LL,
 NVAR10, NVAR12, INDXP (MLMAX), IScene, MX1, MX2,
 INDXT (MLMAX), INDXM (ISMX, MLMAX), MLAT
 REAL T0, P0, TORR, REX, PX, TX, TMIDN, TNOON, FRSNWP, FRICOP,
 FACLAT, ABSLAT, PX1, PX2, TX1, TX2, CX1, CX2, FRWTRP
 LOGICAL FLRD2, FLRD3, FLRD4, FLRD5, FLRD6
 CHARACTER*1 DOT
 CHARACTER*20 VRDATA (15)
 CHARACTER*80 TITLE, DUMMY
 CHARACTER*255 VARIAB

COMMON Blocks: /ATMDAT/, /CONSTN/, /EXTMOL/, /HEADER/, /MOLECP/,
 /STDMOL/, /USERDF/, /USERNM/

REAL FUNCTION VIRIAL

Argument Declarations:

T - REAL Variable - Temperature (K)
WH2O - REAL Variable - Water vapor content (ppm)
INDX - REAL Variable - Index for virial coefficient

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP,VIRLBD

Local Variable Declarations:

REAL AAA,AWW,AWWW,AAW,X

COMMON Blocks: /VIRDAT/

REAL FUNCTION VISRH

Argument Declarations:

RH - REAL Variable - Relative humidity (fraction)
IAERO - INTEGER Variable - Aerosol index
IAERO = 1 implies Rural
IAERO = 2 implies Urban
IAERO = 3 implies Maritime
IAERO = 4 implies Oceanic
IAERO = 5 implies Tropospheric
IAERO = 6 implies Desert
IAERO = 7 implies Advection Fog
IAERO = 8 implies Radiation Fog
IAERO = 9 implies Light Rural Fog
IAERO = 10 implies Light Urban Fog
IAERO = 11 implies Light Maritime Fog
IAERO = 12 implies Undefined
IAERO = 13 implies Light Tropospheric Fog

Local Variable Declarations:

REAL VIS0(13),EXP0(13)

COMMON Blocks: None

SUBROUTINE VSA

Argument Declarations:

VIS - REAL Array (Dim = MAXLAT x Unspecified) (Input) - Sea level
visible range (km)
CEILHT - REAL Variable (Input) - Cloud ceiling altitude (km)
DEPTH - REAL Variable (Input) - Cloud/fog depth (km)
ZINVHT - REAL Variable (Input) - Altitude of inversion or boundary layer
(km)
NLAT - INTEGER Variable (Input) - Number of latitudes
NLON - INTEGER Variable (Input) - Number of longitudes

PARAMETER Declarations:

INTEGER NVSA, MAXLAT, MAXLON
PARAMETER (NVSA=9, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, EXP, MIN, LOG

Local Variable Declarations:

INTEGER IFOG, IVSA, I, K, KK, LL
REAL ZT, ZC, A(2), B(2), C(2), FAC1(9), FAC2(9), ZHIGH, D,
ZINV, E, ZALGO, ANUM, F

COMMON Blocks: /VSADTA/

REAL FUNCTION XMCONV

Argument Declarations:

ZUSER - REAL Variable - User-defined altitude (km)
 AUSER - REAL Variable - User-defined molecular concentration
 INDX - INTEGER Variable - Units index for AUSER
 INDX =0 implies that molecular profile for M2 is to be used
 INDX =1 implies that AUSER is provided in volume mixing ratio (ppmv)
 INDX =2 implies that AUSER is provided in number density (cm^{-3})
 INDX =3 implies that AUSER is provided in mass mixing ratio (gm/kg)
 INDX =4 implies that AUSER is provided in mass density (gm/m^3)
 INDX =5 implies that AUSER is provided in partial pressure (mb)
 INDX =6 implies that AUSER is provided in dew point
 temperature (K) (water vapor only)
 INDX =7 implies that AUSER is provided in dew point
 temperature (deg. C) (water vapor only)
 INDX =8 implies that AUSER is provided in relative
 humidity (per cent) (water vapor only)
 PRESS - REAL Variable - Pressure at altitude Z (mb)
 TEMP - REAL Variable - Temperature at altitude Z (K)
 Z - REAL Vector (Len = Unspecified) - Altitude array (km)
 AMOL - REAL Vector (Len = Unspecified) - Molecular concentration
 used if INDX =0 (ppmv)
 NL - INTEGER Variable - DIMENSION of Z and AMOL
 KTYPE - INTEGER Variable - Molecular index
 KTYPE=1 implies water vapor

PARAMETER Declarations:

INTEGER MLIDMX
 PARAMETER (MLIDMX=45)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, SATUR
 EXTERNAL XTERP, SATUR, MOLPBD

Local Variable Declarations:

INTEGER ITYPE0, ITYPE1, ITRP0
 REAL T0, AVOGAD, XLOSMT, TT, EW, RHDUM

COMMON Blocks: /MOLDAT/

SUBROUTINE XPNDAR

Argument Declarations:

X - REAL Vector (Len = Unspecified) (Input) - X-array
Y - REAL Vector (Len = Unspecified) (Input/Output) - Y-array
N1 - INTEGER Variable (Input) - Length of X,Y-arrays already filled
N2 - INTEGER Variable (Input) - Length of Y-array to be filled

INTRINSIC and EXTERNAL Declarations:

REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER NP,I,ITRP1

COMMON Blocks: None

REAL FUNCTION XTERP

Argument Declarations:

X0 - REAL Variable - Value of X for which Y(X0) is to be found
X - REAL Vector (Len = Unspecified) - X-array (must be monotonically increasing)
Y - REAL Vector (Len = Unspecified) - Y-array as a function of X-array
N - INTEGER Variable - DIMENSION of X- and Y-arrays
NTYPE - INTEGER Variable - Index for the type of interpolation
NTYPE = 0 implies linear interpolation
NTYPE = 1 implies exponential interpolation
NTYPE = 2 implies that Y(COS(X)), where X is in degrees and linear interpolation
NTYPE = 3 implies that Y(COS(X)²), where X is in degrees and linear interpolation
NTYPE = 4 implies that Y(1/X) with linear interpolation
NTYPE = 5 implies that Y(1/X) with exponential interpolation
NTYPE = 6 implies that X is cyclical (i.e., X(1) follows X(N)) with linear interpolation; it is assumed that 0 ≤ X ≤ 1.
NTYPE = 7 implies an Aitken iterated polynomial interpolation. N must be less than or equal to NAIT.

PARAMETER Declarations:

INTEGER NAIT
PARAMETER (NAIT=100)

INTRINSIC and EXTERNAL Declarations:

INTEGER IBNSRC
INTRINSIC MAX,MIN,ABS,COS
EXTERNAL IBNSRC

Local Variable Declarations:

INTEGER J,K,KEY,KEYP
REAL FAC,DX,Z0,Z1,Z2,DZ,DUM,P(NAIT),Q(NAIT)

COMMON Blocks: /CONSTN/

REAL FUNCTION ZLAT

Argument Declarations:

XLMBDA - REAL Variable - Geocentric ecliptic longitude
 BETA - REAL Variable - Geocentric ecliptic latitude
 LABSUN - REAL Variable - Earth heliocentric latitude
 DIST - REAL Variable - Distance of the band
 ASC - REAL Variable -
 FI - REAL Variable -

INTRINSIC and EXTERNAL Declarations:

INTRINSIC ABS, MOD, MAX, MIN, COS, ACOS, SIN, ASIN, SQRT

Local Variable Declarations:

REAL PHI, PHI0, R, BETSOL, XX0, YY0, ZZ0, ANG, SNLONG, VAR,
 SOBLON, SE

COMMON Blocks: /CONSTN/

REAL FUNCTION ZODICL

Argument Declarations:

XLMBDA - REAL Variable - Ecliptic longitude (deg)
 BETA - REAL Variable - Ecliptic latitude (deg)
 V - REAL Variable - Wavenumber (cm^{-1})
 DV - REAL Variable - Wavenumber increment (cm^{-1})
 SOLDIS - REAL Variable - Normalized solar distance
 LONG - REAL Variable - Longitude (in degrees and
 fractions of degrees, is east)
 DAY - INTEGER Variable - Day of the month
 MONTH - INTEGER Variable - Month of the year
 YEAR - INTEGER Variable - Year
 TIME - REAL Variable - Time (decimal) local standard (LST)
 or Greenwich mean (GMT)
 ITIME - INTEGER Variable - Time index
 ITIME = 0 implies local standard time
 ITIME = 1 implies Greenwich mean time
 ITIME = 2 implies local daylight savings time

INTRINSIC and EXTERNAL Declarations:

REAL EMISSV, DBANDS
 DOUBLE PRECISION EPHTIM
 INTRINSIC REAL, SQRT, DBLE, AINT, INT, ABS, MOD, SIGN, COS, ACOS,
 SIN
 EXTERNAL EMISSV, GETGLC, DBANDS, ZOD2BD, EPHTIM

Local Variable Declarations:

INTEGER I, J, NORDER, INDX, ISW
 REAL ZCUT, RE, RECL, RSYM, ZSYM, FUDGE, XECL, YECL, ZECL,
 RMAX, XANG, LABSUN, DAYCNT, TEMP, DCIR, ZNLONG,
 GMTDEG
 DOUBLE PRECISION RT(512), WT(512), ZOD, DDCIR, GAMMA, CENT, ZDEP, DUST,
 XSINE, ETIME

COMMON Blocks: /CONSTN/, /ZPLANE/

SUBROUTINE ZROHDR

Argument Declarations: None

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)

Local Variable Declarations:

INTEGER	I, K, M, KK, LL, MM

COMMON Blocks: /HEADER/

SUBROUTINE ZROINT

Argument Declarations:

NASPCT	- INTEGER Vector (Len = Unspecified) (Input) - Number of earth/skyshine angles
NAZSH	- INTEGER Variable (Input) - Number of earth/skyshine azimuths
NAZ	- INTEGER Vector (Len = Unspecified) (Input) - Number of observer/source azimuths
BW	- REAL Variable (Input/Output) - Bandwidth (cm^{-1})
BWL	- REAL Variable (Input/Output) - Bandwidth (μm)

PARAMETER Declarations:

INTEGER	NAZMAX, MLMAX, NASMAX, NZSMAX, NMATL, MAXLAT, MAXLON, NGMAX
PARAMETER	(NAZMAX=30, NASMAX=15, NZSMAX=4, NGMAX=15)
PARAMETER	(MLMAX=140, NMATL=28, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER	I, M, MM, LB, IGEOM, LS

COMMON Blocks: /BCKDAT/, /INTSTO/

BLOCK DATA ARSABD

PARAMETER Declarations:

INTEGER NWLAER, NWLCLD
PARAMETER (NWLAER=47, NWLCLD=79)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /AERSLA/

BLOCK DATA ARSLBD

PARAMETER Declarations:

INTEGER NWLAER, NWLCLD, NANG
PARAMETER (NWLAER=47, NWLCLD=79, NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /AEROSL/

BLOCK DATA ARSXBD

PARAMETER Declarations:

INTEGER NWLAER, NWLCLD
PARAMETER (NWLAER=47, NWLCLD=79)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /AERSLX/

BLOCK DATA ATMSBD

PARAMETER Declarations:

INTEGER NL, MAXLAT, MAXLON
PARAMETER (NL=50, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /ATMDAT/

BLOCK DATA BKGDBD

PARAMETER Declarations:

INTEGER NMATL, MAXLAT, MAXLON
PARAMETER (NMATL=28, MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /BACKGD/

BLOCK DATA BKSTBD

PARAMETER Declarations:

INTEGER NWLAER, NSTTMP
PARAMETER (NWLAER=47, NSTTMP=16)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /BSTAER/

BLOCK DATA BRBNBD

COMMON Blocks: /CLDPAR/, /FLXTAB/, /SWPARM/

BLOCK DATA CFCBD

Local Variable Declarations:

INTEGER I, J

COMMON Blocks: /CFCBM/

BLOCK DATA CHRCBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /CHRCNM/

BLOCK DATA CIRBD

PARAMETER Declarations:

INTEGER	NWLAER,NWLCLD
PARAMETER	(NWLAER=47, NWLCLD=79)

Local Variable Declarations:

INTEGER	I

COMMON Blocks: /CRASYM/

BLOCK DATA CLDRBD

Local Variable Declarations:

INTEGER	L

COMMON Blocks: /CLDRN/

BLOCK DATA CROSD

Local Variable Declarations:

INTEGER	I,J

COMMON Blocks: /CRSECT/

BLOCK DATA DEVCBD

PARAMETER Declarations:

INTEGER	MOLMAX
PARAMETER	(MOLMAX=26)

COMMON Blocks: /DEVCMN/, /DEVICE/, /MACHIN/

BLOCK DATA DSRTBD

PARAMETER Declarations:

INTEGER	NWLAER
PARAMETER	(NWLAER=47)

Local Variable Declarations:

INTEGER	I

COMMON Blocks: /DESDAT/

BLOCK DATA ECOSBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /ECOCNV//, /ECOSYS/

BLOCK DATA EMISBD

PARAMETER Declarations:

INTEGER NLMAX
PARAMETER (NLMAX=10)

Local Variable Declarations:

INTEGER I, L

COMMON Blocks: /CDRYDS//, /WETNES/

BLOCK DATA EXMLBD

PARAMETER Declarations:

INTEGER NL
PARAMETER (NL=50)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /EXTMOL/

BLOCK DATA GLCFBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /GAUSSL/

BLOCK DATA H2OBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /CONTNS/

BLOCK DATA HAZEBD

PARAMETER Declarations:

INTEGER NZBNDR,NZTROP,NZSTRA,NZUPR
PARAMETER (NZBNDR=3, NZTROP=9, NZSTRA=17, NZUPR=14)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /HZDATA/

BLOCK DATA ICEBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /ICEREF/

BLOCK DATA INFLBD

Local Variable Declaration

INTEGER I

COMMON Blocks: /INFLTR/

BLOCK DATA INPTBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /INPTDT/, /INPNDX/

BLOCK DATA LAGRBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /LAGUER/

BLOCK DATA LUNPBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /PERLUN/

BLOCK DATA MARNBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /NAVMAR/

BLOCK DATA MOLNBD

PARAMETER Declarations:

INTEGER NSMX, MLIDMX
PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /MOLNMX/

BLOCK DATA MOLPBD

PARAMETER Declarations:

INTEGER MLMAX, MAXLAT, MAXLON, MLIDMX
PARAMETER (MLMAX=140, MLIDMX=45)
PARAMETER (MAXLAT=3, MAXLON=1)

Local Variable Declarations:

INTEGER I, J

COMMON Blocks: /MOLCON/, /MOLDAT/

BLOCK DATA NO2BD

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=7176)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /NO2XS/

BLOCK DATA O2CBD

COMMON Blocks: /O2C/

BLOCK DATA O2UVBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /HERZBG/, /SHURUN/

BLOCK DATA O3CWBD

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=3080)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /O3CWB/

BLOCK DATA O3HHBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /O3HHB/

BLOCK DATA OCNTBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /TMPOCN/

BLOCK DATA PHFGBD

PARAMETER Declarations:

INTEGER NWLAER, NANG
PARAMETER (NWLAER=47, NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /PHFFOG/

BLOCK DATA PHHYBD

PARAMETER Declarations:

INTEGER NWLCLD
PARAMETER (NWLCLD=79)

Local Variable Declarations:

INTEGER J

COMMON Blocks: /PHHYDR/

BLOCK DATA PHMABD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J, K

COMMON Blocks: /PHFMAR/

BLOCK DATA PHOCBD

PARAMETER Declarations:

INTEGER	NANG
PARAMETER	(NANG=65)

Local Variable Declarations:

INTEGER	J,K

COMMON Blocks: /PHFOCE/

BLOCK DATA PHRUBD

PARAMETER Declarations:

INTEGER	NANG
PARAMETER	(NANG=65)

Local Variable Declarations:

INTEGER	J,K

COMMON Blocks: /PHFRUR/

BLOCK DATA PHSTBD

PARAMETER Declarations:

INTEGER	NANG
PARAMETER	(NANG=65)

Local Variable Declarations:

INTEGER	J,K

COMMON Blocks: /PHFSTR/

BLOCK DATA PHTRBD

PARAMETER Declarations:

INTEGER	NANG
PARAMETER	(NANG=65)

Local Variable Declarations:

INTEGER	J,K

COMMON Blocks: /PHFTRP/

BLOCK DATA PHURBD

PARAMETER Declarations:

INTEGER NANG
PARAMETER (NANG=65)

Local Variable Declarations:

INTEGER J,K

COMMON Blocks: /PHFURB/

BLOCK DATA RAINBD

PARAMETER Declarations:

INTEGER NWLCLD
PARAMETER (NWLCLD=79)

Local Variable Declarations:

INTEGER J

COMMON Blocks: /RAINTP/, /RAINWL/

BLOCK DATA REFRBD

Local Variable Declarations:

INTEGER L

COMMON Blocks: /MMWREF/

BLOCK DATA SCENBD

PARAMETER Declarations:

INTEGER NSCEN, NMATL
PARAMETER (NSCEN=35, NMATL=28)

Local Variable Declarations:

INTEGER K

COMMON Blocks: /SCENES/

BLOCK DATA SICEBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SICEDT/

BLOCK DATA SNOWBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SNWDAT/

BLOCK DATA SO2BD

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=5562)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SO2XS/

BLOCK DATA SLR1BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR1/

BLOCK DATA SLR2BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR2/

BLOCK DATA SLR3BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR3/

BLOCK DATA SLR4BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR4/

BLOCK DATA SLR5BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SOLIR5/

BLOCK DATA STMLBD

PARAMETER Declarations:

INTEGER NL
PARAMETER (NL=50)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /STDMOL/

BLOCK DATA UFTPBD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /UFTAPE/

BLOCK DATA UPRBD

PARAMETER Declarations:

INTEGER MAXLAT, MAXLON, NLUPR, NTEXO
PARAMETER (MAXLAT=3, MAXLON=1, NLUPR=8, NTEXO=11)

Local Variable Declarations:

INTEGER L

COMMON Blocks: /UPRATM/

BLOCK DATA VIRLBD

COMMON Blocks: /VIRDAT/

BLOCK DATA WTRBD

PARAMETER Declarations:

INTEGER NWLWTR, NFRQ
PARAMETER (NWLWTR=169, NFRQ=28)

Local Variable Declarations:

INTEGER I

COMMON Blocks: /INDXWR/

BLOCK DATA ZOD1BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /SILEMS/

BLOCK DATA ZOD2BD

Local Variable Declarations:

INTEGER I

COMMON Blocks: /ZODBND/, /ZPLANE/

PROGRAM ASCBIN

PARAMETER Declarations:

```

      INTEGER      MOLMAX
      PARAMETER    (MOLMAX=26)

```

INTRINSIC and EXTERNAL Declarations:

```

      CHARACTER*1  UPCASE
      CHARACTER*72 IOERR
      EXTERNAL     CONVAB, TABLEA, TABLEB, TABLEH, DEVCBD, FILRT,
                   SETFIL, PROMPT, CONFIG, UPCASE, IOERR, CNSTNT

```

Local Variable Declarations:

```

      INTEGER      K, KTER, IWORK, IFBIN, JASC, JTBL, IERR, IOS
      CHARACTER*1  CX
      CHARACTER*40 FILERT
      CHARACTER*80 FILENM(17), FILBIN

```

```

COMMON Blocks:      /DEVCONM/, /DEVICE/

```

SUBROUTINE CONVAB

Argument Declarations:

```

      ICONV - INTEGER Variable (Input) - Index for type of conversion
              ICONV = 0 implies a binary to ASCII conversion
              Otherwise, an ASCII to binary conversion
      IFBIN - INTEGER Variable (Input) - Binary file unit number
      FILBIN - CHARACTER*(*) Variable (Input) - Binary file name
      IFASC - INTEGER Variable (Input) - ASCII file unit number
      FILASC - CHARACTER*(*) Variable (Input) - ASCII file name
      IERR - INTEGER Variable (Output) - Error index

```

PARAMETER Declarations:

```

      INTEGER      NVSMAX, NGMAX
      PARAMETER    (NVSMAX=20, NGMAX=15)

```

INTRINSIC and EXTERNAL Declarations:

```

      CHARACTER*72 IOERR
      EXTERNAL     SETFIL, IOERR

```

Local Variable Declarations:

```

      INTEGER      NHDR(2), NVAR(NGMAX), IV, IVSET, IVS, IG, NVSET,
                   NVS(NVSMAX), IH, IOS, ITER, JTER, IHDR(2000),
                   NGEOM, IVSETX, IVSX, IGEOM
      REAL          HDR(2500), VAR(10000)
      CHARACTER*1  DUMMY
      CHARACTER*40 HEADNG
      CHARACTER*80 TITLE

```

```

COMMON Blocks:      None

```

SUBROUTINE SETFIL

Argument Declarations:

NFILE - INTEGER Variable (Input) - File unit number
FILNAM - CHARACTER*(*) Variable (Input) - File name
IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER IOS
LOGICAL FXST
CHARACTER*11 FMT(2)

COMMON Blocks: None

SUBROUTINE SLITFN

Argument Declarations:

X - REAL Vector (Len = Unspecified) (Input/Output) - Element
of variables being convolved with slit function
SLIT - REAL Array (Dim = NDV x Unspecified) (Input/Output) -
Running of convolved value (temporary storage)
SUM - REAL Vector (Len = Unspecified) (Input/Output) - Running
integral of slit function (temporary storage)
VP - REAL Vector (Len = Unspecified) (Input/Output) - Previous
wavenumbers (cm^{-1})
DVP - REAL Vector (Len = Unspecified) (Input/Output) - Previous
spectral increment (cm^{-1})
NDV - INTEGER Variable (Input) - Maximum number of spectral points
NDAT - INTEGER Variable (Input) - Number of data sets
V - REAL Variable (Input) - Wavenumber (cm^{-1})
DV - REAL Variable (Input) - Spectral increment (cm^{-1})
RESOL - REAL Variable (Input) - Slit full width at half maximum (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX,ABS

Local Variable Declarations:

INTEGER I,J,IP
REAL WGT

COMMON Blocks: None

SUBROUTINE TABLEA

Argument Declarations:

IFATM - INTEGER Variable (Input) - Source binary file number
 IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, MLMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX, NDV, NSLTD
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(NVSMAX=20, NDV=200, NSLTD=5)

INTRINSIC and EXTERNAL Declarations:

REAL	FILTER
CHARACTER*4	UPCASE
CHARACTER*72	IOERR
INTRINSIC	MOD
EXTERNAL	GETHDR, PROMPT, IOERR, FILTER, SLITFN, UPCASE, RDFLTR

Local Variable Declarations:

INTEGER	IPRNT, M, KAZ, MM, MMP, IG, IVP, K, IOS, NBCKZ, ML0, NVAR (NGMAX), IGEOM, IGX, JMOD, IFLTR, IV, IVS
REAL	TAUSH (NASMAX, NZSMAX), RADSH (NASMAX, NZSMAX), FLTR, RADT (NAZMAX), WL, VWL, RADSE (NASMAX, NZSMAX), RADSS (NASMAX, NZSMAX), RADSC (NASMAX, NZSMAX), RDSLST (NAZMAX), DV (NDV), RDSLBS (NAZMAX), RESX, RADBE (NAZMAX), TAUT (NAZMAX), SIGMET (NAZMAX), RADBR (NAZMAX), RADSD (NAZMAX), RADLNT (NAZMAX), ZBCKZ (MLMAX), DRADT (NAZMAX), TAUSCT (NAZMAX), TAUB (NAZMAX), RADB (NAZMAX), TAUSCB (NAZMAX), RADSLT (NAZMAX), DRADB (NAZMAX), SUM (NSLTD), SWBCK (MLMAX, NGMAX), TBCK (MLMAX, MAXLAT, MAXLON), ZL (MLMAX), SIGMEB (NAZMAX), SLIT (NDV, NSLTD), DV0, XSLIT (NSLTD), SUMSLT (NDV), V (NDV), RES, RESWL, V0, LATST (MAXLAT), LONST (MAXLON)
CHARACTER*24	TFLTR
CHARACTER*40	HEADNG
CHARACTER*80	TITLE, FILENM

COMMON Blocks: /HEADER/

SUBROUTINE TABLEB

Argument Declarations:

IFBCK - INTEGER Variable (Input) - Background binary file number
 IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, MLMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX, NDV, NSLTD
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(NVSMAX=20, NDV=200, NSLTD=5)

INTRINSIC and EXTERNAL Declarations:

REAL	FILTER
CHARACTER*4	UPCASE
CHARACTER*72	IOERR
INTRINSIC	MOD
EXTERNAL	GETHDR, PROMPT, IOERR, FILTER, SLITFN, UPCASE, RDFLTR

Local Variable Declarations:

INTEGER	IPRNT, IZ, M, KAZ, IZBCK, IG, MM, IV, K, NBCKZ, IOS, ML0, NVAR (NGMAX), IGEOM, IGP, IVS, IVP, IFLTR, JMOD
REAL	ZBCKZ (MLMAX), TAUBZ (NAZMAX, MLMAX), RES, RESWL, SIGMEZ (NAZMAX, MLMAX), TAUSCZ (NAZMAX, MLMAX), RADBZ (NAZMAX, MLMAX), WL, VWL, FLTR, RESX, DRADZ (NAZMAX, MLMAX), DV (NDV), SUM (NSLTD), RDSLZBZ (NAZMAX, MLMAX), RDLNBZ (NAZMAX, MLMAX), RDSCBZ (NAZMAX, MLMAX), RADSHB (NAZMAX, MLMAX), RDSHSB (NAZMAX, MLMAX), ZL (MLMAX), V0, DV0, SWBCK (MLMAX, NGMAX), TBCK (MLMAX, MAXLAT, MAXLON), XSLIT (NSLTD), SLIT (NDV, NSLTD), V (NDV), SUMSLT (NDV), LATST (MAXLAT), LONST (MAXLON)
CHARACTER*24	TFLTR
CHARACTER*40	HEADNG
CHARACTER*80	TITLE, FILENM

COMMON Blocks: /HEADER/

SUBROUTINE TABLEH

Argument Declarations:

IFHTR - INTEGER Variable (Input) - Heat transfer binary file number
 IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
 NTIME, MLMAX, NVSMAX, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (NTIME=97, NVSMAX=20)
 PARAMETER (MAXLAT=3, MAXLON=1, MLMAX=140)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 INTRINSIC MOD
 EXTERNAL GETHDR, PROMPT, IOERR

Local Variable Declarations:

INTEGER L, L0, KK, LL, IOS, ITM, IZ, NBCKZ, ML0, NVAR (NGMAX),
 ITIM
 REAL DECTIM (NTIME), SOLEVX (NTIME, MAXLAT, MAXLON),
 BSWZ (10, NTIME, MAXLAT, MAXLON), LATST (MAXLAT),
 USWZ (10, NTIME, MAXLAT, MAXLON), LONST (MAXLON),
 DSWZ (10, NTIME, MAXLAT, MAXLON),
 ULWZ (10, NTIME, MAXLAT, MAXLON),
 DLWZ (10, NTIME, MAXLAT, MAXLON),
 SWBCK (MLMAX, NGMAX), ZBCKZ (MLMAX), ZLYR (10),
 TLYR (10, NTIME, MAXLAT, MAXLON),
 RHLYR (10, NTIME, MAXLAT, MAXLON),
 SOLAZX (NTIME, MAXLAT, MAXLON), ZL (MLMAX),
 TBCK (MLMAX, MAXLAT, MAXLON)
 CHARACTER*40 HEADNG
 CHARACTER*80 TITLE

COMMON Blocks: /HEADER/

SUBROUTINE TABLET

Argument Declarations:

IFTRN - INTEGER Variable (Input) - Molecular transmittance binary file
number
IFTBL - INTEGER Variable (Input) - Tabular file unit number

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
+	MLMAX, NVSMAX, MOLMAX, NSLTD, NDV, MLIDMX, NSMX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(NVSMAX=20, NSLTD=4, NDV=200)
PARAMETER	(MAXLAT=3, MAXLON=1, MLMAX=140)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MLIDMX=45, NSMX=MLIDMX+8)

INTRINSIC and EXTERNAL Declarations:

REAL	FILTER
CHARACTER*4	UPCASE
CHARACTER*72	IOERR
INTRINSIC	MOD, INT, MIN
EXTERNAL	GETHDR, PROMPT, IOERR, FILTER, SLITFN, UPCASE, MOLNBD

Local Variable Declarations:

INTEGER	M, N, KAZ, MM, IG, IVP, K, IOS, NBCKZ, ML0, MOLX, IM, IM1,
+	NVAR (NGMAX), IGEOM, IGX, JMOD, IV, IVS, IM2, IM3,
+	NMOLEC, MOLID (NSMX), IM4
REAL	WL, DV (NDV), RESX, ZBCKZ (MLMAX), RESWL, V0,
+	SWBCK (MLMAX, NGMAX), SUMSLT (NDV), V (NDV), RES,
+	TBCK (MLMAX, MAXLAT, MAXLON), ZL (MLMAX),
+	SLIT (NDV, NSLTD), DV0, XSLIT (NSLTD),
+	TAULR (NAZMAX), SPCTRN (ISMX, 3, NAZMAX),
+	LATST (MAXLAT), LONST (MAXLON)
CHARACTER*40	HEADNG
CHARACTER*80	TITLE

COMMON Blocks: /HEADER/, /MOLNMX/

PROGRAM BBTEMP

PARAMETER Declarations:

```

INTEGER      NGMAX, NAZMAX, NASMAX, NZSMAX, MLMAX, MAXLAT, MAXLON,
              ISMX, NVSMAX, MOLMAX, MLIDMX
PARAMETER    (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER    (MLMAX=140, MAXLAT=3, MAXLON=1)
PARAMETER    (MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER    (NVSMAX=20)

```

INTRINSIC and EXTERNAL Declarations:

```

REAL          INVPLK, FILTER
CHARACTER*72   IOERR
INTRINSIC      REAL, DBLE, SQRT, COS, SIN
EXTERNAL       CNSTNT, DEVCBD, SUMFIL, GETHDR, INVPLK, FILTER,
              RDFLTR, PROMPT, CONFIG, SETFLG, IOERR, FILRT

```

Local Variable Declarations:

```

INTEGER      IOS, IG, IV, MM, M, IFLTR, IVS, NBCKZ, ML0, NVAR (NGMAX),
              IGP, IGEOM, IGX
REAL          V, DV, ZBCK (MLMAX), SWBCK (MLMAX, NGMAX), WL, TMP1,
              TAUT (NAZMAX), TMP2, DRADT (NAZMAX), TMPBCK, WL1,
              RADSLT (NAZMAX), RADBT (NAZMAX), SIGMET (NAZMAX),
              TAUSCT (NAZMAX), RADLNT (NAZMAX), TAUB (NAZMAX),
              RADSH, SIGMEB (NAZMAX), TMPDRT, TAUSCB (NAZMAX),
              RADSD (NAZMAX), VBAR, TMPSL, TMPLN, TMPSDT, RADSS,
              RDSLST (NAZMAX), RDSLBS (NAZMAX), RADB (NAZMAX),
              RADBE (NAZMAX), RADBR (NAZMAX), TMPBE, TMPBR, WL2,
              RADT (NAZMAX), TAU1 (NAZMAX), TAU2 (NAZMAX), RADSC,
              RAD1 (NAZMAX), RAD2 (NAZMAX), TMPSLT, TMPSLB,
              DRADTT (NAZMAX), DRADBT (NAZMAX), BW, BWL, DFLT,
              SGMETT (NAZMAX), SGMEBT (NAZMAX), ZL (MLMAX),
              TASCTT (NAZMAX), TASCBT (NAZMAX), RADSDT (NAZMAX),
              RDSLST (NAZMAX), RDLNT (NAZMAX), TMPDRB, DUM,
              RSLSTT (NAZMAX), RADBT (NAZMAX), RADBT (NAZMAX),
              TAUSH, TBCK (MLMAX, MAXLAT, MAXLON), RADSE,
              DRADB (NAZMAX), RSLSBT (NAZMAX), LATST (MAXLAT),
              LONST (MAXLON)
DOUBLE PRECISION RE, REPOL, REEQU
CHARACTER*24   TFLTR
CHARACTER*40   HEADNG, FILERT
CHARACTER*50   TLBL (18)
CHARACTER*80   TITLE, FILENM (14), NFFLTR

```

```

COMMON Blocks:      /CONSTN/, /DEVICE/, /FLAGS/, /HEADER/, /MOLECP/,
                   /USERNM/

```

REAL FUNCTION INVPLK

Argument Declarations:

RADNCE - REAL Variable - Radiance ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$).
V - REAL Variable - Wavenumber (cm^{-1})

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, DBLE, LOG

Local Variable Declarations:

DOUBLE PRECISION X, Y, C1, C2

COMMON Blocks: /CONSTN/

SUBROUTINE CNVJTK

Argument Declarations:

JCHAR - CHARACTER*(*) Vector (Len = Unspecified) - MODTRAN string
KNDX - INTEGER Vector (Len = Unspecified) - MOSART string

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
INTRINSIC LEN
EXTERNAL IOERR

Local Variable Declarations:

INTEGER K, IOS
CHARACTER*6 F

COMMON Blocks: None

SUBROUTINE CRBKGD

Argument Declarations:

IFUBK - INTEGER Variable (Input) - Background file number
FILNAM - CHARACTER*(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL INBKBD, DEVCBD, IOERR

Local Variable Declarations:

INTEGER I, IOS
LOGICAL FXSUBK

COMMON Blocks: /INBKGD/, /MACHIN/

PROGRAM CRFILE

PARAMETER Declarations:

```

      INTEGER      MOLMAX
      PARAMETER    (MOLMAX=26)
    
```

INTRINSIC and EXTERNAL Declarations:

```

      CHARACTER*72  IOERR
      EXTERNAL      DEVCBD, FILRT, MENU, CRINPT, CRFLTR, CRBKGD, CRUATM,
                     CRUCLD, CRUAER, PROMPT, CONFIG, RDMDTN, IOERR
    
```

Local Variable Declarations:

```

      INTEGER      IWORK, IERR, IOS, INDXI
      CHARACTER*40  FILERT
      CHARACTER*80  FILENM(17)
    
```

```

COMMON Blocks:      /DEVICE/
    
```

SUBROUTINE CRFLTR

Argument Declarations:

```

      IFFLT - INTEGER Variable (Input) - Filter response file number
      FILNAM - CHARACTER*(*) Variable (Input) - Input file name
      IERR - INTEGER Variable (Output) - Error index
    
```

INTRINSIC and EXTERNAL Declarations:

```

      INTEGER      LENSTR
      CHARACTER*1   UPCASE
      CHARACTER*72  IOERR
      EXTERNAL      INFLBD, DEVCBD, IOERR, PROMPT, UPCASE, LENSTR, LCTRIM
    
```

Local Variable Declarations:

```

      INTEGER      I, IOS, IFLTSW, NFLTR, IFMOD, NF, NEW, IFT, IPRINT,
                     KODE, NLOW, IFWV, NW, LENF
      REAL          WLF(200), FLTR(200), TEMP
      LOGICAL       FXSFLT
      CHARACTER*1    RESPON
      CHARACTER*2    WNL(0:1)
      CHARACTER*20   IDFIL
      CHARACTER*24   TFLTR
      CHARACTER*80   NFMOD
    
```

```

COMMON Blocks:      /INFLTR/, /MACHIN/
    
```

SUBROUTINE CRINPT

Argument Declarations:

NILE - INTEGER Variable (Input) - File number
 FILNAM - CHARACTER*(*) Variable (Input) - Input file name
 IERR - INTEGER Variable (Output) - Error index

PARAMETER Declarations:

INTEGER NGMAX
 PARAMETER (NGMAX=15)

INTRINSIC and EXTERNAL Declarations:

REAL GETVAR
 CHARACTER*1 UPCASE, LWCASE
 CHARACTER*72 IOERR
 EXTERNAL INPTBD, DEVCBD, MENU, LCTRIM, GETVAR, UPCASE, LWCASE,
 IOERR, PROMPT, CRUATM, MONTH, IGTINT, CALEND,
 CHTIME

Local Variable Declarations:

INTEGER I, J, IOS, IMENU(154), LENX
 REAL HO, HS, SLRNG, BETA, PHIO, PHIS, HT
 LOGICAL FXSFIL
 CHARACTER*1 RESPON, BLANK, V1, V2
 CHARACTER*40 VARIAB, VX, VY, VZ, VU, VV, VL
 CHARACTER*80 STRING

COMMON Blocks: /HEADER/, /INPNDX/, /INPTDT/, /MACHIN/

SUBROUTINE CRUAER

Argument Declarations:

IFUAR - INTEGER Variable (Input) - Aerosol file number
 FILNAM - CHARACTER*(*) Variable (Input) - Input file name
 IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 EXTERNAL INARBD, DEVCBD, IOERR

Local Variable Declarations:

INTEGER I, IOS
 LOGICAL FXSUAR

COMMON Blocks: /INUAER/, /MACHIN/

SUBROUTINE CRUATM

Argument Declarations:

IFUAT - INTEGER Variable (Input) - Atmosphere file number
FILNAM - CHARACTER*(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index
FLUATM - LOGICAL Variable (Input) - Flag for creation of separate
user-defined atmosphere file

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
INTRINSIC	INDEX, REAL, LEN, INT, MAX
EXTERNAL	INPTBD, DEVCBD, IOERR, MSAG, PROMPT, CHTIME, CALEND, GETVAR, IGTINT, UPCASE

Local Variable Declarations:

INTEGER	I, IOS
LOGICAL	FXSUAT
CHARACTER*50	INPATM(2)

COMMON Blocks: /HEADER/, /INPNDX/, /INPTDT/, /MACHIN/

SUBROUTINE CRUCLD

Argument Declarations:

IFUCL - INTEGER Variable (Input) - Hydrometeor file number
FILNAM - CHARACTER*(*) Variable (Input) - Input file name
IERR - INTEGER Variable (Output) - Error index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
EXTERNAL	INCLBD, DEVCBD, IOERR

Local Variable Declarations:

INTEGER	I, IOS
LOGICAL	FXSUCL

COMMON Blocks: /INUCLD/, /MACHIN/

BLOCK DATA INARBD

Local Variable Declaration

INTEGER	I

COMMON Blocks: /INUAER/

BLOCK DATA INBKBD

Local Variable Declaration

INTEGER I

COMMON Blocks: /INBKGD/

BLOCK DATA INCLBD

COMMON Blocks: /INUCLD/

SUBROUTINE MDRI

PARAMETER Declarations:

INTEGER MOLMAX
PARAMETER (MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

REAL AFTERP, DNO, OHCALC, POZONE, SINTRP, TDEP, VP
EXTERNAL AFTERP, DNCALC, DNO, DREAD, GTD6, INTERP, OHCALC,
+ POZONE, SINTRP, SUN, TDEP, VP, DEVCBD, NRLBD

Local Variable Declarations:

INTEGER K, KMAX, IXM, IXP
REAL D(8), T(2), ALT, APNO, AR72, AR90, CNO, CNODAY, CNONIT,
+ CO2AR, CO2MIX, CONC, D40, DAYAV, DAYO, DAYO3,
+ DENORM, DENS, DENS8, DN, FLUXC2, FLUXNO,
+ H80, O272, O280, O290, O372, O380, O80, O86, ODMS72,
+ ODN72, OH72, OH80, ORATIO, PMBAR, PREVVP, RIS, RLAT,
+ RNO100, RNO90, RRLAT, SET, SUNRIS, SUNSET,
+ TEMP80, TINF, TK, TMP, TOTN, TROPHT, TROPT, VALUE,
+ W1, W2, WT, X120, X150, X300, X90, XO3D, XO3D80,
+ XO3N, XO3N80, XOD, XOD80, XON, XON80, NITEO, NITEO3,
+ SOD(46), SON(46), SO3D(46), SO3N(46), N280, N272,
+ N290, T8, D8
CHARACTER*80 FILENM

COMMON Blocks: /DEVCM/, /NRLFIL/, /SPECIE/

SUBROUTINE MENU

Argument Declarations:

IMENU - INTEGER Variable (Input) - Menu index

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL CHRCBD, PROMPT, IOERR

Local Variable Declarations:

INTEGER IS(24), IM(24), I, J, IOS
CHARACTER*1 DUMMY
CHARACTER*3 DASH
CHARACTER*3 CHMNT(12)
CHARACTER*5 CHAER(0:19)
CHARACTER*6 CHATM(0:10), CHAZE(0:9), CHSEA(0:10), CHMES(0:2)
CHARACTER*39 SEAS(4)

COMMON Blocks: /CHRCNM/

SUBROUTINE MSAG

Argument Declarations:

AP - REAL Vector (Len = Unspecified) (Input) - Geomagnetic planetary indices
F107 - REAL Variable (Input) - Solar Flux at 10.2 cm
F107A - REAL Variable (Input) - 3-month mean value of solar flux
XLAT - REAL Variable (Input) - Latitude
XLONG - REAL Variable (Input) - Longitude
IDAY - INTEGER Variable (Input) - Day of the month
MONTH - INTEGER Variable (Input) - Month of the year
IYEAR - INTEGER Variable (Input) - Year
TIME - REAL Variable (Input) - Time (decimal) local standard (LST) or Greenwich mean (GMT)
ITIME - INTEGER Variable (Input) - Time index
ITIME = 0 implies local standard time
ITIME = 1 implies Greenwich mean time
ITIME = 2 implies local daylight saving time
SUNRIS - REAL Variable (Output) - Sunrise (hour)
SUNSET - REAL Variable (Output) - Sunset (hour)
Continuous day if SUNRIS = SUNSET = 0.0
Continuous night if SUNRIS = SUNSET = 24.0
ORATIO - REAL Variable (Output) - 72 km MSIS/NRL O atom ratio
TMPEXO - REAL Variable (Output) - Exospheric temperature (K)
IFUAT - INTEGER Variable (Output) - Output file index

INTRINSIC and EXTERNAL Declarations:

DOUBLE PRECISION EPHTIM
INTRINSIC REAL, MOD
EXTERNAL MDRI, EPHTIM, CALEND

Local Variable Declarations:

INTEGER JULDAY
REAL DYEAR, UT, XLST

COMMON Blocks: None

BLOCK DATA NRLBD

Local Variable Declarations:

```

      INTEGER          I
COMMON Blocks:        /NRLDEV//, /NRLFIL//, /SPECIE/

```

SUBROUTINE RDMDTN

Argument Declarations:

```

      IFILE  - INTEGER Variable (Input) - File number
      FILENM - CHARACTER*(*) Variable (Input) - MOSART input file name

```

PARAMETER Declarations:

```

      INTEGER          NGMAX, NVSMAX, MLUSR, MOLMAX
      PARAMETER        (NGMAX=15, NVSMAX=20, MLUSR=34, MOLMAX=26)

```

INTRINSIC and EXTERNAL Declarations:

```

      CHARACTER*72      IOERR
      INTRINSIC         REAL, MIN, AINT
      EXTERNAL          PROMPT, INPTBD, CNVJTK, IOERR

```

Local Variable Declarations:

```

      INTEGER          I, J, K, L, IV1, IV2, IDV, IFWHM, IRPT, IVS, IGEOM, IS, IN,
                        ID, MODEL, ITYPE, IEMSC, M1, M2, M3, M4, M5, M6, MDEF,
                        IRD1, IRD2, IM, NOPRT, IHAZE, ISEASN, IVULCN, IG,
                        ICSTL, ICLD, IVSA, IREG(4), IMULT, NGEOM, NVS,
                        ISEED, IYEAR, IDAY, ISOURC, ML, IPARM, IPH, NANGLS,
                        NATM(0:7), NVS1, NVS2, NCLD(0:11), IOS, MP, MT,
                        IHA1(MLUSR), ICLD1(MLUSR), IVUL1(MLUSR),
                        ISEA1(MLUSR), ICHR1(MLUSR), KNDX(20, MLUSR),
                        IAERO, IZERO, MC(MOLMAX)
      REAL              TBOUND, SALB, VIS, WSS, WHH, RAINRT, CTHIK, CALT,
                        CEXT, HOBS(NGMAX), HSRC(NGMAX), XLAT, XLON,
                        PHIOBS(NGMAX), SLROS(NGMAX), BETAOS(NGMAX),
                        LENP(NGMAX), V1(NVSMAX), V2(NVSMAX), DV(NVSMAX),
                        HBCK, SOLDIS, SOLAT, SOLON, AZIM, AWCCON,
                        SOLAZ, SOLZEN, AHR, SEC, ZCVSA, ZTVSA, ZERO, CN2,
                        ZINVSA, RO, ANGLEM, AMN, TIME, G, ANGF(50),
                        F(4, 50), AHAZE(MLUSR), EQLWCZ(MLUSR), AZDUM,
                        RRATZ(MLUSR), ZMDL(MLUSR), P(MLUSR), T(MLUSR),
                        WMOL(12, MLUSR), CLALTB(3), CLALTT(3)
      LOGICAL           FLSUB(17), MODTRN
      CHARACTER*1       JCHAR(14, MLUSR)
      CHARACTER*2       TYGEOM(NGMAX)
      CHARACTER*3       RESPON(4)
      CHARACTER*6       MONTH
      CHARACTER*10      CHGEOM(NGMAX, 5)
      CHARACTER*12      CHATM(0:7), CHSEA(0:7), CHAZE(0:8), CHAER1(0:10),
      CHARACTER*32      TITAER
      CHARACTER*40      HEADNG
      CHARACTER*72      HMODEL
      CHARACTER*80      NFMODT, DUMMY(8), INSTR(153)

```

```

COMMON Blocks:        /INPNDX//, /INPTDT/

```

PROGRAM FACET

PARAMETER Declarations:

INTEGER	NNMAX, NRMAX, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MLMAX, MOLMAX, NRFMAX, NSPCT, NZSH, MLIDMX
PARAMETER	(NNMAX=3, NRMAX=4, MLMAX=140)
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER	(NRFMAX=80, NSPCT=181, NZSH=361)

INTRINSIC and EXTERNAL Declarations:

REAL	GETVAR, SHADOW, FILTER, XTERP, SURFAC
CHARACTER*3	UPCASE
CHARACTER*4	LWCASE
CHARACTER*72	IOERR
INTRINSIC	CMPLX, SQRT, COS, SIN, ACOS, ATAN2, REAL, INT, MAX, MIN, ABS
EXTERNAL	GETVAR, RDLINE, PARSE, UPCASE, SURFAC, CONFIG, CNSTNT, SHADOW, FILTER, RDFLTR, DEVCBD, INFLBD, LWCASE, XTERP, SETFLG, SUMFIL, GETHDR

Local Variable Declarations:

INTEGER	I, K, M, N, NBCKZ, ML0, NVAR (NGMAX), IOS, NN, IGEOM, MM, IV, IVS, IG, NPHI, NTHETA, IP, IT, IFLTR, MINV, NSPCTP, NZSHP, IGRID
REAL	XNORM (NNMAX), RINDEX, IINDEX, ZBCK (MLMAX), V, DV, SWBCK (MLMAX, NGMAX), SIGNAT (NAZMAX), TBCK (MLMAX, MAXLAT, MAXLON), ZL (MLMAX), A, B, TAUT (NAZMAX), SIGMET (NAZMAX), TAUSCT (NAZMAX), RADT (NAZMAX), RADSLT (NAZMAX), RADLNT (NAZMAX), TAUB (NAZMAX), SIGMEB (NAZMAX), TAUSCB (NAZMAX), RADB (NAZMAX), DRADT (NAZMAX), DRADB (NAZMAX), RDSLST (NAZMAX), RDSLSTB (NAZMAX), RADBE (NAZMAX), RADBR (NAZMAX), RADSD (NAZMAX), FLTR, VPM, VPP, TAREA (NGMAX, NAZMAX), BKGD (NGMAX, NAZMAX), UP, VP, TAUSH (NASMAX, NZSMAX), CNTRST, DUMAZ (NZSMAX), RADSH (NASMAX, NZSMAX), SNORM (3), PROJA, TNORM, RADSE (NASMAX, NZSMAX), APPS (NGMAX, NAZMAX), PATH (NGMAX, NAZMAX), DPHI, DTHETA, ASH (NZSH), RADSS (NASMAX, NZSMAX), DAREA, DUM, OBS (3), WL2, RADSC (NASMAX, NZSMAX), RCNTR, PSH (NSPCT), WL1, RADSHN (NSPCT, NZSH), ECCEN, LATST (MAXLAT), RSH (NZSH), PSHI (NASMAX), BW (NGMAX), BWL (NGMAX), RSHM (NASMAX, NZSH), LONST (MAXLON)
LOGICAL	FLTMP
CHARACTER*1	DOT, DUMMY
CHARACTER*24	TFLTR, TFLTR0, TFLTRX, GRID (3), REFT (3), RGH (2)
CHARACTER*25	SHAPE (4)
CHARACTER*40	VRDATA (NRMAX), HEADNG, NFFCT
CHARACTER*80	TITLE
CHARACTER*255	VARIAB, FILENM, FILNAM

COMMON Blocks:

/CONSTN/, /DEVICE/, /HEADER/, /MATRLD/, /MOLECP/,
/USERNM/

REAL FUNCTION ROUGH

Argument Declarations:

HSIGMA - REAL Variable - Standard deviation of the heights on the
reflective surface
WL - REAL Variable - Wavelength (same units as HSIGMA)
PSI - REAL Variable - Elevation angle at the surface (deg)
ITYPE - INTEGER Variable - Type of surface
ITYPE = 0 implies a plane wave on a Gaussian distribution
of stepped surfaces
Otherwise, it implies a spherical wave on a Gaussian
distribution of sinusoidal surfaces

INTRINSIC and EXTERNAL Declarations:

REAL	EHBSL0
INTRINSIC	SIN, EXP
EXTERNAL	EHBSL0

Local Variable Declarations:

REAL	DUM

COMMON Blocks: /CONSTN/

REAL FUNCTION SURFAC

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
 XNORM - REAL Vector (Len = Unspecified) - Surface normal vector
 HSOLAR - REAL Variable - Spectral solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 SOLAZ - REAL Variable - Azimuth angle of incident solar radiation (deg)
 SOLEV - REAL Variable - Elevation angle of incident solar radiation (deg)
 HLUNAR - REAL Variable - Spectral lunar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 XLUNAZ - REAL Variable - Azimuth angle of incident lunar radiation (deg)
 XLUNEV - REAL Variable - Elevation angle of incident lunar radiation (deg)
 HSHINE - REAL Array (Dim = NASMAX x Unspecified) - Skyshine radiance
 ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 PHISH - REAL Vector (Len = Unspecified) - Skyshine elevation angles (deg)
 NASPCT - INTEGER Variable - Number of skyshine elevation angles
 NASMAX - INTEGER Variable - Maximum number of skyshine elevation angles
 AZSH - REAL Vector (Len = Unspecified) - Skyshine azimuth angles (deg)
 NAZSH - INTEGER Variable - Number of skyshine azimuths
 TAU - REAL Variable - Transmittance observer-facet
 TAIR - REAL Variable - Air temperature (K)
 PHIRF - REAL Variable - Elevation angle of reflected line of sight at the
 facet (deg)
 AZIM - REAL Variable - Observer azimuthal angle (deg)

PARAMETER Declarations:

INTEGER NRFBMAX
 PARAMETER (NRFBMAX=80)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, PLANCK, BDRF, SHADOW, ROUGH
 COMPLEX REFEST
 INTRINSIC SQRT, REAL, DBLE, DPROD, ABS, SIN, COS, MAX, MIN, CMPLX,
 ATAN2, ACOS, ASIN
 EXTERNAL XTERP, PLANCK, FRESNL, BDRF, REFEST, DIREMS, PROFAC,
 ROUGH

Local Variable Declarations:

INTEGER I, K, ITRP0, KEY, KEYP, M, MM, MP, MMM, MMP, NLayer
 REAL WL, REFLS, REFL, RFN, EMIS, PLK, FAC, AZLUN,
 REFLX, EMV, EMH, TMPLYR(0:3), UOBS(3), USOL(3),
 ULUN(3), POBS, PSOL, PLUN, XOBS, XSOL, XLUN, AZSOL,
 SLOPE, SHDWS, SHDWL, XOS, XOL, USHN(3), XSHN,
 YNORMO, YNORMS, YNORML, FRACSP, DEP(0:3), ZNORM(3)
 DOUBLE PRECISION EM, RF, RTERS, RTERL, RTERSH, DSNP, DAZSH
 COMPLEX DIELEC, XMUC, INAIR(2), INMAT(0:2), REFR, EPSX, RH,
 RV, TV, TH, EPSA

COMMON Blocks: /CONSTN/, /MATRLD/

SUBROUTINE CKSTAT

Argument Declarations:

X - REAL Variable (Output) - Uninitialized variable
Y - REAL Variable (Output) - Static/dynamic variable

PARAMETER Declarations:

INTEGER NMAX
PARAMETER (NMAX=500)

INTRINSIC and EXTERNAL Declarations:

REAL ZSTAT
INTRINSIC MOD, REAL
EXTERNAL ZSTAT

Local Variable Declarations:

INTEGER ICOUNT, KMOD
REAL Z(NMAX)

COMMON Blocks: None

REAL FUNCTION ZSTAT

Argument Declarations:

I - INTEGER Variable - Counter

Local Variable Declarations:

REAL ZSTOR

COMMON Blocks: None

LOGICAL FUNCTION FLCOL1

Argument Declarations: None

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
EXTERNAL IOERR

Local Variable Declarations:

INTEGER IFSCR, II, JJ(5), IOS

COMMON Blocks: None

PROGRAM FPTEST

PARAMETER Declarations:

INTEGER	MOLMAX
PARAMETER	(MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

INTEGER	LRECHK
LOGICAL	FLCOL1
CHARACTER*72	IOERR
EXTERNAL	CNSTNT, CONFIG, TITLCR, DEVCBD, PROMPT, IOERR, CKSTAT, FLCOL1, LRECHK

Local Variable Declarations:

	INTEGER	I, IOS, NRECL(4)
CIBM	INTEGER	IERR
	REAL	X1, X2, Y1, Y2
	LOGICAL	FLINI, FLSTA
	LOGICAL	FLREC
	CHARACTER*1	DUMMY
	CHARACTER*32	ENDIAN(2), CMPLMT(0:2)
	CHARACTER*33	UNDFL(0:1)
	CHARACTER*47	ROUND(0:2)
	CHARACTER*80	TITLE

COMMON Blocks:	/CONSTN/, /DEVICE/, /MACHIN/

INTEGER FUNCTION LRECHK

Argument Declarations: None

NVAR - INTEGER Variable - Number of variables in record
 NTYPE - CHARACTER*(*) Variable - Type of variable in record

1:	'INTEGER' or 'INTEGER*4'
2:	'INTEGER*1'
3:	'INTEGER*2'
4:	'REAL' or 'REAL*4'
5:	'REAL*8' or 'DOUBLE PRECISION'
6:	'REAL*16'
7:	'COMPLEX'
8:	'COMPLEX*16' or 'DOUBLE COMPLEX'
9:	'COMPLEX*32'
10:	'LOGICAL' or 'LOGICAL*4'
11:	'LOGICAL*1'
12:	'LOGICAL*2'
13:	'BYTE'
14:	'BOOLEAN'
15:	'CHARACTER'

PARAMETER Declarations:

INTEGER	MXLNRC,NLINES
PARAMETER	(MXLNRC=16384, NLINES=10)

INTRINSIC and EXTERNAL Declarations:

	CHARACTER*72	IOERR
	INTRINSIC	INT, REAL, DBLE, CMPLX, MOD, CHAR, ICHAR, MAX, AIMAG, LEN
CDBL	INTRINSIC	DCMPLX, DIMAG
CIBM	INTRINSIC	QEXT, QCMLPX, QIMAG
	EXTERNAL	IOERR

Local Variable Declarations:

	INTEGER	I,J,K,IOS,NRECL,LREC,IFSCR,ITYPE,ICH,NLEN,NCH, JTYPE(20),NBYTES(20),LRECMN,LRECMX
CIBM	INTEGER	IERR,LRECL
CINT1	INTEGER*1	I1(MXLNRC)
	INTEGER*2	I2(MXLNRC)
CINT4	INTEGER*4	I4(MXLNRC)
	REAL	R4(MXLNRC)
CRL4	REAL*4	R4(MXLNRC)
CRL8	REAL*8	R8(MXLNRC)
CIBM	REAL*16	R16(MXLNRC)
	DOUBLE PRECISION	R8(MXLNRC)
	COMPLEX	C8(MXLNRC)
CCM8	COMPLEX*8	C8(MXLNRC)
CCM16	COMPLEX*16	C16(MXLNRC)
	DOUBLE COMPLEX	C16(MXLNRC)
CIBM	COMPLEX*32	C32(MXLNRC)
	LOGICAL	L4(MXLNRC),FL4
	LOGICAL*1	L1(MXLNRC),FL1
CLOG2	LOGICAL*2	
CLOG4	LOGICAL*4	L4(MXLNRC),FL4
	CHARACTER*100	CH(MXLNRC)
	BYTE	B1(MXLNRC)
CUNV	BOOLEAN	BL(MXLNRC)

COMMON Blocks: None

PROGRAM INSTDB

PARAMETER Declarations:

```

      INTEGER      NTEMP,MLIDMX,MOLMAX
      PARAMETER    (NTEMP=5, MLIDMX=45, MOLMAX=26)
  
```

INTRINSIC and EXTERNAL Declarations:

```

      CHARACTER*1  UPCASE
      CHARACTER*72 IOERR
      INTRINSIC    INT, INDEX, LEN, MOD, REAL
      CMIL  INTRINSIC  MVBITS
      EXTERNAL    DEVCBD, PROMPT, CONFIG, UPCASE, IOERR, MOLBND, LCTRIM, RDSCN
      CIBMV EXTERNAL  FILEINF
  
```

Local Variable Declarations:

```

      INTEGER      I, J, K, NREC, IFSEQ, IOS, N, NALT, ICKSUM, LAT, LON,
                   NMOLEC, MOLID, NVA, IVA(30), ICHK, IXM, IDUM, IYM
                   IBIN(250), IALF(250), IMOL(250), IPARAM(295),
                   IFREQ(295), IT, IBLK, IBNDWD, IBLOCK, MTEMP, JBK
      CINT1  INTEGER*1  IBK(6,6), IWTR(6,6)
      INTEGER*2  IBK(6,6), IWTR(6,6)
      INTEGER*2  IALT(6,6)
      CINT  INTEGER    IALT(6,6)
                   IBK(6,6)
                   IWTR(6,6)
      CMIL  INTEGER    IFLD(6,6)
      CIBMV INTEGER    IERBMD
      REAL   SD(NTEMP), OD(NTEMP), CD(NTEMP), DUM, V, DV, ALF,
                   VA(30), VB(30), CIR, SNOW, TERR, TSRF(2),
                   CLCV(2,0:3,2), XLAT, XLON, CLDRAD(2,3,2),
                   GMT(2,2), TBAND(NTEMP), SDU(NTEMP,250),
                   ODU(NTEMP,250), ALTIT, FRWTR
      CHARACTER*1  RESPON, YES
      CHARACTER*10 LBMNTH
      CHARACTER*17 MOLNAM(MLIDMX)
      CHARACTER*80 FILENM(12), FILNMS, FILNMG, FILNMU
      CHARACTER*120 NFILE
      LOGICAL      DEFALT, FLXST
  
```

```

COMMON Blocks:      /DEVCM/ , /DEVICE/
  
```


SUBROUTINE ATMINT

Argument Declarations:

NV - INTEGER Variable (Input) - Number of spectral records
 IFLTR - INTEGER Variable (Input) - Filter index
 Refer to User Reference Manual for definition.
 VI - REAL Variable (Input) - Initial wavenumber (cm^{-1})
 VF - REAL Variable (Input) - Final wavenumber (cm^{-1})
 BW - REAL Variable (Output) - Effective bandwidth (cm^{-1})
 BWL - REAL Variable (Output) - Effective bandwidth (μm)
 NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of
 azimuths for each geometry
 NAZSH - INTEGER Variable (Input) - Number of skyshine azimuths
 NASPCT - INTEGER Vector (Len = Unspecified) (Input) - Number of
 sky/earthshine angles
 NGEOM - INTEGER Variable (Input) - Number of geometries

PARAMETER Declarations:

INTEGER	NAZMAX, NASMAX, NZSMAX, NMATL, NGMAX, MOLMAX
PARAMETER	(NAZMAX=30, NASMAX=15, NZSMAX=4, NMATL=28)
PARAMETER	(NGMAX=15, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
REAL	FILTER
EXTERNAL	FILTER, DEVCBD, IOERR

Local Variable Declaration

INTEGER	M, MM, IV, IOS, IGEOM, IG
REAL	V, DV, FLTR, TAUT(NAZMAX), SIGMET(NAZMAX), TAUSCT(NAZMAX), RADT(NAZMAX), TAUB(NAZMAX), SIGMEB(NAZMAX), TAUSCB(NAZMAX), RADB(NAZMAX), DRADT(NAZMAX), RADSLT(NAZMAX), RADLNT(NAZMAX), DRADB(NAZMAX), RDSLBS(NAZMAX), RDSLST(NAZMAX)

COMMON Blocks: /DEVICE/, /INTSTO/, /MOLNMX/

SUBROUTINE ATMOUT

Argument Declarations:

VI - REAL Vector (Len = Unspecified) (Input) - Initial wavenumber (cm^{-1})
 VF - REAL Vector (Len = Unspecified) (Input) - Final wavenumber (cm^{-1})
 IFLTR - INTEGER Variable (Input) - Index for filter response
 IFLTR = 0 implies a square wave response
 IFLTR = 1 implies a user-defined response
 TFLTR - CHARACTER*(*) Variable (Input) - Title for user-defined filter
 ISMARY - INTEGER Variable (Input) - Summary index

PARAMETER Declarations:

INTEGER NGMAX, NAZMAX, NASMAX, MLMAX, NZSMAX, MAXLAT,
 MAXLON, NVSMAX, ISMX, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 INTRINSIC ABS
 EXTERNAL ATMINT, BCKINT, DEVCBD, GETHDR, ATMPRN, BCKPRN,
 ZROINT, IOERR

Local Variable Declarations:

INTEGER IG, IZ, IOS, IVS, MLO, NVAR (NGMAX)
 REAL BW, BWL, VIP, VFP, ZL (MLMAX), BWB, BWLB,
 LATST (MAXLAT), LONST (MAXLON)
 LOGICAL FLBCKZ
 CHARACTER*40 HEADNG, HEADBK
 CHARACTER*80 TITLE

COMMON Blocks: /BCKDAT/, /CONSTN/, /DEVICE/, /HEADER/

SUBROUTINE BCKINT

Argument Declarations:

NV - INTEGER Variable (Input) - Number of spectral records
 IFLTR - INTEGER Variable (Input) - Filter index
 Refer to User Reference Manual for definition.
 VI - REAL Variable (Input) - Initial wavenumber (cm^{-1})
 VF - REAL Variable (Input) - Final wavenumber (cm^{-1})
 BW - REAL Variable (Output) - Effective bandwidth (cm^{-1})
 BWL - REAL Variable (Output) - Effective bandwidth (μm)
 NAZ - INTEGER Vector (Len = Unspecified) (Input) - Number of azimuths
 NGEOM - INTEGER Variable (Input) - Number of geometries

PARAMETER Declarations:

INTEGER NAZMAX,MLMAX,MAXLAT,MAXLON,NGMAX,MOLMAX
 PARAMETER (NAZMAX=30, MLMAX=140, MAXLAT=3, MAXLON=1)
 PARAMETER (NGMAX=15, MOLMAX=26)

INTRINSIC and EXTERNAL Declarations:

REAL FILTER
 CHARACTER*72 IOERR
 EXTERNAL FILTER,DEV CBD,IOERR

Local Variable Declarations:

INTEGER LB,MM,IV,IOS,IG,IGEOM
 REAL DV,FLTR,V,SIGMEZ(NAZMAX,MLMAX),
 TAUSCZ(NAZMAX,MLMAX),RDSCBZ(NAZMAX,MLMAX),
 RADBZ(NAZMAX,MLMAX),DRADZ(NAZMAX,MLMAX),
 RDSL BZ(NAZMAX,MLMAX),RDLNBZ(NAZMAX,MLMAX),
 TAUBZ(NAZMAX,MLMAX)

COMMON Blocks: /BCKDAT/,/DEVICE/

SUBROUTINE GETHDR

Argument Declarations:

NFILE - INTEGER Variable (Input) - Device number
 ITYPE - INTEGER Variable (Input) - Type of header
 ZBCK - REAL Vector (Len = Unspecified) (Output) - Altitude grid from the
 background header (km)
 SWBCK - REAL Array (Dim = MLMAX x Unspecified) (Output) - Switch for
 availability of background data
 TBCK - REAL Array (Dim = MLMAX x MAXLAT x Unspecified) (Output) -
 Background altitude air temperatures (K)
 NBCKZ - INTEGER Variable (Output) - Number of background altitudes
 ZL - REAL Vector (Len = Unspecified) (Output) - Altitude grid (km)
 MLO - INTEGER Variable (Output) - Number of altitude layers
 NVAR - INTEGER Vector (Len = NGMAX) (Output) - Number of variables in
 record
 LATST - REAL Vector (Len = Unspecified) (Input) - Latitude grid (deg)
 LONST - REAL Vector (Len = Unspecified) (Input) - Longitude grid (deg)

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX,
 NVSMAX, MLMAX, MOLMAX
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MAXLAT=3, MAXLON=1, NVSMAX=20)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MLMAX=140)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 EXTERNAL IOERR

Local Variable Declarations:

INTEGER L, IZ, IOS, KK, LL, NHDR(2), IGEOM

COMMON Blocks: /HEADER/

PROGRAM MRFLTR

PARAMETER Declarations:

INTEGER	NGMAX, NAZMAX, NASMAX, MAXLAT, MAXLON, NVSMAX, MLMAX, NXMAX, ISMX, NZSMAX, MOLMAX
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MLMAX=140, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20, NXMAX=100)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72	IOERR
INTRINSIC	MAX, MIN
EXTERNAL	CNSTNT, ATMOUT, DEVCBD, INITL, RDFLTR, SUMFIL, GETHDR, SETFLG, CONFIG, PROMPT, DBINIT, IOERR

Local Variable Declarations:

INTEGER	LENP (NGMAX) , ISMARY, ISHINE (NGMAX) , NXTRA, IFLTR, NVAR (NGMAX) , IOS, JFILE, ISLPOS, IVS, KFILE
REAL	HXTRA (NXMAX) , VI (NVSMAX) , VF (NVSMAX) , ZBCKZ (MLMAX) , LATST (MAXLAT) , LONST (MAXLON)
CHARACTER*24	TFLTR
CHARACTER*40	HEADNG, FILERT
CHARACTER*80	TITLE

COMMON Blocks: /BCKDAT/, /DEVICE/, /FLAGS/ , /HEADER/, /INITAL/

SUBROUTINE AGUTOL

Argument Declarations:

IAXS	- INTEGER Variable (Input) - Number of the axis IAXS = 1 implies the left axis IAXS = 2 implies the right axis IAXS = 3 implies the bottom axis IAXS = 4 implies the top axis
FUNS	- REAL Variable (Input) - Value of 'AXIS/s/FUNCTION.'
IDMA	- INTEGER Variable (Input) - Direction of the mapping
VINP	- REAL Variable (Input) - Value in one coordinate system
VOTP	- REAL Variable (Output) - Value in other coordinate system

CHARACTER*(*) FUNCTION APPEND

Argument Declarations:

STRNG1 - CHARACTER*(*) Variable - Root string
STRNG2 - CHARACTER*(*) Variable - Additional string

INTRINSIC and EXTERNAL Declarations:

INTEGER	LENSTR
INTRINSIC	LEN, MIN
EXTERNAL	LENSTR

Local Variable Declarations:

INTEGER	IX, IX1, IX2

COMMON Blocks: None

BLOCK DATA PLTBD

PARAMETER Declarations:

INTEGER	NSMX, MLIDMX
PARAMETER	(MLIDMX=45, NSMX=MLIDMX+8)

COMMON Blocks: /CHRPRM/, /PLTPRM/

SUBROUTINE PLTDRV

Argument Declarations:

IFATM - INTEGER Variable (Input) - Atmosphere file number
 IFTRN - INTEGER Variable (Input) - Transmittance file number
 HEADNG - CHARACTER*(*) Variable (Input) - MOSART file header
 TITLE - CHARACTER*(*) Variable (Input) - MOSART file title
 NVG - INTEGER Variable (Input) - Number of spectral points
 IGEOM - INTEGER Variable (Input) - Geometry index number
 ITYPE - INTEGER Variable (Input) - X-axis index
 ITYPE = 1 implies wavelength
 ITYPE = 2 implies wavenumber
 ISCALE - INTEGER Variable (Input) - X-axis scale index
 ISCALE = 1 implies linear
 ISCALE = 2 implies logarithmic
 RES - REAL Variable (Input) - Resolution (cm^{-1})
 RESWL - REAL Variable (Input) - Resolution (μm)
 IVS - INTEGER Variable (Input) - Spectral subset index

PARAMETER Declarations:

INTEGER	NUMPTS, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT,
	MAXLON, ISMX, NVSMAX, NUMCRV, MOLMAX, MLIDMX, NSMX
PARAMETER	(NUMPTS=3000, NUMCRV=5)
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(MLIDMX=45, NSMX=MLIDMX+8)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*1	UPCASE
CHARACTER*72	IOERR
CHARACTER*100	APPEND
INTRINSIC	MAX, MIN, INDEX, LEN
EXTERNAL	IOERR, PROMPT, UPCASE, PLTBD, RDMSRT, APPEND,
	CHRCBD
EXTERNAL	EZMX, AGSETC, AGSETI, AGSETF, AGUTOL

Local Variables

INTEGER	K, L, IOS, IX, IBOT, ITOP, ILAB(5), NVGM, MDX
REAL	ATMINP, RNGLOG
CHARACTER*1	DOLLAR, RESPON
CHARACTER*10	PTHYPT(6)
CHARACTER*46	CHARX
CHARACTER*79	GEOMNM
CHARACTER*100	TITLX, HEADNX, ATMNAM, BKGNAM, DUM

COMMON Blocks: /CHRCNM/, /CHRPRM/, /HEADER/, /PLTPRM/, /RMODAT/

PROGRAM PLTGEN

PARAMETER Declarations:

INTEGER	MLMAX, NVSMAX, MAXLAT, MAXLON, ISMX, NGMAX, NAZMAX, NASMAX, NZSMAX, MOLMAX
PARAMETER	(MLMAX=140, NVSMAX=20, MAXLAT=3, MAXLON=1)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*2	UPCASE
CHARACTER*72	IOERR
INTRINSIC	INDEX, LEN
EXTERNAL	PLTDRV, GETHDR, PROMPT, CONFIG, IOERR, UPCASE, LCTRIM
EXTERNAL	OPNGKS, CLSGKS, AGUTOL

Local Variable Declarations:

INTEGER	K, IOS, IFATM, IVS, NBCKZ, ML0, NVAR(NGMAX), IGEOM, IFTRN, ITYPE, ISCALE
REAL	ZBCKZ(MLMAX), SWBCK(MLMAX, NGMAX), ZL(MLMAX), TBCK(MLMAX, MAXLAT, MAXLON), RES, RESWL, LATST(MAXLAT), LONST(MAXLON)
LOGICAL	FLXST
CHARACTER*2	WLN
CHARACTER*4	SUFFIX, SUFFIT
CHARACTER*40	HEADNG, FILERT
CHARACTER*80	TITLE, FILENM

COMMON Blocks: /HEADER/

SUBROUTINE RDMSRT

Argument Declarations:

IFATM - INTEGER Variable (Input) - Atmosphere file unit number
 IFTRN - INTEGER Variable (Input) - Transmittance file unit number
 NVG - INTEGER Variable (Input) - Number of spectral points
 ITYPE - INTEGER Variable (Input) - X-axis index
 MGEOM - INTEGER Variable (Input) - Number of geometry
 RES - REAL Variable (Input) - Resolution (cm^{-1})
 RESWL - REAL Variable (Input) - Resolution (μm)
 IVS - INTEGER Variable (Input) - Spectral subset index

PARAMETER Declarations:

INTEGER NAZMAX, NASMAX, MLMAX, NUMPTS, NGMAX, NZSMAX,
 MAXLAT, MAXLON, ISMX, NVSMAX, NUMCRV, MOLMAX,
 MLIDMX, NSMX, NDV, NSLTD
 PARAMETER (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
 PARAMETER (MLMAX=140, MAXLAT=3, MAXLON=1)
 PARAMETER (MOLMAX=26, ISMX=MOLMAX+8)
 PARAMETER (MLIDMX=45, NSMX=MLIDMX+8)
 PARAMETER (NUMPTS=3000, NUMCRV=5, NVSMAX=20)
 PARAMETER (NDV=200, NSLTD=3*NAZMAX*(1+ISMX))

INTRINSIC and EXTERNAL Declarations:

CHARACTER*72 IOERR
 INTRINSIC MAX, MIN, MOD
 EXTERNAL IOERR, PLTBD, SLITFN

Local Variable Declarations:

INTEGER J, K, M, N, MM, IOS, IG, IGEOM, JP, JJ, MJ, MJM, IS, JMOD,
 IV, JPM, ISP
 REAL DVW, SIGMEB, RADT(NAZMAX), DRADT, RADSLT, RESX, V0,
 RADB(NAZMAX), DRADB, TAUSH, RADSH, RADSE, RADLNT,
 RADSS, RADSC, RDSLST(NAZMAX), RDSLSE(NAZMAX),
 RADBE(NAZMAX), RADBR(NAZMAX), RADSD, TAUSCB,
 DVWL, TAUT(NAZMAX), TM(3, NAZMAX, NSMX), TAUTX,
 TAUB(NAZMAX), T2, T3, XSLIT(NSLTD), V(NDV),
 SLIT(NDV, NSLTD), DV(NDV), SUMSLT(NDV)

COMMON Blocks: /HEADER/, /PLTPRM/, /RMODAT/

SUBROUTINE COLOR

Argument Declarations:

WL - REAL Variable (Input) - Wavelength (μm)
X - REAL Variable (Output) - First CIE response curve
Y - REAL Variable (Output) - Second CIE response curve
Z - REAL Variable (Output) - Third CIE response curve

PARAMETER Declarations:

INTEGER MPTS
PARAMETER (MPTS=83)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC INT, MAX, MIN, REAL

Local Variable Declarations:

INTEGER M, MP
REAL XCIE(MPTS), YCIE(MPTS), ZCIE(MPTS), FAC

COMMON Blocks: None

SUBROUTINE HUMAN

Argument Declarations:

V - REAL Vector (Len = *) (Input) - Wavenumber array (cm^{-1})
FILTER - REAL Vector (Len = *) (Output) - Spectral filter ($1/w$)
BCKGND - REAL Vector (Len = *) (Input) - Spectral background ($W/\text{sr}/\text{cm}^{-1}$)
NPTS - INTEGER Variable (Input) - Number of spectral points
WTLUMN - REAL Variable (Output) - Filter normalization (w/l)

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MAX, MIN, LOG
REAL XTERP
EXTERNAL XTERP

Local Variable Declarations:

INTEGER I, IV, I1, I2, IVM, IVP
REAL WL(45), RESP(45, 9), BCKLVL(9), CLPW(9),
F1, F2, FAC, DV, DUM, BCKINT(9), WLO, CP, FLTLUX

COMMON Blocks: None

SUBROUTINE NRMLZ

Argument Declarations:

X - REAL Variable (Input/Output) - First CIE response curve
Y - REAL Variable (Input/Output) - Second CIE response curve
Z - REAL Variable (Input/Output) - Third CIE response curve

Local Variable Declarations:

REAL SUM

COMMON Blocks: None

SUBROUTINE SUMIT

Argument Declarations:

R - REAL Variable (Input/Output) - Summed value with weight FILTER (xx)
RX - REAL Variable (Input/Output) - Summed value with weight X (xx)
RY - REAL Variable (Input/Output) - Summed value with weight Y (xx)
RZ - REAL Variable (Input/Output) - Summed value with weight Z (xx)
RV - REAL Variable (Input) - Spectral function (xx/cm⁻¹)
FILTER - REAL Variable (Input) - Basic filter function
DV - REAL Variable (Input) - Spectral increment (cm⁻¹)
X - REAL Variable (Input) - First CIE response curve
Y - REAL Variable (Input) - Second CIE response curve
Z - REAL Variable (Input) - Third CIE response curve

PROGRAM VISUAL

PARAMETER Declarations:

```

INTEGER      NGMAX, NAZMAX, NASMAX, NZSMAX, NVMAX, MLMAX,
              MAXLAT, MAXLON, ISMX, NVSMAX, MOLMAX, MLIDMX
PARAMETER    (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER    (NVMAX=3600, MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER    (MLMAX=140, MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER    (MLIDMX=45)

```

INTRINSIC and EXTERNAL Declarations:

```

CHARACTER*72  IOERR
INTRINSIC     REAL, DBLE, SQRT, COS, SIN
EXTERNAL      CNSTNT, DEVCBD, HUMAN, COLOR, SUMFIL, GETHDR,
              NRMLZ, SUMIT, PROMPT, CONFIG, SETFLG, IOERR, FILRT

```

Local Variable Declarations:

```

INTEGER      I, K, M, IOS, IG, IV, MM, IVS, NBCKZ, ML0, NVAR (NGMAX),
              IGP, IGEOM, IDUM
REAL         V (NVMAX), DV (NVMAX), FILTER (NVMAX), SGMEBT, RADBZ,
              ZBCK (MLMAX), SWBCK (MLMAX, NGMAX), WL, RADBT, WL1,
              TAUT (NVMAX, NAZMAX), DRADT (NVMAX, NAZMAX), TAU1,
              RADSLT (NVMAX, NAZMAX), TAUSCT (NVMAX, NAZMAX),
              RADLNT (NVMAX, NAZMAX), TAUB (NVMAX, NAZMAX), TAU2,
              SIGMET (NVMAX, NAZMAX), RADBCK (NVMAX, NAZMAX),
              RADSH (NASMAX), SIGMEB (NVMAX, NAZMAX), RADBY, WL2,
              TAUSCB (NVMAX, NAZMAX), TAUSH, X, Y, Z, WTLUMN, RAD1,
              RADSS (NASMAX, NZSMAX), DRADTT, DRADBT, SGMETT,
              RADSC (NASMAX, NZSMAX), DRADB (NVMAX, NAZMAX),
              RADSE (NASMAX, NZSMAX), RADSD (NVMAX, NAZMAX),
              RDSLST (NVMAX, NAZMAX), RDSLSTB (NVMAX, NAZMAX),
              RADB (NVMAX, NAZMAX), RADBX, RDLNT, RSLSTT, RADBET,
              RADBE (NVMAX, NAZMAX), RADBR (NVMAX, NAZMAX), DUM,
              RADT (NVMAX, NAZMAX), RAD2, TASCST, TASCST, RDSLST,
              RADBRT, RSLSTB, RADSDT, BW, BWL, XP (11), YP (11),
              ZP (11), TBCK (MLMAX, MAXLAT, MAXLON), ZL (MLMAX),
              LATST (MAXLAT), LONST (MAXLON)
DOUBLE PRECISION RE, REPOL, REEQU
CHARACTER*24  TFLTR
CHARACTER*40  HEADNG, FILERT
CHARACTER*45  TLBL (18)
CHARACTER*80  TITLE, FILENM (14)

```

```

COMMON Blocks:      /CONSTN/, /DEVICE/, /FLAGS/, /HEADER/, /MOLECP/,
                    /USERNM/

```

PROGRAM FACET

PARAMETER Declarations:

INTEGER	NNMAX, NRMAX, NAZMAX, NASMAX, NGMAX, NZSMAX, MAXLAT, MAXLON, ISMX, NVSMAX, MLMAX, MOLMAX, NRMFMAX, NSPCT, NZSH, MLIDMX
PARAMETER	(NNMAX=3, NRMAX=4, MLMAX=140)
PARAMETER	(NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER	(MAXLAT=3, MAXLON=1, NVSMAX=20)
PARAMETER	(MOLMAX=26, ISMX=MOLMAX+8, MLIDMX=45)
PARAMETER	(NRMFMAX=80, NSPCT=181, NZSH=361)

INTRINSIC and EXTERNAL Declarations:

REAL	GETVAR, SHADOW, FILTER, XTERP, SURFAC
CHARACTER*3	UPCASE
CHARACTER*4	LWCASE
CHARACTER*72	IOERR
INTRINSIC	CMPLX, SQRT, COS, SIN, ACOS, ATAN2, REAL, INT, MAX, MIN, ABS
EXTERNAL	GETVAR, RDLIN, PARSE, UPCASE, SURFAC, CONFIG, CNSTNT, SHADOW, FILTER, RDLFTR, DEVCBD, INFLBD, LWCASE, XTERP, SETFLG, SUMFIL, GETHDR

Local Variable Declarations:

INTEGER	I, K, M, N, NBCKZ, ML0, NVAR (NGMAX), IOS, NN, IGEOM, MM, IV, IVS, IG, NPHI, NTHETA, IP, IT, IFLTR, MINV, NSPCTP, NZSHP, IGRID
REAL	XNORM (NNMAX), RINDEX, IINDEX, ZBCK (MLMAX), V, DV, SWBCK (MLMAX, NGMAX), SIGNAT (NAZMAX), TBCK (MLMAX, MAXLAT, MAXLON), ZL (MLMAX), A, B, TAUT (NAZMAX), SIGMET (NAZMAX), TAUSCT (NAZMAX), RADT (NAZMAX), RADSLT (NAZMAX), RADLNT (NAZMAX), TAUB (NAZMAX), SIGMEB (NAZMAX), TAUSCB (NAZMAX), RADB (NAZMAX), DRADT (NAZMAX), DRADB (NAZMAX), RDSLST (NAZMAX), RDSLSTB (NAZMAX), RADBE (NAZMAX), RADBR (NAZMAX), RADSD (NAZMAX), FLTR, VPM, VPP, TAREA (NGMAX, NAZMAX), BKGD (NGMAX, NAZMAX), UP, VP, TAUSH (NASMAX, NZSMAX), CNTRST, DUMAZ (NZSMAX), RADSH (NASMAX, NZSMAX), SNORM (3), PROJA, TNORM, RADSE (NASMAX, NZSMAX), APPS (NGMAX, NAZMAX), PATH (NGMAX, NAZMAX), DPHI, DTHETA, ASH (NZSH), RADSS (NASMAX, NZSMAX), DAREA, DUM, OBS (3), WL2, RADSC (NASMAX, NZSMAX), RCNTR, PSH (NSPCT), WL1, RADSHN (NSPCT, NZSH), ECCEN, LATST (MAXLAT), RSH (NZSH), PSHI (NASMAX), BW (NGMAX), BWL (NGMAX), RSHM (NASMAX, NZSH), LONST (MAXLON)
LOGICAL	FLTMP
CHARACTER*1	DOT, DUMMY
CHARACTER*24	TFLTR, TFLTR0, TFLTRX, GRID (3), REFT (3), RGH (2)
CHARACTER*25	SHAPE (4)
CHARACTER*40	VRDATA (NRMAX), HEADNG, NFFCT
CHARACTER*80	TITLE
CHARACTER*255	VARIAB, FILENM, FILNAM

COMMON Blocks: /CONSTN/, /DEVICE/, /HEADER/, /MATRLD/, /MOLECP/, /USERNM/

REAL FUNCTION ROUGH

Argument Declarations:

HSIGMA - REAL Variable - Standard deviation of the heights on the
reflective surface
WL - REAL Variable - Wavelength (same units as HSIGMA)
PSI - REAL Variable - Elevation angle at the surface (deg)
ITYPE - INTEGER Variable - Type of surface
ITYPE = 0 implies a plane wave on a Gaussian distribution
of stepped surfaces
Otherwise, it implies a spherical wave on a Gaussian
distribution of sinusoidal surfaces

INTRINSIC and EXTERNAL Declarations:

REAL	EHBSL0
INTRINSIC	SIN, EXP
EXTERNAL	EHBSL0

Local Variable Declarations:

REAL	DUM

COMMON Blocks: /CONSTN/

REAL FUNCTION SURFAC

Argument Declarations:

V - REAL Variable (Input) - Wavenumber (cm^{-1})
 DV - REAL Variable (Input) - Wavenumber increment (cm^{-1})
 XNORM - REAL Vector (Len = Unspecified) - Surface normal vector
 HSOLAR - REAL Variable - Spectral solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 SOLAZ - REAL Variable - Azimuth angle of incident solar radiation (deg)
 SOLEV - REAL Variable - Elevation angle of incident solar radiation (deg)
 HLUNAR - REAL Variable - Spectral lunar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
 XLUNAZ - REAL Variable - Azimuth angle of incident lunar radiation (deg)
 XLUNEV - REAL Variable - Elevation angle of incident lunar radiation (deg)
 HSHINE - REAL Array (Dim = NASMAX x Unspecified) - Skyshine radiance
 ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
 PHISH - REAL Vector (Len = Unspecified) - Skyshine elevation angles (deg)
 NASPCT - INTEGER Variable - Number of skyshine elevation angles
 NASMAX - INTEGER Variable - Maximum number of skyshine elevation angles
 AZSH - REAL Vector (Len = Unspecified) - Skyshine azimuth angles (deg)
 NAZSH - INTEGER Variable - Number of skyshine azimuths
 TAU - REAL Variable - Transmittance observer-facet
 TAIR - REAL Variable - Air temperature (K)
 PHIRF - REAL Variable - Elevation angle of reflected line of sight at the
 facet (deg)
 AZIM - REAL Variable - Observer azimuthal angle (deg)

PARAMETER Declarations:

INTEGER NRFXMAX
 PARAMETER (NRFXMAX=80)

INTRINSIC and EXTERNAL Declarations:

REAL XTERP, PLANCK, BDRF, SHADOW, ROUGH
 COMPLEX REFEST
 INTRINSIC SQRT, REAL, DBLE, DPROD, ABS, SIN, COS, MAX, MIN, CMPLX,
 ATAN2, ACOS, ASIN
 EXTERNAL XTERP, PLANCK, FRESNL, BDRF, REFEST, DIREMS, PROFAC,
 ROUGH

Local Variable Declarations:

INTEGER I, K, ITRP0, KEY, KEYP, M, MM, MP, MMM, MMP, NLayer
 REAL WL, REFLS, REFL, RFN, EMIS, PLK, FAC, AZLUN,
 REFLX, EMV, EMH, TMPLYR(0:3), UOBS(3), USOL(3),
 ULUN(3), POBS, PSOL, PLUN, XOBS, XSOL, XLUN, AZSOL,
 SLOPE, SHDWS, SHDWL, XOS, XOL, USHN(3), XSHN,
 YNORMO, YNORMS, YNORML, FRACSP, DEP(0:3), ZNORM(3)
 DOUBLE PRECISION EM, RF, RTERS, RTERL, RTERSH, DSNP, DAZSH
 COMPLEX DIELEC, XMUC, INAIR(2), INMAT(0:2), REFR, EPSX, RH,
 RV, TV, TH, EPSA

COMMON Blocks: /CONSTN/, /MATRLD/

SUBROUTINE COEFF

Argument Declarations:

BUF - REAL Array (Dim = NX x Unspecified) (Output) - Array containing
 packed scene Fourier coefficients
 NX - INTEGER Variable (Input) - Number of pixels in x direction
 NY - INTEGER Variable (Input) - Number of pixels in y direction
 DX - REAL Variable (Input) - Resolution in x
 DY - REAL Variable (Input) - Resolution in y
 KOX - REAL Variable (Input) - PSD frequency scale in x direction
 KOY - REAL Variable (Input) - PSD frequency scale in y direction
 ALPHA - REAL Variable (Input) - PSD power law index
 VAR - REAL Variable (Input) - Desired scene variance

INTRINSIC and EXTERNAL Declarations:

REAL	GAUS
INTRINSIC	SQRT, REAL
EXTERNAL	GAUS

Local Variable Declarations:

INTEGER	I, J, NX2, NY2, NX1, NY1, I1, J1, IP
REAL	KX, KY, SQT2, RMAXX, RMAXY, RMAX2, DKAPX, DKAPY, PSD2D, STDV, A, B

COMMON Blocks: /CONSTN/

REAL FUNCTION CORF

Argument Declarations:

CORL - REAL Variable - Correlation length
 K0 - REAL Variable - PSD frequency scale
 ALPHA - REAL Variable - PSD power law index

INTRINSIC and EXTERNAL Declarations:

REAL	KNU, GAMMA
EXTERNAL	KNU, GAMMA

Local Variable Declarations:

REAL	NU, X

COMMON Blocks: None

SUBROUTINE FM2D

Argument Declarations:

X - REAL Array (Dim = NMAX x Unspecified) (Input/Output) - Scene matrix. It assumed that the y-dimension is at least as large as the x-dimension
N - INTEGER Variable (Input) - Number of pixels in x direction. The scene is assumed to be square
NMAX - INTEGER Variable (Input) - Maximum x-dimension of X
SIGMA - REAL Variable (Input) - Standard deviation of scene
H - REAL Variable (Input) - Sceling parameter defined by $H=3-D$, where D is the fractal dimension
FLADD - LOGICAL Variable (Input) - Switch for determining if random additions are to be included

INTRINSIC and EXTERNAL Declarations:

REAL GAUS
EXTERNAL GAUS

Local Variable Declarations:

INTEGER IX,IY,ND,ND2,MAXLVL,ISTAGE,NM
REAL DELTA

Statement Function Declarations:

REAL F3,F4,X0,X1,X2,X3

COMMON Blocks: None

SUBROUTINE FOUR1

Argument Declarations:

PDATA - REAL Vector (Len = Unspecified) (Input/Output) - One-dimensional complex (i.e., the real and imaginary parts adjacent in storage) whose length $NN=2**K$, $K \geq 0$ (if necessary append zeroes to the data). Transform values are returned in array PDATA, replacing the input.
NN - INTEGER Variable (Input) - Length of PDATA
ISIGN - INTEGER Variable (Input) - +1 or -1 for finite FFT or its inverse. One of these followed by the other results in the original data multiplied by NN.

Local Variable Declarations:

INTEGER I,J,M,N,MMAX,ISTEP
REAL TEMPR,TEMPI,THETA,SINTH,WSTPR,WSTPI,WR,WI

COMMON Blocks: /CONSTN/

REAL FUNCTION GAMMA

Argument Declarations:

X - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL

Local Variable Declarations:

INTEGER I,N
REAL A(5),Y,Y1

COMMON Blocks: None

REAL FUNCTION GAUS

Argument Declarations:

STD - REAL Variable - Standard deviation

INTRINSIC and EXTERNAL Declarations:

EXTERNAL RUNIF

Local Variable Declarations:

INTEGER I,N
REAL T(33),DUM,RAND

COMMON Blocks: None

REAL FUNCTION KNU

Argument Declarations:

NU - REAL Variable - Index
X - REAL Variable - Argument

INTRINSIC and EXTERNAL Declarations:

REAL GAMMA
INTRINSIC MAX,REAL,LOG,EXP
EXTERNAL GAMMA

Local Variable Declarations:

INTEGER I,N
REAL T,T0,DT,SUM,C

COMMON Block Declarations: /CONSTN/

SUBROUTINE RUNIF

Argument Declarations:

- T - REAL Vector (Len = Unspecified) (Input/Output) - Array of ABS(N)+1 random numbers from a previous invocation of RUNIF. Whenever N is positive and differs from the old N, the table is initialized. The first ABS(N) numbers are the table discussed in the reference, and the (N+1)-st value is Y. This array may be saved in order to restart a sequence.
- N - INTEGER Variable (Input) - ABS(N) is the number of random numbers in an auxiliary table. Although ABS(N)+1 is the number of items in array T. If N is positive and differs from its value in the previous invocation, then the table is initialized for the new value of N. If N is negative, ABS(N) is the number of items in an auxiliary table, but the tables are now assumed already to be initialized. This option enables the user to save the table T at the end of a long computer run and to restart with the same sequence. Normally, RUNIF would be called at most once with negative N. Subsequent invocations would have N positive and of the correct magnitude.
- X - REAL Variable (Output) - Random number between 0.0 and 1.0.

INTRINSIC and EXTERNAL Declarations:

REAL	UNI
INTRINSIC	ABS,INT
EXTERNAL	UNI

Local Variable Declarations:

INTEGER	I,J,NOLD
REAL	DUMMY

COMMON Blocks: None

REAL FUNCTION SCALE

Argument Declarations:

- CORL - REAL Variable - Correlation length
- ALPHA - REAL Variable - PSD slope

INTRINSIC and EXTERNAL Declarations:

REAL	CORF
INTRINSIC	EXP
EXTERNAL	CORF

Local Variable Declarations:

INTEGER	N
REAL	C,CON,SCMIN,SCMAX,SCL

COMMON Blocks: None

PROGRAM SCNGEN

PARAMETER Declarations:

INTEGER	NX,NY,NZ,NXP,NYP,NPTS,NXT2,NMATL,NXTILE,NYTILE, NOVRX,NOVRY
PARAMETER	(NX=1024, NY=NX, NXP=NX+1, NYP=NY+1)
PARAMETER	(NPTS=NX*NY)
PARAMETER	(NXTILE=128, NYTILE=NXTILE)
PARAMETER	(NOVRX=20, NOVRY=NOVRX)
PARAMETER	(NXT2=2*NX, NZ=1)
PARAMETER	(NMATL=100)

INTRINSIC and EXTERNAL Declarations:

INTEGER	IGTINT
REAL	UNI, SCALE, GETVAR, XTERP
CHARACTER*1	UPCASE
CHARACTER*3	LWCASE
CHARACTER*72	IOERR
INTRINSIC	MAX, MIN, REAL, INT, ABS, SIN, LEN
EXTERNAL	UNI, SCALE, COEFF, TDFFT, GETVAR, RDLIN, PARSE, FM2D, IGTINT, PROMPT, CONFIG, UPCASE, LWCASE, CNSTNT, IOERR, TILEIT, XTERP

Local Variable Declarations:

INTEGER	I, IX, IY, IOS, IFSCN, IFINP, IFMSK, NDUM, NCOLM, NROWM, INDX(NMATL), IM, NMAT, IXM, IYM, IFCLD, IXC, IYC, NCP, NROWC, NCOLC, NO, LVAR, NXUSER, NYUSER, NRECL, IROW, NGRID
REAL	KOX, KOY, DUM, DX, DY, SEED, SIG, SIGMA, RESMKY, RY, ALPHA(0:NMATL), RESMKX, CMIN, VAR(0:NMATL), SCN, SCNMN(0:NMATL, 2), FRACT(NMATL), CMAX, H, PSDPWR, XMIN, XMAX, CUMFRC, DPTS, WTMSK(0:NMATL), CLDCVR, RESCLD, ELEV, CORLEN(0:NMATL), ROW(NX), TRN, RTRAN(NX), RPATH(NX), RSTDV(NX), REFTRN
LOGICAL	FLADD, MSKADD, CLDADD, FLGRD
CHARACTER*1	DOT
CHARACTER*20	VRDATA(8)
CHARACTER*40	FILENM
CHARACTER*80	DUMMY
CHARACTER*255	VARIAB, NFSCN, NFMSK, NFCLD
CHARACTER*1024	BUFF

COMMON Blocks: /CONSTN/, /PIXEL/

SUBROUTINE TDFFT

Argument Declarations:

BUF - REAL Array (Dim = NX x Unspecified) (Input/Output) - Upon input, BUF is the packed array of scene Fourier coefficients. Upon output, BUF is the random, correlated background fluctuations.
 NX - INTEGER Variable (Input) - Number of pixels in x direction
 NY - INTEGER Variable (Input) - Number of pixels in y direction
 ARR - REAL Vector (Len = Unspecified) - Work space
 UNPCK - REAL Vector (Len = Unspecified) - Work space

INTRINSIC and EXTERNAL Declarations:

EXTERNAL FOUR1

Local Variable Declarations:

INTEGER I, J, ISGN, NX2, NY2, NSORT, IP, JP, IJ
 REAL SAVE

COMMON Blocks: None

SUBROUTINE TILEIT

Argument Declarations:

X - REAL Array (Dim = NXMAX x Unspecified) (Output) - Large array
 NX - INTEGER Variable (Input) - Number of x-elements for X
 NXMAX - INTEGER Variable (Input) - Maximum number of x-elements for X
 NY - INTEGER Variable (Input) - Number of y-elements for X
 TILE - REAL Array (Dim = NTXMAX x Unspecified) (Input) - Small array
 NTX - INTEGER Variable (Input) - Number of x-elements for TILE
 NTXMAX - INTEGER Variable (Input) - Maximum number of x-elements for TILE
 NTY - INTEGER Variable (Input) - Number of y-elements for TILE
 NOVRX - INTEGER Variable (Input) - Number of overlappine elements at the edge in the x-direction
 NOVRY - INTEGER Variable (Input) - Number of overlappine elements at the edge in the y-direction

INTRINSIC and EXTERNAL Declarations:

INTRINSIC REAL, MOD

Local Variable Declarations:

INTEGER IX, IY, ITX1, ITX2, ITY1, ITY2
 REAL FACX, FACY

COMMON Blocks: None

REAL FUNCTION UNI

Argument Declarations:

R - REAL Variable - Argument
If R=0., the next random number of the sequence is generated.
If R<0., the last generated number will be returned for possible use in a restart procedure.
If R>0., the sequence of random numbers will start with the seed R mod 1. This seed is also returned as the value of UNI provided the arithmetic is done exactly.

INTRINSIC and EXTERNAL Declarations:

INTRINSIC MOD, INT

Local Variable Declarations:

INTEGER IA1, IA0, IA1MA0, IC, IX1, IX0, IY1, IY0

COMMON Blocks: None

INTEGER FUNCTION NCHTER

Argument Declarations:

CHVAR - CHARACTER*(*) Variable - Model atmosphere identifier

PARAMETER Declarations:

INTEGER NMATL
PARAMETER (NMATL=76)

INTRINSIC and EXTERNAL Declarations:

CHARACTER*10 UPCASE
INTRINSIC LEN, MIN
EXTERNAL LCTRIM, UPCASE

Local Variable Declarations:

INTEGER I, J, LMAX
CHARACTER*10 CHTER(0:NMATL, 2), CHVARP

COMMON Blocks: None

SUBROUTINE RDUSRM

Argument Declarations:

IMATL - INTEGER Variable (Input) - Material index
 IFILE - INTEGER Variable (Input) - File unit number
 IEND - INTEGER Variable (Output) - End of file switch
 LABEL - CHARACTER*(*) Variable (Output) - Material label
 HTALF - REAL Variable (Output) - Solar absorptivity
 HTEP - REAL Variable (Output) - Thermal emissivity
 CHRLN - REAL Variable (Output) - Characteristic length (m)
 IHTFL - INTEGER Variable (Output) - Heat calculation flag
 SPHT - REAL Variable (Output) - Specific heat (W-sec/gm/K)
 HCND - REAL Variable (Output) - Thermal conductivity (W/m/K)
 DNSTY - REAL Variable (Output) - Density (gm/m³)
 ZLYRR - REAL Vector (Len = Unspecified) (Output) - Layer thickness (m)
 INLYR - INTEGER Vector (Len = Unspecified) (Output) - Layer index

PARAMETER Declarations:

INTEGER NMATL, MAXLAT, MAXLON
 PARAMETER (NMATL=76, MAXLAT=3, MAXLON=1)

INTRINSIC and EXTERNAL Declarations:

INTEGER NCHTER
 REAL GETVAR
 CHARACTER*3 UPCASE
 EXTERNAL GETVAR, RDLINE, UPCASE, BKGDBD, NCHTER

Local Variable Declarations:

INTEGER MTLDEF
 CHARACTER*255 VARIAB

COMMON Blocks: /BACKGD/

PROGRAM TERTEM

PARAMETER Declarations:

```

INTEGER      NMATL, NTIME, NLayer, MAXLAT, MAXLON, MOLMAX, NALTMX,
              MSURF, NGMAX, MLMAX, NSLPMX, NAZMAX, NASMAX, ISMX,
              NZSMAX, NVSMAX, MLIDMX, NL
PARAMETER    (NGMAX=15, NAZMAX=30, NASMAX=15, NZSMAX=4)
PARAMETER    (MOLMAX=26, ISMX=MOLMAX+8)
PARAMETER    (NVSMAX=20, NMATL=76, NTIME=500, MLMAX=140)
PARAMETER    (NLayer=20, NALTMX=11, MSURF=14, NSLPMX=3)
PARAMETER    (MAXLAT=3, MAXLON=1, MLIDMX=45)
PARAMETER    (NL=50)

```

INTRINSIC and EXTERNAL Declarations:

```

INTEGER      IGTINT
REAL          SEATMP, XTERP, GETVAR, SATUR
CHARACTER*3  UPCASE
CHARACTER*4  LWCASE
CHARACTER*72 IOERR
INTRINSIC    SIN, MAX, MIN, REAL, ABS, COS, SQRT, MOD
EXTERNAL     CNSTNT, CONFIG, FILRT, GETHDR, GETVAR, GETVEC, HTBLNC,
              IGTINT, INTR2D, IOERR, PARSE, EXMLBD, PROFAC, PROMPT,
              RDLINE, SEATMP, SPCLYR, UPCASE, XTERP, DEVCBD, BKGDBD,
              CHRCBD, SATUR, ATMSBD, LWCASE, RDUSRM, AECALC

```

Local Variable Declarations:

```

INTEGER      I, J, K, L, M, MTL, ITM, NSTAB, IOS, KK, LL, IDUM, LY,
              NBCKZ, ML0, NVAR (NGMAX), NALT, NSLP, NSURF, NTMP,
              KEYT, KEYTP, NVARMX, NVARX, SCNDX (22), JJ, MTLX,
              KS, NMTLT, NMTL0, MTIME
REAL          DECTIM (NTIME), DELTIM, RFDS (NALTMX, NTIME, MSURF),
              SOLAZT (NTIME), SOLEVT (NTIME), ALT (NALTMX),
              LTEMP (NTIME), TSRF (NALTMX, NTIME, NMATL, MSURF),
              TAIRLC (NALTMX, NTIME), STABRS, TSSL (NALTMX),
              TLYR (10, NTIME), FACTOR (MAXLAT, MAXLON), BSWI,
              WINDLC (NALTMX, NTIME), PAIRLC (NALTMX, NTIME),
              TPLYR (0:NLayer+1), BSW1, BSW2, DTMAX,
              SPHLYR (0:NLayer+1), DENLYR (0:NLayer+1),
              HTCLYR (0:NLayer+1), ZLYR (0:NLayer+1), BSWF,
              DUMLYR (2, NLayer+1), YNORM (3),
              XNORM (3, MSURF), PLYR (10, NTIME), AZM (4), DSWI,
              BSWZL (10, NTIME), DSWZL (10, NTIME), DSW1, DSW2,
              DLWZL (10, NTIME), BSW, DSW (NALTMX, NTIME), DLWI,
              DLW (NALTMX, NTIME), WNDLYR (10, NTIME), DLWF, DSWF,
              ZLYR (10), ULWZ (10), DLWZ (10), DLW1, DLW2, SOLAZI,
              USWZ (10), DSWZ (10), BSWZ (10), FRTEMP (NALTMX),
              ZBCK (1), SWBCK (MLMAX, 1), TBCK (MLMAX, MAXLAT, 1),
              ZL (1), SLOPE (NSLPMX), SOLEVI, SOLAZF, SOLEVF,
              RFDSI, RFDSF, TAIR1, TAIR2, TAIRI, TAIRF, FACTIM,
              PAIR1, PAIR2, PAIRI, PAIRF, WIND1, WIND2, WINDI
REAL          WINDF, ALTX, SLEV, SLAZ, TIMELP, TFINAL, TINIT,
              TIMEL, SCNCMP (4, NMATL), RHLR (10, NTIME),
              TMPCMP (NALTMX, NTIME, MSURF, 4), CMOL (MLIDMX),
              SUMC, RHX, CH2O (10, NTIME)
LOGICAL       FLSUN, FLINI, FLUSR
CHARACTER*1   DOT
CHARACTER*40  HEADNG, FILERT, VRSUB (8)
CHARACTER*80  TITLE, FILENM (19), FILNM, DUMMY
CHARACTER*255 VARIAB

```

```

COMMON Blocks:  /ATMDAT/, /BACKGD/, /CHRCNM/, /CONSTN/, /DEVICE/,
                 /EXTMOL/, /HEADER/

```


4.2 Static Variables

All local variables, with the exceptions noted below, are dynamic (except for variables initialized by a DATA statement). All COMMON blocks are SAVED in each routine in which the COMMON block appears; hence, all variables in COMMON blocks are static.

As stated above, a few local variables are static (via a SAVE statement). These variables and their routines are:

SUBROUTINE ABSMOL:	VDUM, IBIN, IMOL, SDZ, IALF, ODZ, NRECU
SUBROUTINE BMOD:	ISWX, KEYWL, KEYMLP, FAC, TS, TSS, AD0, MLOLD, PRTN0
SUBROUTINE CKSTAT:	ICOUNT
SUBROUTINE CXDTA:	IND
REAL FUNCTION GAUS:	T
SUBROUTINE MIEPHS:	ISWTCH, PCTP
SUBROUTINE MLSCAT:	TAPU, SCTI, SCT3
SUBROUTINE PHFUNC:	WLY, JWL, JWLP, FACWL
SUBROUTINE PHYDRO:	WLY, KWL, KWLP, FACTP
SUBROUTINE PHTOSB:	PLK1, DPLK1
SUBROUTINE RAINSP:	KEYWL
SUBROUTINE RDGBL:	IPRINT
SUBROUTINE RDSCN:	IPRINT
SUBROUTINE RUNIF:	NOLD
SUBROUTINE SETBCK:	ISTORE
SUBROUTINE SNOWSP:	KEYWL
SUBROUTINE STRCNZ:	CN2BCK, VV0

REAL FUNCTION UNI: IX1, IX0

REAL FUNCTION XTERP: KEY

REAL FUNCTION ZODICL: ISW, NORDER, RT, WT

5.0 COMMON BLOCK DATA DICTIONARY

The data dictionary for the COMMON blocks in the MOSART program and related utility codes follow. A brief summary of the COMMON block contents is included, together with a list of routines in which the block occurs. Each variable is listed by name, array size (if applicable), variable type, and a description. See the PARAMETER Data Dictionary for those arrays whose size is defined by a PARAMETER constant.

All COMMON blocks are SAVEd in each routine in which it appears, so all of the variables are static.

AEROSL

This COMMON block contains the aerosol model parameters and the phase functions for the various atmospheric components.

Common Block AEROSL used in:

AERSOL	ARSLBD	BBARSL	BNDPAR	HYDROM	MARINE
PHFUNC	PHYDRO	PRCALC	RSHINE		

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
WLA(NWLCLD)	REAL	Wavelength (μm)
NRH(30)	INTEGER	Number of relative humidity values
RHP(4,30)	REAL	Relative humidity
ANGLE(NANG)	REAL	Scattering angles (deg)
SCPHA(NANG)	REAL	Aerosol phase function (sr^{-1})
SCPHH(NANG)	REAL	Hydrometer phase function (sr^{-1})
ASYMD(47)	REAL	Asymmetry factor
TMPAMM (4)	REAL	Water cloud temperatures (K)
TMPIMM (4)	REAL	Ice cloud temperatures (K)
NTMP (30)	INTEGER	Number of temperatures used for a cloud

AERSCA

This COMMON block contains the absorption and scattering coefficients for the atmospheric aerosols as a function of wavelength and altitude, together with the keys and proportionality factors for relative humidity.

Common Block AERSCA used in:

AERSOL BBARSL BNDPAR PHFUNC

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SCAERO(NWLAER, MLMAX)	REAL	Aerosol scattering coefficient (km^{-1}) as a function of wavelength and altitude
ABAERO(NWLAER, MLMAX)	REAL	Aerosol absorption coefficient (km^{-1}) as a function of wavelength and altitude
JRH(MLMAX)	INTEGER	First index for relative humidity
JRHP(MLMAX)	INTEGER	Second index for relative humidity
FACRH(MLMAX)	REAL	Proportional value between first and second indices

AERSCC

This COMMON block contains the absorption and scattering coefficients as a function of wavelength and altitude.

Common Block AERSCC used in:
BNDPAR HYDROM

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ABCLOU(NWLCLD, MLMAX)	REAL	Water cloud absorption coefficient (km^{-1}) as a function of wavelength and altitude
SCCLOU(NWLCLD, MLMAX)	REAL	Water cloud scattering coefficient (km^{-1}) as a function of wavelength and altitude
ABCIRR(NWLCLD, MLMAX)	REAL	Cirrus cloud absorption coefficient (km^{-1}) as a function of wavelength and altitude
SCCIRR(NWLCLD, MLMAX)	REAL	Cirrus cloud scattering coefficient (km^{-1}) as a function of wavelength and altitude
ABCICE(NWLCLD, MLMAX)	REAL	Ice cloud absorption coefficient (km^{-1}) as a function of wavelength and altitude
SCCICE(NWLCLD, MLMAX)	REAL	Ice cloud scattering coefficient (km^{-1}) as a function of wavelength and altitude

AERSLA

This COMMON block contains the aerosol and hydrometeor absorption coefficients.

Common Block AERSLA used in:

AERSOL ARSABD HYDROM MARINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CA(NWLCLD,30,4)	REAL	Aerosol absorption coefficients (normalized)

AERSLX

This COMMON block contains the aerosol and hydrometeor extinction coefficients.

Common Block AERSLX used in:

AERSOL ARSXBD HYDROM MARINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CX(NWLCLD,30,4)	REAL	Aerosol extinction coefficients normalized to unity at 0.55 μm

AERUSR

This COMMON block contains the parameters for the user-defined aerosol model.

Common Block AERUSR used in:
AERSOL PHFUNC

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
GAERO(NWLAER, MLMAX)	REAL	User-defined aerosol asymmetry factor as a function of wavelength and altitude
GUSER(NWLAER)	REAL	User-defined aerosol asymmetry factor corresponding to PHUSER
PHUSER(4,NANG, NWLAER)	REAL	User-defined aerosol phase function (polarization terms included)

ANTECD

This COMMON block contains the 24-hour antecedent parameters for the heat balance calculations.

Common Block ANTECD used in:

BRBNDR DEFAULT INITL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NANTE	INTEGER	Number of points
AHR(NANTMX)	REAL	Hour of day (deg.)
ATMP(NANTMX)	REAL	Air temperature (K)
ARH(NANTMX)	REAL	Relative humidity (fraction)
AWND(NANTMX)	REAL	Wind speed (m/sec)
APRS(NANTMX)	REAL	Pressure (mb)
ACLCV(NANTMX,3)	REAL	Low/mid/high etage cloud cover
ACLBS(NANTMX,3)	REAL	Low/mid/high etage cloud base altitude (km)
ACLTP(NANTMX,3)	REAL	Low/mid/high etage cloud top altitude (km)
ISWANT	INTEGER	Antecedent data switch

ARSLSC

This COMMON block contains various parameters used for the aerosol scattering calculations.

Common Block ARSLSC used in:

BNDPAR INICPL MLSCAT PHFUNC PRCALC PTHOSB
RSHINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SCATTR(NANG, MAXLAT,MAXLON, MLMAX)	REAL	Scatter term equal to scatter coefficient times the phase function divided by 4*PI ($\text{km}^{-1} \text{sr}^{-1}$)
SCTVAR(NANG, MAXLAT,MAXLON, MLMAX)	REAL	
ASYM(MLMAX, MAXLAT,MAXLON)	REAL	Combined asymmetry factor
ASYMA(MLMAX, MAXLAT,MAXLON)	REAL	Aerosol asymmetry factor
SCATOT(MLMAX, MAXLAT,MAXLON)	REAL	Combined scattering coefficient (km^{-1})

ATMDAT

This COMMON block contains the model atmosphere parameters.

Common Block ATMDAT used in:

ATMPRN	ATMSBD	BCKPRN	BRBNDR	CALCUL	CIRRUS
DFLT2	EQABS	EQUABS	INITL	PRCALC	SCNRIO
SETALT	SETBCK	SHNGEO	SRCGEO	SRCIRR	USRDEF

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
REBAR	DOUBLE PRECISION	Mean radius of the earth (km)
REPOL	DOUBLE PRECISION	Polar radius of the earth (km)
REEQU	DOUBLE PRECISION	Equatorial radius of the earth (km)
Z(NL)	REAL	Altitude (km)
P(NL,24)	REAL	Pressure (mb)
T(NL,24)	REAL	Temperature (K)
LATIT(24)	REAL	Latitude (deg)
WINDEF(24)	REAL	Effective wind speed (m/sec)
LATST(MAXLAT)	REAL	Storage for model atmosphere latitude (deg)
LATST(MAXLON)	REAL	Storage for model atmosphere longitude (deg)

BACKGD

This COMMON block contains the material reflectivity and temperature parameters and the scene composition parameters.

Common Block BACKGD used in:

ATMPRN	BCKGND	BKGDBD	BRBNDR	COUPLE	GETBCK
INITL	SETBCK	SPCLYR	USRBCK		

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLBK(NMATL)	INTEGER	Number of wavelengths
WLBKGD(90,NMATL)	REAL	Wavelength (μm)
NMATRL	INTEGER	Number of materials
REFLEC(90,NMATL)	REAL	Hemispherical average reflectivity
IBKTYP(NMATL)	INTEGER	Background reflection index
FRDIF(NMATL)	REAL	Fraction of background reflection that is diffuse
BKRGH(NMATL)	REAL	Roughness standard deviation (m)
CORREL(NMATL)	REAL	Roughness correlation length (m)
IRGH(NMATL)	INTEGER	Roughness index
FINC(NMATL)	REAL	Fraction of air mixed with material
ITINC(NMATL)	INTEGER	Type of inclusion
KMATL	INTEGER	Number of materials in scene
INDEXB(NMATL)	INTEGER	Material index
FRACT(NMATL)	REAL	Fraction of material defined by INDEX in scene
TEMPM(NAMTL,6 MAXLAT,MAXLON)	REAL	Temperature (K) of each material in sun light and in shade
IHTFLG(NMATL)	INTEGER	Heat balance calculation index
HTALPH(NMATL)	REAL	Solar absorptivity
HTEPS(NMATL)	REAL	Thermal emissivity
HTCOND(NMATL)	REAL	Conduction coefficient ($\text{W}/\text{m}^2/\text{K}$)
CHARLN(NMATL)	REAL	Convective characteristic length (m)
SPHEAT(NMATL)	REAL	Specific heat ($\text{W}\cdot\text{sec}/\text{gm}/\text{K}$)
DENSTY(NMATL)	REAL	Density (gm/m^3)
STDVSC(NMATL)	REAL	Standard deviation of the material defined by INDEX divided by the mean

BACKGD (continued)

ZHLYR(2,NMATL)	REAL	Layer thickness (m)
NWLUSR	INTEGER	Number of spectral points for user-defined materials
WLUSR(100)	REAL	Wavelength (μm)
REFUSR(100,3)	REAL	User-defined diffuse reflectivity
WAVEHT(MAXLAT, MAXLON)	REAL	Sea wave height (m)
SLOPEW(MAXLAT, MAXLON)	REAL	Sea rms wave slope
FOAM(MAXLAT, MAXLON)	REAL	Fraction of foam
INDLYR(3,NMATL)	INTEGER	Indices of layers

BCKDAT

This COMMON block contains the parameters for the paths to each background altitude.

Common Block BCKDAT used in:

BCKPRN	EQUABS	INTEG	KDISTR	PRCALC	PUTHDR
SCNRIO	ZROINT	ATMOUT	BCKINT	MRFLTR	

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NBCKZ	INTEGER	Number of background altitudes
LBCKXX(MLMAX)	INTEGER	Background altitude indices
ZBCK(MLMAX)	REAL	Altitude (km)
TAUBZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of transmission at altitude
RADBZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of thermal path radiance to background (W/cm ² /sr)
RSLBZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of Apparent solar irradiance at background (W/cm ²)
RLNBZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of apparent lunar irradiance at background (W/cm ²)
RSCBZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of scattered path radiance to background (W/cm ² /sr)
RADSHB(NAZMAX, MLMAX)	REAL	Upper thermal skyshine irradiance at background (W/cm ² /cm ⁻¹)
RDSHBT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of upper thermal skyshine irradiance at background (W/cm ²)

BCKDAT (continued)

RDSHSB(NAZMAX, MLMAX)	REAL	Upper scattered skyshine irradiance at background ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
RSHSBT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of upper scattered skyshine irradiance at background (W/cm^2)
SGMEZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of scintillation at background
TASCZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of in-scattered transmittance
DRADZT(NAZMAX, MLMAX,NGMAX)	REAL	Running integral of standard deviation of the thermal path radiance
SWBCK(MLMAX, NGMAX)	REAL	Switch for availability of background parameters
TBCK(MLMAX, MAXLAT,MAXLON)	REAL	Temperature at background (K)
LZ(MLMAX,NGMAX)	INTEGER	Altitude indices

BRBNDT

This COMMON block contains the altitude and time dependent heat fluxes.

Common Block BRBNDT used in:

BRBNDR SRCFLX

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ZLYR(10)	REAL	Altitude (km)
TLBR(101)	REAL	Temperature (K)
PLBR(101)	REAL	Pressure (mb)
RHLYER(10,NTIME)	REAL	Relative humidity
ULWZ(10,NTIME)	REAL	Upward long-wave flux (W/m^2)
DLWZ(10,NTIME)	REAL	Downward long-wave flux (W/m^2)
USWZ(10,NTIME)	REAL	Upward short-wave flux (W/m^2)
DSWZ(10,NTIME)	REAL	Downward short-wave flux (W/m^2)
BSWZ(10,NTIME)	REAL	Beam short-wave flux (W/m^2)

BSTAER

This COMMON block contains the parameters for the temperature dependent background stratospheric aerosol model.

Common Block BSTAER used in:

AERSOL BKSTBD PHFUNC

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
IWL(NWLAER)	INTEGER	Key relating the other aerosol wavelength array to WLBST
WLBST(68)	REAL	Wavelength (μm)
STATMP(NSTTMP)	REAL	Temperature (K)
STMPSC (NSTTMP,68)	REAL	Normalized scattering coefficient
STMPAB (NSTTMP,68)	REAL	Normalized absorption coefficient
STMPSY (NSTTMP,68)	REAL	Asymmetry factor

CDRYDS

This COMMON block contains the user-defined model name.

Common Block CDRYDS used in:

DIREMS EMISBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
FRAC(2,0:NLMAX,6)	REAL	Layer fraction volume
DEP(0:NLMAX,6)	REAL	Layer depth (m)

CFCBM

This COMMON block contains the cross-sections for the chloro-fluorocarbons.

Common Block CFCBM used in:

ABSCFC CFCBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
N11	INTEGER	Number of spectral bins for CFC-11
NV11(2)	INTEGER	Number of spectral points in each bin
V11(2,2)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC11(5,75)	REAL	Cross-sections for CFC-11 ($\text{molecules}^{-1} \text{cm}^2$)
N12	INTEGER	Number of spectral bins for CFC-12
NV12(2)	INTEGER	Number of spectral points in each bin
V12(2,2)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC12(5,165)	REAL	Cross-sections for CFC-12 ($\text{molecules}^{-1} \text{cm}^2$)
N13	INTEGER	Number of spectral bins for CFC-13
NV13(3)	INTEGER	Number of spectral points in each bin
V13(2,3)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC13(5,177)	REAL	Cross-sections for CFC-13 ($\text{molecules}^{-1} \text{cm}^2$)
N14	INTEGER	Number of spectral bins for CFC-14
NV14(1)	INTEGER	Number of spectral points in each bin
V14(2,1)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC14(5,34)	REAL	Cross-sections for CFC-14 ($\text{molecules}^{-1} \text{cm}^2$)

CFCBM (continued)

N21	INTEGER	Number of spectral bins for CFC-21
NV21(3)	INTEGER	Number of spectral points in each bin
V21(2,3)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC21(5,172)	REAL	Cross-sections for CFC-21 ($\text{molecules}^{-1} \text{cm}^2$)
N22	INTEGER	Number of spectral bins for CFC-22
NV22(3)	INTEGER	Number of spectral points in each bin
V22(2,3)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC22(5,172)	REAL	Cross-sections for CFC-22 ($\text{molecules}^{-1} \text{cm}^2$)
N113	INTEGER	Number of spectral bins for CFC-113
NV113(2)	INTEGER	Number of spectral points in each bin
V113(2,2)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC113(5,440)	REAL	Cross-sections for CFC-113 ($\text{molecules}^{-1} \text{cm}^2$)
N114	INTEGER	Number of spectral bins for CFC-114
NV114(4)	INTEGER	Number of spectral points in each bin
V114(2,4)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC114(5,358)	REAL	Cross-sections for CFC-114 ($\text{molecules}^{-1} \text{cm}^2$)
N115	INTEGER	Number of spectral bins for CFC-115
NV115(3)	INTEGER	Number of spectral points in each bin
V115(2,3)	REAL	Beginning and ending values for each bin (cm^{-1})
CFC115(5,186)	REAL	Cross-sections for CFC-115 ($\text{molecules}^{-1} \text{cm}^2$)

CGWTS

This COMMON block contains the summing weights for the Curtis-Godson approximation.

Common Block CGWTS used in:
BNDPAR PTHTAU

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CGWT1(ISMX, MLMAX,MAXLAT, MAXLON)	REAL	Curtis-Godson summing weight for S1
CGWT2(ISMX, MLMAX,MAXLAT, MAXLON)	REAL	Curtis-Godson summing weight for S2
CGWT3(ISMX, MLMAX,MAXLAT, MAXLON)	REAL	Curtis-Godson summing weight for S3
CGWT4(ISMX, MLMAX,MAXLAT, MAXLON)	REAL	Curtis-Godson summing weight for S6

CHRCNM

This COMMON block contains the miscellaneous CHARACTER strings used in output files.

Common Block CHRCNM used in:

ATMPRN	BRBNDR	CHRCBD	EQUABS	PUTCLD	SUMFIL
USRBCK	MENU	PLTDRV			

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
TAERO(19)	CHARACTER*50	Aerosol titles
TITAER(19)	CHARACTER*10	Aerosol abbreviated titles
TTYPE(24)	CHARACTER*50	Model atmosphere titles
THAZE(9,2)	CHARACTER*50	Haze profile titles
TUPPER(2)	CHARACTER*50	Upper atmosphere titles
TITBKD(-4:118)	CHARACTER*10	Abbreviated background titles
RNTYPE(5)	CHARACTER*40	Rain model titles
CLDRNM(22)	CHARACTER*60	Cloud/fog/rain titles
CLDABR(22)	CHARACTER*8	Abbreviated cloud titles
SNTYPE(6)	CHARACTER*26	Snow model titles
TITBKG(-4:118)	CHARACTER*60	Background titles

CHRPDM

This COMMON block contains the miscellaneous CHARACTER strings used in the plotting package.

Common Block CHRPDM used in:

PLTBD PLTDRV

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
TLABEL(5)	CHARACTER*50	Plot labels
XLAB	CHARACTER*42	X-axis label
MOLNAM(NSMX)	CHARACTER*18	Molecular name

CLDPAR

This COMMON block contains the parameters for determining the impact of clouds on the broad band heat fluxes.

Common Block CLDPAR used in:

BRBNBD CLDLYR FLUXLW

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
TLC	REAL	Low etage cloud optical depth
GLC	REAL	Low etage cloud asymmetry factor
EL	REAL	Low etage cloud emissivity
TMC	REAL	Middle etage cloud optical depth
GMC	REAL	Middle etage cloud asymmetry factor
EM	REAL	Middle etage cloud emissivity
THC	REAL	High etage cloud optical depth
GHC	REAL	High etage cloud asymmetry factor
EH	REAL	High etage cloud emissivity

CLDRN

This COMMON block contains the parameters for altitude dependent cloud/fog/rain/snow conditions.

Common Block CLDRN used in:

CLDRBD	ENDPT	EQUABS	GETCLD	HYDROM	PUTCLD
RAINSF	TANGPT	USRCLD			

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ZCLD(21)	REAL	Altitude (km)
CLDEQ(21,15)	REAL	Liquid water content (gm/m ³)
XLWC(15)	REAL	Conversion from liquid water content to extinction at 0.55 μ m (km ⁻¹ /(gm/m ³))
RNRT(21,15)	REAL	Rain rate (mm/hr)
NCLD(5)	INTEGER	Cloud index for a given rain model
NZCLD	INTEGER	Number of altitude points in profile
NRNTYP(5)	INTEGER	Rain index
NZUCLD	INTEGER	Number of user-defined altitudes
ZUCLD(25)	REAL	User-defined altitude (km)
CLDEQU(25)	REAL	User-defined liquid water content (gm/m ³)
XLWCU	REAL	Conversion from liquid water content to extinction at 0.55 μ m for user-defined cloud (km ⁻¹ /(gm/m ³))
CLDICU(25)	REAL	User defined ice content (gm/m ³)
XICEU	REAL	Conversion from ice content to extinction at 0.55 μ m for user-defined cloud (km ⁻¹ /(gm/m ³))
RNRTU(25)	REAL	User-defined rain rate (mm/hr)
NRNTYU	INTEGER	User-defined rain index
SNRTU(25)	REAL	User-defined snow rate (mm/hr)
NSNTYU	INTEGER	User-defined snow index
CLDBS(16)	REAL	Cloud base altitude (km)
CLDTP(16)	REAL	Cloud top altitude (km)
NAERCL(16)	INTEGER	Aerosol index for cloud model

CLDUSR

This COMMON block contains the parameters for a user-defined cloud/rain/snow model.

Common Block CLDUSR used in:

BNDPAR HYDROM PHYDRO USRCLD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLCLU	INTEGER	Number of spectral points
WLCLU(100)	REAL	Wavelength (μm)
SLWCU(100)	REAL	Normalized scatter coefficient for water
ALWCU(100)	REAL	Normalized absorption coefficient for water
GLWCU(100)	REAL	Asymmetry factor for water
SICEU(100)	REAL	Normalized scatter coefficient for ice
AICEU(100)	REAL	Normalized absorption coefficient for water
GICEU(100)	REAL	Asymmetry factor for ice

CLIMAT

This COMMON block contains the layer indices for the broad band heat flux calculations.

Common Block CLIMAT used in:

FLUXLW OPATH PRETEM SRAT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
IALAY(10)	INTEGER	Altitude index for each layer

CO2PAR

This COMMON block contains the LOWTRAN band parameters for carbon dioxide.

Common Block CO2PAR used in:
LOWTRN UMIXBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CPCO2(1219)	REAL	LOWTRAN band model parameters for carbon dioxide

CONSTN

This COMMON block contains the basic constants used throughout the program.

Common Block CONSTN used in:

ABSMOL	AIRTMP	AMOLSC	ASPECT	ATMPRN	BAND
BCKGND	BCKPRN	BDRF	BETA	BETAU	BMOD
BNDPAR	BRBNDR	CNSTNT	COAT	COMFNC	COUPLE
CSPHFN	DBINIT	DESAER	DFLT2	DFLT8	DIREMS
DNDR	DPLDT	ECLGAL	ENDPT	EPHEML	EPHEMS
EQABS	EQUABS	EQUECL	ESFIT	EXGALS	FILTER
FRESNL	GALRAD	GEOM	GETSLR	HOREQU	HORIZN
HTBLNC	INICPL	INIGEO	INITL	LYRINT	MARINE
MIE	MIEPHS	MLSCAT	MODBCK	PHFUNC	PHYDRO
PLANCK	PLANET	PRCALC	PRETEM	PROFAC	PTHOSB
PTHTAU	RADTRX	RADTRY	RAINEX	REFEST	RSHINE
SATUR	SCINTL	SCNRIO	SETALT	SETUP	SHADOW
SHNGEO	SKYNOI	SLPOS	SLUNAR	SNOWEX	SPCLYR
SPTRIG	SRCGEO	SRCIRR	STARAD	STGEOM	STRCN2
SUPK	TERMPR	UDLAY	USRDEF	XTERP	ZLAT
ZODICL	BBTEMP	INVPLK	FPTEST	ATMOUT	VISUAL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
DPI	DOUBLE PRECISION	3.1415926358979
DRAD	DOUBLE PRECISION	Pi/180 for conversion of degrees to radians
DE	DOUBLE PRECISION	2.71828182845904
DEPSMN	DOUBLE PRECISION	Smallest normalized positive number
DEPSMX	DOUBLE PRECISION	Largest normalized positive number
DEPSDF(2)	DOUBLE PRECISION	Smallest value that can be significantly added (1) or subtracted (2) from unity
DEPSDN	DOUBLE PRECISION	Smallest denormalized positive number
PI	REAL	3.14159
RAD	REAL	Pi/180 for conversion of degrees to radians

CONSTN (continued)

E	REAL	2.71828
EPSMIN	REAL	Smallest normalized positive number
EPSMAX	REAL	Largest normalized positive number
EPSDIF(2)	REAL	Smallest value that can be significantly added (1) or subtracted (2) from unity
EPSDNM	REAL	Smallest denormalized positive number
IRADIX	INTEGER	Radix; basic unit of calculation
ITR	INTEGER	Number of bits in REAL significand
ITD	INTEGER	Number of bits in DOUBLE PRECISION significand
IRND	INTEGER	Addition rounding switch
NGRD	INTEGER	Number of guard digits
MACHEP	INTEGER	Smallest exponent for 1+e (REAL)
NEGEP	INTEGER	Smallest exponent for 1-e (REAL)
MACHED	INTEGER	Smallest exponent for 1+e (DOUBLE PRECISION)
NEGEPD	INTEGER	Smallest exponent for 1-e (DOUBLE PRECISION)
MINEXP	INTEGER	Minimum REAL exponent
MAXEXP	INTEGER	Maximum REAL exponent
MINEXD	INTEGER	Minimum DOUBLE PRECISION exponent
MAXEXD	INTEGER	Maximum DOUBLE PRECISION exponent
IEXPR	INTEGER	Number of bits in REAL exponent
IEXPD	INTEGER	Number of bits in DOUBLE PRECISION exponent
IUNDFL	INTEGER	Gradual/abrupt underflow switch
ICMLMT	INTEGER	One's/two's/signed complement switch
IEND	INTEGER	Big/little-endian switch
IREG	INTEGER	Register vs. storage calculation switch

CONTNS

This COMMON block contains the parameters for the self- and foreign-broadened water vapor continuum.

Common Block CONTNS used in:

H2OBD H2OCNT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
VS1	REAL	Initial wavenumber (cm^{-1})
VS2	REAL	Final wavenumber (cm^{-1})
DVS	REAL	Wavenumber increment (cm^{-1})
NPTSC	INTEGER	Number of spectral points
TEMP(2)	REAL	Temperature (K)
SBAC(-1:2001,2)	REAL	Temperature dependent self-broadened continuum ($\text{amagat}^{-1} \text{cm}^{-1}$)
FBAC(-1:2001)	REAL	Foreign broadened continuum ($\text{amagat}^{-1} \text{cm}^{-1}$)

CRASYM

This COMMON block contains the asymmetry factors for the standard, sub-visual, and Heymsfield cirrus cloud models.

Common Block CRASYM used in:

CIRRBD PHYDRO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CIRASY (NWLCLD,4,3)	REAL	Asymmetry factors

CURGDA

This COMMON block contains the Curtis-Godson summing variables for correlation calculations.

Common Block CURGDA used in:

PRCALC PTHTAU RSHINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
S1S(ISMX,MLMX2)	REAL	Intermediate values of the summing variable for Lorentz half-width times the line density
S2S(ISMX,MLMX2)	REAL	Intermediate values of the summing variable for Doppler half-width times the line density

CURGDB

This COMMON block contains the Curtis-Godson summing variables for correlation calculations.

Common Block CURGDB used in:

PRCALC PTHTAU RSHINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
S3S(ISMX,MLMX2)	REAL	Intermediate values of the summing variable for line density (cm)
S4S(ISMX,MLMX2)	REAL	Intermediate values of the summing variable for the continuum optical depth

CURGDC

This COMMON block contains the Curtis-Godson summing variables for correlation calculations.

Common Block CURGDC used in:

PRCALC PTHOSB PTHTAU RSHINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
S5S(ISMX,MLMX2)	REAL	Intermediate values of the summing variable for scattering optical depth
S6S(ISMX,MLMX2)	REAL	Intermediate values of the summing variable for the square of the Lorentz half-width

DESDAT

This COMMON block contains the parameters for the desert aerosol model.

Common Block DESDAT used in:
DESAER DSRTBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
DESEX(NWLAER,4)	REAL	Normalized extinction coefficient equal to unity at 0.55 μm
DESAB(NWLAER,4)	REAL	Normalized absorption coefficient
DESG(NWLAER,4)	REAL	Asymmetry factor

DEVCNM

This COMMON block contains the CHARACTER strings for the binary data bases used by the code.

Common Block DEVCNM used in:

DBINIT	DEVCBD	FILRT	RDGBL	RDSCN	SUMFIL
ASCBIN	INSTDB				

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NFBMD(MOLMAX)	CHARACTER*60	File names of the direct access binary data base files
SUFFIX(18)	CHARACTER*10	Suffixes for all input and output files
NFGBL	CHARACTER*60	File name for global climatology data base
NFSCN	CHARACTER*60	File name for terrain scene and altitude data base
NFVFT	CHARACTER*60	File name for MODTRAN band parameter data base
DIRPTH	CHARACTER*60	Data base directory path

DEVICE

This COMMON block contains the file unit numbers used by the code.

Common Block DEVICE used in:

ABSMOL	ATMPRN	BCKPRN	BRBNDR	CALCUL	DBINIT
DEFAULT	DEVCBD	DFLT8	EQUABS	FLSTAT	GETASP
GETATM	GETBCK	GETCLD	GETPOS	GETSLR	INITL
MIEINP	MOSART	PRCALC	PUTCLD	PUTHDR	PUTSLR
RDFLTR	RDGBL	RDSCN	SUMFIL	USRBCK	USRCLD
ASCBIN	BBTEMP	CRFILE	FPTEST	INSTDB	
ATMINT	ATMOUT	BCKINT	MRFLTR	VISUAL	

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
IFINP	INTEGER	Input file number
IFOUT	INTEGER	Output file number
IFATM	INTEGER	Atmospheric binary file number
IFBCK	INTEGER	Background binary file number
IFPLM	INTEGER	Plume binary file number
IFMSC	INTEGER	Multiple scatter binary file number
IFHTR	INTEGER	Heat transfer binary file number
IFTRN	INTEGER	Transmittance binary file number
IFUAT	INTEGER	User-defined atmosphere file number
IFUBK	INTEGER	User-defined background file number
IFUCL	INTEGER	User-defined cloud file number
IFUAR	INTEGER	User-defined aerosol file number
IFASC	INTEGER	ASCII conversion file number
IFTBL	INTEGER	Tabular file number
IFFLT	INTEGER	Filter response file number
IFTP7	INTEGER	LOWTRAN TAPE7 file number
IFTP8	INTEGER	LOWTRAN TAPE8 file number
IFDIS	INTEGER	DIS in-band file number
IFBMD(MOLMAX)	INTEGER	Molecular data base file numbers
IFVFT	INTEGER	MODTRAN band parameter file number
IFGBL	INTEGER	Global data base file number
IFSCN	INTEGER	Scene data base file number
IFSCR	INTEGER	Scratch file number
IFGEO	INTEGER	Geometry scratch file number

DEVICE (continued)

IRECL(MOLMAX)	INTEGER	Molecular data base record lengths
IRECLU	INTEGER	MODTRAN band parameter data base record length
IRECLG	INTEGER	Global data base record length
IRECLS	INTEGER	Scene data base record length
NVRMAX(MOLMAX)	INTEGER	Number of records for molecular data bases
NVRMXU	INTEGER	Number of records for MODTRAN band parameter data base
NVRMXG	INTEGER	Number of records for global data base
NVRMXS	INTEGER	Number of records for scene data base
FLBMD(MOLMAX)	LOGICAL	Flag for existence of separate molecular data base file

EXTMOL

This COMMON block contains the trace gas altitude profiles.

Common Block EXTMOL used in:

EQABS EXMLBD USRDEF

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
BMOL(NL,38)	REAL	Trace gas concentration profiles (ppmv)

FLAGS

This COMMON block contains various flags to control certain calculations.

Common Block FLAGS used in:

ATMPRN	BCKCHK	BCKPRN	BINFIL	CALCUL	EPHEMS
EQABS	HAZE	INITL	ISRAEL	MOSART	PRCALC
PUTSLR	RSHINE	SCNRIO	SETFLG	SRCIRR	SUMFIL
TERMPR	BBTEMP	MRFLTR	VISUAL		

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
FLSLR	LOGICAL	Solar calculation flag
FLLNR	LOGICAL	Lunar calculation flag
FLEPH	LOGICAL	Ephemeris calculation flag
FLSMP	LOGICAL	Solar simple calculation flag
FLSML	LOGICAL	Lunar simple calculation flag
FLVSA	LOGICAL	Vertical structure algorithm calculation flag
FLATM	LOGICAL	Atmospheric file existence flag
FLBCK	LOGICAL	Background file existence flag
FLFBA	LOGICAL	Fore/background flag
FLSRC(NGMAX)	LOGICAL	Source geometry flag
FLCNT(NGMAX)	LOGICAL	Combined (contrast) geometry flag
FLASR(NGMAX)	LOGICAL	At-source geometry flag
FLHOR(NGMAX)	LOGICAL	Horizontal path geometry flag
FLIMB(NGMAX)	LOGICAL	Earthlimb geometry flag
FLMSC	LOGICAL	Multiple scattering flag

FLTRDT

This COMMON block contains the filter response parameters.

Common Block FLTRDT used in:

FILTER MOSART RDFLTR BBTEMP MRFLTR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NFLTR	INTEGER	Number of spectral points in filter response function
WLF(1200)	REAL	Wavelength (μm)
FLTR(1200)	REAL	Spectral filter response function

FLXTAB

This COMMON block contains various parameters for the broad band heat flux taken from Staley and Jurica.

Common Block FLXTAB used in:
BRBNBD TRANLW

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
UTAB(21,4)	REAL	Unknown parameter for water vapor
VTAB(23,4)	REAL	Unknown parameter for carbon dioxide
WTAB(16,4)	REAL	Unknown parameter for ozone
OPR(23,3)	REAL	Unknown parameter
TR(4)	REAL	Unknown parameter
IR(3)	INTEGER	Unknown parameter

GAUSSL

This COMMON block contains the Gauss-Legendre coefficients.

Common Block GAUSSL used in:

GETGLC GLCFBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XMU2(1)	DOUBLE PRECISION	2-point Gauss-Legendre abscissa
WT2(1)	DOUBLE PRECISION	2-point Gauss-Legendre weights
XMU3(2)	DOUBLE PRECISION	3-point Gauss-Legendre abscissa
WT3(2)	DOUBLE PRECISION	3-point Gauss-Legendre weights
XMU4(2)	DOUBLE PRECISION	4-point Gauss-Legendre abscissa
WT4(2)	DOUBLE PRECISION	4-point Gauss-Legendre weights
XMU5(3)	DOUBLE PRECISION	5-point Gauss-Legendre abscissa
WT5(3)	DOUBLE PRECISION	5-point Gauss-Legendre weights
XMU6(3)	DOUBLE PRECISION	6-point Gauss-Legendre abscissa
WT6(3)	DOUBLE PRECISION	6-point Gauss-Legendre weights
XMU7(4)	DOUBLE PRECISION	7-point Gauss-Legendre abscissa
WT7(4)	DOUBLE PRECISION	7-point Gauss-Legendre weights
XMU8(4)	DOUBLE PRECISION	8-point Gauss-Legendre abscissa
WT8(4)	DOUBLE PRECISION	8-point Gauss-Legendre weights
XMU9(5)	DOUBLE PRECISION	9-point Gauss-Legendre abscissa
WT9(5)	DOUBLE PRECISION	9-point Gauss-Legendre weights
XMU10(5)	DOUBLE PRECISION	10-point Gauss-Legendre abscissa
WT10(5)	DOUBLE PRECISION	10-point Gauss-Legendre weights
XMU12(6)	DOUBLE PRECISION	12-point Gauss-Legendre abscissa
WT12(6)	DOUBLE PRECISION	12-point Gauss-Legendre weights
XMU16(8)	DOUBLE PRECISION	16-point Gauss-Legendre abscissa
WT16(8)	DOUBLE PRECISION	16-point Gauss-Legendre weights
XMU24(12)	DOUBLE PRECISION	24-point Gauss-Legendre abscissa
WT24(12)	DOUBLE PRECISION	24-point Gauss-Legendre weights
XMU32(16)	DOUBLE PRECISION	32-point Gauss-Legendre abscissa
WT32(16)	DOUBLE PRECISION	32-point Gauss-Legendre weights
XMU40(20)	DOUBLE PRECISION	40-point Gauss-Legendre abscissa
WT40(20)	DOUBLE PRECISION	40-point Gauss-Legendre weights
XMU80(40)	DOUBLE PRECISION	80-point Gauss-Legendre abscissa
WT80(40)	DOUBLE PRECISION	80-point Gauss-Legendre weights

GAUSSL (continued)

XMU128(64)	DOUBLE PRECISION	128-point Gauss-Legendre abscissa
WT128(64)	DOUBLE PRECISION	128-point Gauss-Legendre weights
XMU512(256)	DOUBLE PRECISION	512-point Gauss-Legendre abscissa
WT512(256)	DOUBLE PRECISION	512-point Gauss-Legendre weights
NPTS(17)	INTEGER	Number of points in quadrature
MPTS(17)	INTEGER	Number of points in arrays

H2OPAR

This COMMON block contains the LOWTRAN band parameters of water vapor.

Common Block H2OPAR used in:
CH2OBD LOWTRN

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CPH2O(3515)	REAL	LOWTRAN band model parameters for water vapor

HEADER

This COMMON block contains the variables which form the main header of the output binary files.

Common Block HEADER used in:

ATMPRN	BCKGND	BCKPRN	BNDPAR	BRBNDR	CALCUL
COUPLE	DEFALT	DEFBCK	ENDPT	EQABS	EQUABS
GETASP	GETATM	GETBCK	GETCLD	INICPL	INIGEO
INITL	KDISTR	MOSART	PRCALC	PRTHDR	PTHOSB
PUTCLD	PUTHDR	PUTSLR	RSHINE	SCNRIO	SETBCK
SRCFLX	SRCIRR	SUMFIL	TANGPT	USRDEF	ZROHDR
BBTEMP	GETHDR	PUTCLD	PUTSLR	SUMFIL	GETHDR
TABLEA	TABLEB	TABLEH	VISUAL	PLTDRV	PLTGEN
RDMSRT	ATMOUT	MRFLTR			

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NGEOM	INTEGER	Number of geometries
NVSET	INTEGER	Number of spectral sets
NV(NVS MAX)	INTEGER	Number of spectral points/set
IFILE	INTEGER	Binary file index
NLAT	INTEGER	Number of latitudes
NLON	INTEGER	Number of longitudes
MA(MAXLAT, MAXLON)	INTEGER	Model atmosphere index
MP(MAXLAT, MAXLON)	INTEGER	Model pressure index
MT(MAXLAT, MAXLON)	INTEGER	Model temperature index
MC(ISMX,MAXLAT, MAXLON)	INTEGER	Model molecular concentrations index
IAERO1(MAXLAT, MAXLON)	INTEGER	Boundary layer aerosol index
IAERO2	INTEGER	Stratospheric aerosol index
IHAZE	INTEGER	Haze profile index
IUPPER	INTEGER	Upper atmosphere haze index
ICSTL(MAXLAT, MAXLON)	INTEGER	Air mass character index

HEADER (continued)

IVSA	INTEGER	Vertical structure algorithm index
ISEASN	INTEGER	Season index
IEPHEM	INTEGER	Ephemeris index
ISOLAR	INTEGER	Solar switch
ISMPLS	INTEGER	Simple/complex solar calculation switch
ILUNAR	INTEGER	Lunar switch
ISMPLL	INTEGER	Simple/complex lunar calculation switch
IDAY	INTEGER	Day of the month
IMONTH	INTEGER	Month of the year
IYEAR	INTEGER	Year
ITIME	INTEGER	Time index
ICLDRN	INTEGER	Cloud/fog/rain/snow index
ICLOUD	INTEGER	Cloud index
ICIRUS	INTEGER	Cirrus index
IICE	INTEGER	Ice index
IRAIN	INTEGER	Rain index
ISNOW	INTEGER	Snow index
IBKGD	INTEGER	Background index
NAZ(NGMAX)	INTEGER	Number of observer-source azimuths
MAZ	INTEGER	Temporary storage for NAZ(NGMAX)
NASPCT (NGMAX)	INTEGER	Number of earth/skyshine elevation angles
IAZSH	INTEGER	Earth/skyshine index
NAZSH	INTEGER	Number of earth/skyshine azimuth angles
ITERM(NGMAX)	INTEGER	Observer-source path background index
JTERM(NGMAX, NAZMAX)	INTEGER	Observer-source path background index for each azimuth
KTERM(NASMAX, NZSMAX,NGMAX)	INTEGER	Earth/skyshine path background index
IDV(NVSMAX)	INTEGER	Spectral calculation index
ICOREF	INTEGER	Coordinate reference switch

HEADER (continued)

IHTBLC	INTEGER	Background temperature switch
ISPCAL	INTEGER	Spectral calculation index
IMLSCT	INTEGER	Multiple scattering switch
IFBSW	INTEGER	Fore/background switch
IAZREF	INTEGER	Azimuth reference switch
ISLANG	INTEGER	Elevation/zenith angle switch
IANGSW(NGMAX)	INTEGER	Angle switch
IGMSW(NGMAX)	INTEGER	Geometry switch
ITPGM(NGMAX)	INTEGER	Geometry type index
IPAND(10)	INTEGER	Expansion positions for growth
VIS(MAXLAT, MAXLON)	REAL	Sea level meteorological range (km)
HOBS(NGMAX)	REAL	Observer altitude (km)
PHIOBS(NGMAX)	REAL	Observer elevation angle (deg)
HSRC(NGMAX)	REAL	Source altitude (km)
PHISRC(NGMAX)	REAL	Source elevation angle (deg)
HBACK	REAL	Background altitude (km)
PHIBACK(NGMAX)	REAL	Background elevation angle (deg)
SLROS(NGMAX)	REAL	Observer-source slant range (km)
BETAOS(NGMAX)	REAL	Observer-source earth center angle (deg)
SLROB(NGMAX)	REAL	Observer-background slant range (km)
BETAOB(NGMAX)	REAL	Observer-background earth center angle (deg)
HTANG(NGMAX)	REAL	Tangent altitude (km)
SOLEV	REAL	Solar elevation (deg)
SOLAZ	REAL	Solar azimuth (deg)
SOLDIS	REAL	Normalized solar distance
XLUNEV	REAL	Lunar elevation (deg)
XLUNAZ	REAL	Lunar azimuth (deg)
PHLUNR	REAL	Lunar phase (deg)
XLNDIS	REAL	Normalized lunar distance
AZIM(NAZMAX)	REAL	Observer/source azimuth (deg)
AZIML(NGMAX)	REAL	Azimuth if other latitude and longitude are defined (deg)
HOUR	REAL	Solar time (LST) (hour)

HEADER (continued)

PHISH(NASMAX, NGMAX)	REAL	Earth/skyshine elevation angles (deg)
TAIR(MAXLAT, MAXLON)	REAL	Surface air temperature (K)
V1(NVSMAX)	REAL	Initial wavenumber (cm ⁻¹)
V2(NVSMAX)	REAL	Final wavenumber (cm ⁻¹)
DVI(NVSMAX)	REAL	Calculation increment (cm ⁻¹)
DWL(NVSMAX)	REAL	Calculation increment (μm)
PSRC(NGMAX, NAZMAX)	REAL	Source pressure (mb)
TSRC(NGMAX, NAZMAX)	REAL	Source temperature (K)
CSRC(7,NGMAX, NAZMAX)	REAL	Source molecular concentrations (ppmv)
HCIRBS	REAL	Cirrus base altitude (km)
DELCIR	REAL	Cirrus thickness (km)
ZINVSA	REAL	Inversion altitude (km)
WHH	REAL	24-hour mean wind speed (m/sec)
WIND(MAXLAT, MAXLON)	REAL	Local wind speed (m/sec)
WINDHI	REAL	Average stratospheric wind speed (m/sec)
XLAT(2,NGMAX)	REAL	Latitude of observer and source (deg)
XLONG(2,NGMAX)	REAL	Longitude of observer and source (deg)
TIME	REAL	Time of the day
TINF(MAXLAT, MAXLON)	REAL	Exospheric temperature
AZSH(NZSMAX)	REAL	Earth/skyshine azimuths (deg)
CLDCVR(0:3, MAXLAT,MAXLON)	REAL	Total/low/mid/high cloud cover (%)
HPRF(2)	REAL	Initial and final altitudes for profile (km)

HEADER (continued)

APERT	REAL	Observer aperture diameter (m)
FOR	REAL	Observer field of regard (mrad)
CIREXT	REAL	Cirrus extinction coefficient at 0.55 μm (km^{-1})
CIRICE	REAL	Cirrus ice content (gm/m^3)
ULWSRC(NAZMAX, NGMAX)	REAL	Upward long-wave flux at source (W/m^2)
DLWSRC(NAZMAX, NGMAX)	REAL	Downward long-wave flux at source (W/m^2)
USWSRC(NAZMAX, NGMAX)	REAL	Upward short-wave flux at source (W/m^2)
DSWSRC(NAZMAX, NGMAX)	REAL	Downward short-wave flux at source (W/m^2)
BSWSRC(NAZMAX, NGMAX)	REAL	Beam short-wave flux at source (W/m^2)
CLALTB(3,MAXLAT, MAXLON)	REAL	Low/mid/high etage cloud base altitude (km)
CLALTT(3,MAXLAT, MAXLON)	REAL	Low/mid/high etage cloud top altitude (km)
CN2SRF	REAL	Structure constant at surface ($\text{m}^{-2/3}$)
XLATSL	REAL	Solar latitude (deg)
XLONSL	REAL	Solar longitude (deg)
XLATLN	REAL	Lunar latitude (deg)
XLONLN	REAL	Lunar longitude (deg)
XPAND(10)	REAL	Expansion positions for growth

HERZBG

This COMMON block contains the parameters for the Herzberg absorption bands of molecular oxygen in the ultraviolet.

Common Block HERZBG used in:

ABSO2 O2UVBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLOXY	INTEGER	Number of spectral points
WLOXY(248)	REAL	Wavelength (μm)
SDOXY(248)	REAL	Absorption coefficient (km^{-1})
AOXY(248)	REAL	Pressure correction term ($1.\text{E-}26 \text{ cm}^2 \text{ torr}^{-1}$)

HZDATA

This COMMON block contains the parameters for the model haze profiles.

Common Block HZDATA used in:

HAZE HAZEBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
VS(5)	REAL	Sea level meteorological ranges (km)
ZBNDR(NZBNDR)	REAL	Boundary layer altitudes (km)
HZBNDR(NZBNDR,5)	REAL	Boundary layer haze extinction coefficients (km^{-1})
ZTROP(NZTROP)	REAL	Troposphere altitudes (km)
HZTROP(NZTROP, 2,2)	REAL	Troposphere haze extinction coefficients (km^{-1}) with seasonal variability for meteorological ranges for 23 and 50 km
ZSTRA(NZSTRA)	REAL	Stratosphere altitudes (km)
HZSTRA(NZSTRA, 2,4)	REAL	Stratosphere haze extinction coefficients (km^{-1}) with season variability as a function of volcanic activity (i.e., background, moderate, high, and extreme)
ZUPPR(NZUPR)	REAL	Upper atmosphere altitudes (km)
HZUPPR(NZUPR,2,2)	REAL	Upper atmosphere haze extinction coefficients (km^{-1}) with variations due to volcanic activity (i.e., background and volcanic) and upper atmosphere haze level (i.e., normal and extreme)

ICEREF

This COMMON block contains the index of refraction of ice.

Common Block ICEREF used in:

ICEBD INDEXI

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLICE	INTEGER	Number of spectral points for WLICE
WLICE(468)	REAL	Wavelength (μm)
XMRE(468)	REAL	Real component of the index of refraction
XMIM(468)	REAL	Imaginary component of the index of refraction
NWLJ	INTEGER	Number of spectral points for WLJ
WLJ(62)	REAL	Wavelength (μm)
YMRE(62,4)	REAL	Temperature-dependent real component of the index of refraction
YMIM(62,4)	REAL	Temperature-dependent imaginary component of the index of refraction
TEMICE(4)	REAL	Temperature (K)

INBKGD

This COMMON block contains the sample user-defined background input file.

Common Block INBKGD used in:

CRBKGD INBKBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
INPBCK(39)	CHARACTER*60	User-defined background records
INPSCN(80)	CHARACTER*80	User-defined scene records

INDXWR

This COMMON block contains the index of refraction of water.

Common Block INDXWR used in:

INDEXW WTRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
WLWTR(NWLWTR)	REAL	Wavelength (μm)
WTRINR(NWLWTR)	REAL	Real component of the index of refraction
WTRINI(NWLWTR)	REAL	Imaginary component of the index of refraction
FRGHZ(NFRQ)	REAL	Frequency (GHz)
WTDER(NFRQ)	REAL	Real component of the microwave index of refraction
WTDEI(NFRQ)	REAL	Imaginary component of the microwave index of refraction

INFLTR

This COMMON block contains the sample user-defined filter response input file.

Common Block INFLTR used in:

CRFLTR INFLBD RDFLTR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
INPFLT(57)	CHARACTER*56	Filter response records

INITAL

This COMMON block contains the final atmospheric parameter arrays.

Common Block INITIAL used in:

BBARSL	BMOD	BNDPAR	BRBNDR	CALCUL	COUPLE
ENDPT	EPHEMS	EQUABS	GEOM	HYDROM	INICPL
INIGEO	INITL	LOWTRN	MOSART	PLMSUB	PRCALC
PRETEM	PTHOSB	PUTHDR	RAYPTH	RSHINE	SCNRIO
SETALT	SHNGEO	SRCGEO	SRCIRR	TANGPT	MRFLTR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
RE	DOUBLE PRECISION	Radius of the earth (km)
ML	INTEGER	Number of altitudes in final atmospheric profile
ZL(MLMAX)	REAL	Altitude (km)
PL(MLMAX,MAXLAT,MAXLON)	REAL	Pressure (mb)
TL(MLMAX,MAXLAT,MAXLON)	REAL	Temperature (K)
W(ISMX,MLMAX,MAXLAT,MAXLON)	REAL	Equivalent absorber amounts for each molecular type (amagat)
IAERO(MLMAX,MAXLAT,MAXLON)	INTEGER	Aerosol model index
LOBSV(NGMAX)	INTEGER	Position of observer in altitude profile
LSRCE(NGMAX)	INTEGER	Position of source in altitude profile
LBKGD	INTEGER	Position of background in altitude profile
DTDP(MLMAX,MAXLAT,MAXLON)	REAL	$d(\text{Theta})/d(\text{Phi})$ calculated from refractive index profile
XMH(MLMAX,MAXLAT,MAXLON)	REAL	Refractive bending constant

INITAL (continued)

CN2(MLMAX, MAXLAT,MAXLON)	REAL	Turbulence structure constant ($m^{-2/3}$)
RHL(MLMAX, MAXLAT,MAXLON)	REAL	Relative humidity
PRTNFN(ISMX, MLMAX,MAXLAT, MAXLON)	REAL	Molecular partition functions
CLDLWC(MLMAX, MAXLAT,MAXLON)	REAL	Cloud liquid water content (gm/m^3)
CLDICE(MLMAX, MAXLAT,MAXLON)	REAL	Cloud ice content (gm/m^3)
RRATE(MLMAX, MAXLAT,MAXLON)	REAL	Rain rate (mm/hr)
SRATE(MLMAX, MAXLAT,MAXLON)	REAL	Snow rate (mm/hr)
NTRPAU(MAXLAT, MAXLON)	INTEGER	Position of tropopause in altitude profile
NSTPAU(MAXLAT, MAXLON)	INTEGER	Position of stratopause in altitude profile
MLO	INTEGER	Initial number of altitudes in atmosphere profile, before any tangent points are added
LMIN(MLMAX)	INTEGER	Pointer to altitude of tangent points
LSOLAR	INTEGER	Position of sun in altitude profile
LLUNAR	INTEGER	Position of moon in altitude profile
CT2(MLMAX, MAXLAT,MAXLON)	REAL	Temperature structure constant ($m^{-2/3} K^2$)

INITAL (continued)

CSM2(MLMAX, MAXLAT,MAXLON)	REAL	Molecular scattering structure constant ($\text{m}^{-2/3} \text{ km}^{-2}$)
CSA2(MLMAX, MAXLAT,MAXLON)	REAL	Aerosol scattering structure constant ($\text{m}^{-2/3} \text{ km}^{-2}$)
SKYFAC(3,MLMAX, MAXLAT,MAXLON)	REAL	Sky noise factor

INPNDX

This COMMON block contains the indices for the sub-sections for the MOSART input file.

Common Block INPNDX used in:

CRINPT CRUATM INPTBD RDMDTN

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
INPDX(18)	INTEGER	Indices for MOSART input file sub-sections

INPTDT

This COMMON block contains the sample input file.

Common Block INPTDT used in:

INITL INPTBD CRINPT CRUATM INPTBD RDMDTN

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
INPSTR(202)	CHARACTER*50	Input file records
TITL	CHARACTER*80	Input file title
GEOMST(3)	CHARACTER*80	Sample geometry records
ANTEST(8)	CHARACTER*80	Antecedent parameter records
SUBTIT(17)	CHARACTER*50	Subsection headings
ATMPAR(19)	CHARACTER*80	User-defined atmosphere records

INTSTO

This COMMON block contains intermediate spectral data the integrated in-band values.

Common Block INTSTO used in:

ATMPRN INTEG PRCALC RSHINE ZROINT ATMINT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
RADSH(NASMAX, NZSMAX)	REAL	Spectral earth/skyshine thermal radiance (W/cm ² /sr/cm ⁻¹)
TAUSH(NASMAX, NZSMAX)	REAL	Spectral skyshine transmittance
RADSE(NASMAX, NZSMAX)	REAL	Spectral earth/skyshine terminator emitted radiance (W/cm ² /sr/cm ⁻¹)
RADSS(NASMAX, NZSMAX)	REAL	Spectral earth/skyshine terminator reflected radiance (W/cm ² /sr/cm ⁻¹)
RADSHT(NASMAX, NZSMAX,NGMAX)	REAL	Integrated Earth/Skyshine Thermal Radiance (W/cm ² /sr)
TAUSHT(NASMAX, NZSMAX,NGMAX)	REAL	Integrated earth/skyshine transmittance
RADSET(NASMAX, NZSMAX,NGMAX)	REAL	Integrated earth/skyshine terminator emitted radiance (W/cm ² /sr)
RADSST(NASMAX, NZSMAX,NGMAX)	REAL	Integrated earth/skyshine terminator reflected radiance (W/cm ² /sr)
RADSC(NASMAX, NZSMAX)	REAL	Spectral earth/skyshine scattered radiance (W/cm ² /sr/cm ⁻¹)
RADSCT(NASMAX, NZSMAX,NGMAX)	REAL	Integrated earth/skyshine scattered radiance (W/cm ² /sr)
RSLSTT(NAZMAX, NGMAX)	REAL	Integrated scattered observer-source line-of-sight radiance (W/cm ² /sr)

INTSTO (continued)

RSLSBT(NAZMAX, NGMAX)	REAL	Integrated scattered observer-background line-of-sight radiance ($\text{W}/\text{cm}^2/\text{sr}$)
RADBE(NAZMAX)	REAL	Spectral emitted observer line-of-sight terminator radiance ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
RADBET(NAZMAX, NGMAX)	REAL	Integrated emitted observer line-of-sight terminator radiance ($\text{W}/\text{cm}^2/\text{sr}$)
RADBR(NAZMAX)	REAL	Spectral reflected observer line-of-sight terminator radiance ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
RADBRT(NAZMAX, NGMAX)	REAL	Integrated reflected observer line-of-sight terminator radiance ($\text{W}/\text{cm}^2/\text{sr}$)
RADSD(NAZMAX)	REAL	Spectral terminator radiance standard deviation ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
RADSDT(NAZMAX, NGMAX)	REAL	Integrated terminator radiance standard deviation ($\text{W}/\text{cm}^2/\text{sr}$)
TAU1(NAZMAX, NGMAX)	REAL	Spectral observer-source transmittance
TAU2(NAZMAX, NGMAX)	REAL	Spectral observer-background transmittance
SGMETT(NAZMAX, NGMAX)	REAL	Integrated source scintillation
SGMEBT(NAZMAX, NGMAX)	REAL	Integrated background scintillation
TASCTT(NAZMAX, NGMAX)	REAL	Integrated forward in-scatter transmittance to source
TASCBT(NAZMAX, NGMAX)	REAL	Integrated forward in-scatter transmittance to background
RAD1(NAZMAX, NGMAX)	REAL	Integrated thermal path radiance observer-source line-of-sight ($\text{W}/\text{cm}^2/\text{sr}$)

INTSTO (continued)

RAD2(NAZMAX, NGMAX)	REAL	Integrated thermal path radiance observer-background line-of-sight (W/cm ² /sr)
RDSLT(NAZMAX, NGMAX)	REAL	Integrated source solar irradiance (W/cm ²)
RDLNT(NAZMAX, NGMAX)	REAL	Integrated source lunar irradiance (W/cm ²)
DRADTT(NAZMAX, NGMAX)	REAL	Integrated path standard deviation observer-source line-of-sight (W/cm ² /sr)
DRADBT(NAZMAX, NGMAX)	REAL	Integrated path standard deviation observer-background line-of-sight (W/cm ² /sr)
BCKSUM(2,NMATL, NAZMAX,NGMAX)	REAL	Integrated terrain material radiances in sun and shade (W/cm ² /sr)

INUAER

This COMMON block contains the sample user-defined aerosol input file.

Common Block INUAER used in:

CRUAER INARBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
INPAER(32)	CHARACTER*60	Aerosol file records

INUCLD

This COMMON block contains the sample user-defined hydrometeor input file.

Common Block INUCLD used in:

CRUCLD INCLBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
INPCLD(30)	CHARACTER*80	User-defined hydrometeor file records

KDISDT

This COMMON block contains the parameters for the exponential sum fit used in the multiple scattering calculations.

Common Block KDISDT used in:
KDISTR PRCALC

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
EXTNCA(MLMAX, MAXLAT,MAXLON)	REAL	Extinction coefficient (km^{-1})
ALBA(MLMAX, MAXLAT,MAXLON)	REAL	Aerosol albedo
ALBM(MLMAX, MAXLAT,MAXLON)	REAL	Molecular albedo

LAGUER

This COMMON block contains Gauss-Laguerre coefficients.

Common Block LAGUER used in:

ESFIT LAGRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XLGA(2)	DOUBLE PRECISION	2-point Gauss-Laguerre abscissa
WLGA(2)	DOUBLE PRECISION	2-point Gauss-Laguerre weights
WLGEXA(2)	DOUBLE PRECISION	2-point Gauss-Laguerre weights time EXP(-XLG2)
XLGB(3)	DOUBLE PRECISION	3-point Gauss-Laguerre abscissa
WLGB(3)	DOUBLE PRECISION	3-point Gauss-Laguerre weights
WLGEXB(3)	DOUBLE PRECISION	3-point Gauss-Laguerre weights time EXP(-XLG3)
XLGC(4)	DOUBLE PRECISION	4-point Gauss-Laguerre abscissa
WLGC(4)	DOUBLE PRECISION	4-point Gauss-Laguerre weights
WLGEXC(4)	DOUBLE PRECISION	4-point Gauss-Laguerre weights time EXP(-XLG4)
XLGD(5)	DOUBLE PRECISION	5-point Gauss-Laguerre abscissa
WLGD(5)	DOUBLE PRECISION	5-point Gauss-Laguerre weights
WLGEXD(5)	DOUBLE PRECISION	5-point Gauss-Laguerre weights time EXP(-XLG5)
XLGE(6)	DOUBLE PRECISION	6-point Gauss-Laguerre abscissa
WLGE(6)	DOUBLE PRECISION	6-point Gauss-Laguerre weights
WLGEXE(6)	DOUBLE PRECISION	6-point Gauss-Laguerre weights time EXP(-XLG6)
XLGF(7)	DOUBLE PRECISION	7-point Gauss-Laguerre abscissa
WLGF(7)	DOUBLE PRECISION	7-point Gauss-Laguerre weights
WLGEXF(7)	DOUBLE PRECISION	7-point Gauss-Laguerre weights time EXP(-XLG7)
XLGG(8)	DOUBLE PRECISION	8-point Gauss-Laguerre abscissa
WLGG(8)	DOUBLE PRECISION	8-point Gauss-Laguerre weights
WLGEXG(8)	DOUBLE PRECISION	8-point Gauss-Laguerre weights time EXP(-XLG8)
XLGH(9)	DOUBLE PRECISION	9-point Gauss-Laguerre abscissa
WLGH(9)	DOUBLE PRECISION	9-point Gauss-Laguerre weights
WLGEXH(9)	DOUBLE PRECISION	9-point Gauss-Laguerre weights time EXP(-XLG9)

LAGUER (continued)

XLGI(10)	DOUBLE PRECISION	10-point Gauss-Laguerre abscissa
WLGI(10)	DOUBLE PRECISION	10-point Gauss-Laguerre weights
WLGEXI(10)	DOUBLE PRECISION	10-point Gauss-Laguerre weights time EXP(-XLG10)
XLGJ(12)	DOUBLE PRECISION	12-point Gauss-Laguerre abscissa
WLGJ(12)	DOUBLE PRECISION	12-point Gauss-Laguerre weights
WLGEXJ(12)	DOUBLE PRECISION	12-point Gauss-Laguerre weights time EXP(-XLG12)
XLGK(15)	DOUBLE PRECISION	15-point Gauss-Laguerre abscissa
WLGK(15)	DOUBLE PRECISION	15-point Gauss-Laguerre weights
WLGEXK(15)	DOUBLE PRECISION	15-point Gauss-Laguerre weights time EXP(-XLG15)

LYRSTO

This COMMON block contains the irradiance parameters for each layer in the atmospheric profile.

Common Block LYRSTO used in:

COUPLE INICPL MLSCAT PRCALC PTHOSB RSHINE
SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
PLNK(MLMAX, MAXLAT,MAXLON)	REAL	Blackbody spectral radiance for layer temperature ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
SOLYR(MLMAX, MAXLAT,MAXLON)	REAL	Solar spectral irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
XLNLYR(MLMAX, MAXLAT,MAXLON)	REAL	Lunar spectral irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
USOLAR(MLMAX, NBAND,MAXLAT, MAXLON)	REAL	Upward diffuse reflection term for sun per exponential fit band
DSOLAR(MLMAX, NBAND,MAXLAT, MAXLON)	REAL	Downward diffuse reflection term for sun per exponential fit band
ULUNAR(MLMAX, NBAND,MAXLAT, MAXLON)	REAL	Upward diffuse reflection term for moon per exponential fit band
DLUNAR(MLMAX, NBAND,MAXLAT, MAXLON)	REAL	Downward diffuse reflection term for moon per exponential fit band
RLAYER(0:MLMAX+1, NBAND,MAXLAT, MAXLON)	REAL	Layer reflectance
TLAYER(0:MLMAX+1, NBAND,MAXLAT, MAXLON)	REAL	Layer transmittance

LYRSTO (continued)

HMI(0:MLMAX+1, NBAND)	REAL	Multiple scattered downward flux (thermal/solar) for each exponential fit band ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
HPI(0:MLMAX+1, NBAND)	REAL	Multiple scattered upward flux (thermal/solar) for each exponential fit band ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
SOLEVL(MLMAX)	REAL	Solar elevation angle (deg)
XLNEVL(MLMAX)	REAL	Lunar elevation angle (deg)
HP(2,MLMAX, MAXLAT,MAXLON NSPCMX)	REAL	Total multiple scattered upward flux (thermal/solar) ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
HM(2,MLMAX, MAXLAT,MAXLON, NSPCMX)	REAL	Total multiple scattered downward flux (thermal/solar) ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
DPLKDT(MLMAX, MAXLAT,MAXLON NSPCMX)	REAL	Derivative of Planck blackbody function with temperature ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}/\text{K}$)

MACHIN

This COMMON block contains the machine indices for machine dependent operations.

Common Block MACHIN used in:

CRBKGD	CRFLTR	CRINPT	CRUAER	CRUATM	CRUCLD
DEV CBD	FPTEST	FLSTAT			

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ICMPTR(2)	INTEGER	Machine-dependent indices
LRMAX	INTEGER	Maximum allowed record length

MATERL

This COMMON block contains the parameters for the materials used in the user-defined aerosol model.

Common Block MATERL used in:

DNDR MIEINP MIEPHS

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XN(3,100,5)	COMPLEX	Spectral indices of refraction for two core materials and core material
NSD(5)	INTEGER	Number of points in user-defined size distribution
SIG(5)	REAL	Standard deviation for log normal size distribution
R0(5)	REAL	Mean radius for log normal or breakpoint radius for Junge size distribution (μm)
SNU(5)	REAL	Junge size distribution parameter
REFF(5)	REAL	Effective radius for Hansen size distribution (μm)
VEFF(5)	REAL	Effective variance for Hansen size distribution
ALPHA(5)	REAL	Modified Gamma size distribution parameter
GAMMA(5)	REAL	Modified Gamma size distribution parameter
B(5)	REAL	Modified Gamma size distribution parameter
SDIST(50,5)	REAL	User-defined size distribution
PCT(5)	REAL	Fraction of particle radius that is core
RDCOTI(5)	REAL	Initial particle radius (μm)
RDCOTF(5)	REAL	Final particle radius (μm)
WLAU(100,5)	REAL	Wavelength (μm)
NWLAU(5)	INTEGER	Number of spectral points
NINTR(5)	INTEGER	Number of integration points

MATERL (continued)

ITYPEP(5)	INTEGER	Particle size distribution index
ITYPEI(5)	INTEGER	Core inclusion index
ITYPEM(3,5)	INTEGER	Material indices for core (2) and coating
FR1(5)	REAL	Fraction of core that is first material

MIECOT

This COMMON block contains the scattering matrix components used in the Mie calculations.

Common Block MIECOT used in:
 COAT MIE MIEPHS

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
S1(NXMIE)	COMPLEX	Unknown parameter
S2(NXMIE)	COMPLEX	Unknown parameter
S11(NXMIE)	REAL	(1,1)- and (2,2)-element of the Mueller matrix times PI times scattering efficiency divided the wavelength squared
S12(NXMIE)	REAL	(1,2)- and (2,1)-element of the Mueller matrix times PI times scattering efficiency divided the wavelength squared
S33(NXMIE)	REAL	(3,3)- and (4,4)-element of the Mueller matrix times PI times scattering efficiency divided the wavelength squared
S34(NXMIE)	REAL	(3,4)- and minus the (4,3)-element of the Mueller matrix times PI times scattering efficiency divided by the wavelength squared
AMU(NXMIE)	REAL	Cosine of scattering angle
PII(NXMIE,2)	REAL	Unknown parameter

MMWREF

This COMMON block contains the parameters for calculating millimeter wave refractivity.

Common Block MMWREF used in:
REFRAC REFRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
FRQO2(42)	REAL	Oxygen line frequencies (GHz)
SO2(42)	REAL	Oxygen line strengths at 300 K
ALFO2(42)	REAL	Oxygen line widths at 300 K (GHz/torr)
PINTER(42)	REAL	Interference parameter at 300 K
TINTER(42)	REAL	Interference temperature correction
LQPO2(42)	INTEGER	Oxygen line quantum parameter
VH20(56)	REAL	Water vapor line frequencies (GHz)
SH20(56)	REAL	Water vapor line strengths
ALFH20(56)	REAL	Water vapor line widths (cm ⁻¹ /torr)
ELSH20(56)	REAL	Ground energy state (K)

MOLCON

This COMMON block contains the parameters for the molecular concentrations.

Common Block MOLCON used in:

BMOD	BNDPAR	BRBNDR	ENDPT	EQABS	EQUABS
LOWTRN	MOLPBD	PLMSUB	PRCALC	PRETEM	PUTHDR
SCNRIO	TANGPT				

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CMOL(28,MLIDMX, MLMAX,MAXLAT, MAXLON	REAL	Molecular concentrations (ppmv)
NNN	INTEGER	Number of molecules used in plume binary output file

MOLDAT

This COMMON block contains the parameters for the molecular partition functions.

Common Block MOLDAT used in:

BMOD EQABS MOLPBD PARTIT XMCONV

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NW(MLIDMX)	INTEGER	Number of energy levels for vibration partition function
WMOL(MLIDMX,10)	REAL	Energy levels for vibration partition function
NDEG(MLIDMX,10)	INTEGER	Degeneracy of each energy level for vibration partition function
XK(MLIDMX)	REAL	Exponent for rotational partition function
AIRMTWT	REAL	Molecular weight of air
AMWT(MLIDMX)	REAL	Molecular weights

MOLECP

This COMMON block contains indexing information for each molecule in the direct access binary data files.

Common Block MOLECP used in:

ABSMOL	BAND	BBARSL	BMOD	BNDPAR	DBINIT
DFLT8	DVINCR	EMISSV	ENDPT	EQABS	EQUABS
KDISTR	PLMSUB	PRCALC	PTHOSB	PTHTAU	PUTHDR
SCNRIO	SUMFIL	TANGPT	USRDEF	BBTEMP	VISUAL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NMOLEC	INTEGER	Number of molecules
MOLID(MLIDMX)	INTEGER	Molecular index (see Section 7.0)
NVA(MLIDMX)	INTEGER	Number of spectral groups in binary data files
VA(30,MLIDMX)	REAL	Initial wavenumber (cm^{-1}) for spectral group
VB(30,MLIDMX)	REAL	Final wavenumber (cm^{-1}) for spectral group
IVA(30,MLIDMX)	INTEGER	Direct access record number for the beginning of each spectral group
DVM(MLIDMX)	REAL	Spectral resolution (cm^{-1})
DVREF	REAL	Reference spectral increment in molecular data bases (cm^{-1})
IPLUM(6)	INTEGER	Plume molecular index

MSPARM

This COMMON block contains the exponential sum fit parameters for the multiple scattering calculations.

Common Block MSPARM used in:

COUPLE INICPL PRCALC

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
AMS(NBAND, MLMAX,MAXLAT, MAXLON)	REAL	Weights
XKMS(NBAND, MLMAX,MAXLAT, MAXLON)	REAL	Exponential terms

NAVMAR

This COMMON block contains the parameters for the Navy Aerosol Model.

Common Block NAVMAR used in:

MARINE MARNBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
TQEXT(3,40,4)	REAL	Extinction coefficient (km^{-1}) as a function of wind speed, wavelength, and relative humidity
TQABS(3,40,4)	REAL	Absorption coefficient (km^{-1}) as a function of wind speed, wavelength, and relative humidity
WL(40)	REAL	Wavelength (μm)
RELHUM(4)	REAL	Relative humidity

NO2XS

This COMMON block contains the cross-sections of nitrogen dioxide between 14,095 and 49,970 cm^{-1} .

Common Block NO2XS used in:
ABSNO2 NO2BD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
VBEG	REAL	Initial wavenumber (cm^{-1})
VEND	REAL	Final wavenumber (cm^{-1})
VINCR	REAL	Wavenumber increment (cm^{-1})
CRSNO2(NMAX)	REAL	Cross-section of nitrogen dioxide

O3CWB

This COMMON block contains the cross-section of the Chappuis and Wulf band of ozone between 9,170 and 24,565 cm^{-1} .

Common Block O3CWB used in:

ABSO3 O3CWBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
VBEG	REAL	Initial wavenumber (cm^{-1})
VEND	REAL	Final wavenumber (cm^{-1})
VINCR	REAL	Wavenumber increment (cm^{-1})
CT0(NMAX)	REAL	Zeroth order parameter for cross-section ($\text{amagat}^{-1} \text{cm}^{-1}$)
CT1(NMAX)	REAL	First order parameter for cross-section ($\text{amagat}^{-1} \text{cm}^{-1} \text{K}^{-1}$)
CT2(NMAX)	REAL	Second order parameter for cross-section ($\text{amagat}^{-1} \text{cm}^{-1} \text{K}^{-2}$)

O3PAR

This COMMON block contains the LOWTRAN band parameters of ozone.

Common Block O3PAR used in:
CPO3BD LOWTRN

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CPO3(447)	REAL	LOWTRAN band model parameters for ozone

OMATLW

This COMMON block contains the altitude arrays used in the broad band heat transfer calculations.

Common Block OMATLW used in:

FLUXLW OPATH SOLBND TRANLW

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ULW(10,10)	REAL	Optical path matrix for water vapor
VLW(10,10)	REAL	Optical path matrix for carbon dioxide
WLW(10,10)	REAL	Optical path matrix for ozone
XLW(10,10,2)	REAL	Optical path matrix for aerosol scattering
YLW(10,10)	REAL	Optical path matrix for Rayleigh scattering
ZLW(10,10,2)	REAL	Optical path matrix for aerosol absorption
TU(10,10)	REAL	Temperature-weighted optical path matrix for water vapor
TV(10,10)	REAL	Temperature-weighted optical path matrix for carbon dioxide
TW(10,10)	REAL	Temperature-weighted optical path matrix for ozone
TX(10,10)	REAL	Temperature-weighted optical path matrix for aerosols
TM(10,10)	REAL	Effective temperature (K) matrix
TF(10,10)	REAL	Transmission matrix

OPTDEP

This COMMON block contains the optical depths for the various atmospheric constituents.

Common Block OPTDEP used in:

PRCALC PTHTAU RSHINE

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XSS(ISMX,MLMX2)	DOUBLE PRECISION	Optical depth for each atmospheric constituent at each point along the ray

OUTPUT

This COMMON block contains the switch that controls the ASCII output.

Common Block OUTPUT used in:

ATMPRN BCKPRN BRBNDR EQUABS INITL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
IPRNDX	INTEGER	ASCII output length index

O2C

This COMMON block contains the parameters for the molecular oxygen continuum.

Common Block O2C used in:

O2CBD O2CNT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NPTO2	INTEGER	Number of spectral points
VO2(2)	REAL	Initial and final wavenumbers (cm^{-1})
DVO2	REAL	Incremental wavenumber (cm^{-1})
O2S0(74)	REAL	Absorption coefficient ($\text{amagat}^{-1} \text{cm}^{-1}$)
O2A(74)	REAL	Temperature dependent coefficient (K^{-1})
O2B(74)	REAL	Temperature dependent coefficient (K^{-2})

O3HHB

This COMMON block contains the parameters for the Hartley-Huggins band of ozone in the visible and ultraviolet.

Common Block O3HHB used in:

ABSO3 O3HHBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
V1C	REAL	Initial wavenumber (cm^{-1}) for 27370 - 29400 cm^{-1} region
V2C	REAL	Final wavenumber (cm^{-1}) for 27370 - 29400 cm^{-1} region
DVC	REAL	Wavenumber increment (cm^{-1})
NC	INTEGER	Number of spectral points
CO3DT(3,2687)	REAL	Absorption coefficient ($\text{amagat}^{-1} \text{cm}^{-1}$)
V1O	REAL	Initial wavenumber (cm^{-1}) for 40800 - 54054 cm^{-1} region
V2O	REAL	Final wavenumber (cm^{-1}) for 40800 - 54054 cm^{-1} region
DVO	REAL	Wavenumber increment (cm^{-1})
NO	INTEGER	Number of spectral points
CO3DAT(133)	REAL	Absorption coefficient ($\text{amagat}^{-1} \text{cm}^{-1}$)

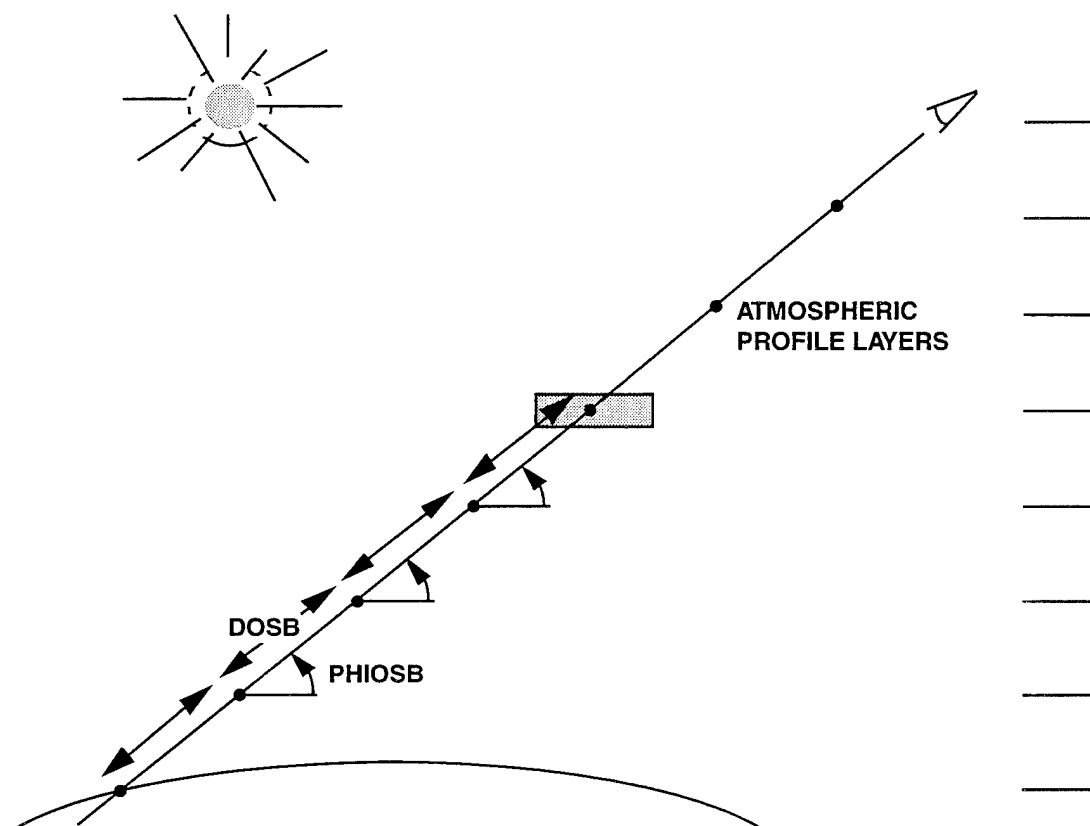
PATH1

This COMMON block contains various parameters for the observer-source-background path. See Figure 3.

Common Block PATH1 used in:

CALCUL PLMSUB PRCALC PTHOSB SCNRIO SRCGEO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NSRCE	INTEGER	Number of points between observer and source
NBKGD	INTEGER	Number of points between observer and background
DOSB(MLMX2)	REAL	Differential slant ranges (km) between observer and source-background
IOSB(MLMX2)	INTEGER	Pointers to altitude profile along the observer-source-background path
VARXZ(MLMX2, NAZMAX)	REAL	Scintillation parameter along the observer-source-background path
RSCINT(MLMX2)	REAL	Running sum of DOSB (km)
SOLEVB(NAZMAX)	REAL	Solar elevation angle at background (rad)
XLNEVB(NAZMAX)	REAL	Lunar elevation angle at background (rad)
PHIOSB(MLMX2)	REAL	Elevation angle (rad) along the observer-source-background path
ACCAPT(2)	REAL	Sensor aperture acceptance angle (rad) for forward in-scatter along the observer-source-background path
THOSB(MLMX2)	REAL	Earth center angle (rad) along the observer-source-background path



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Figure 3. Observer-Source-Background Path. COMMON Block: PATH1.

PATH1A

Common Block PATH1A used in:

CALCUL PLMSUB PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
PTHLAT(MLMX2, NAZMAX)	REAL	Latitude along path (deg)
PTHLON(MLMX2, NAZMAX)	REAL	Longitude along path (deg)
PTHFAC(MAXLAT, MAXLON,MLMX2, NAZMAX)	REAL	Interpolation factor along path
NPTHFC(2,2, NAZMAX)	INTEGER	Limits of grid where geometry is valid
FRSNW(NAZMAX)	REAL	Fraction snow in terrain
FRWTR(NAZMAX)	REAL	Fraction water in terrain
FRICE(NAZMAX)	REAL	Fraction ice in terrain

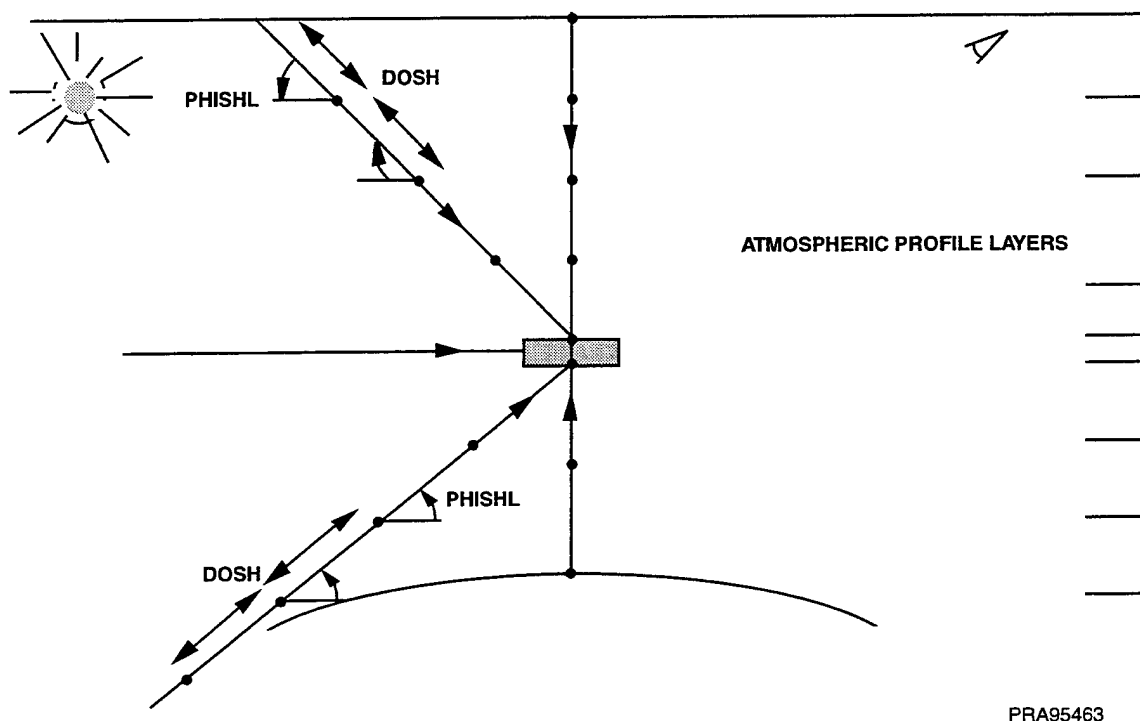
PATH2

This COMMON block contains the parameters for the earth/skyshine rays at the source paths. See Figure 4.

Common Block PATH2 used in:

RSHINE SRCIRR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NSH	INTEGER	Number of points along each earth/skyshine path
DRSH(MLMX2)	REAL	Differential slant ranges (km) along each earth/skyshine path
ISH(MLMX2)	INTEGER	Pointer to altitude profile along each earth/skyshine path
PHISHL(MLMX2)	REAL	Elevation angles (rad) along each earth/skyshine path
SHNFAC(MAXLAT, MAXLON,MLMX2, NZSMAX)	REAL	Interpolation factor for global atmosphere for each point along earth/skyshine path
SHSNW(NZSMAX)	REAL	Fraction snow cover on terrain at path end
SHICE(NZSMAX)	REAL	Fraction ice on terrain at path end
SHWTR(NZSMAX)	REAL	Fraction water on terrain at path end
NSHNFC(2,2, NSHNFC)	INTEGER	Limits of grid where geometry is valid



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Figure 4. Sky/Earthshine Ray Path at Source. There is a set of paths for each user-specified observer-source azimuth angle. COMMON Block: PATH3.

PATH2A

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the sun. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 30 path dealt with in this COMMON block.

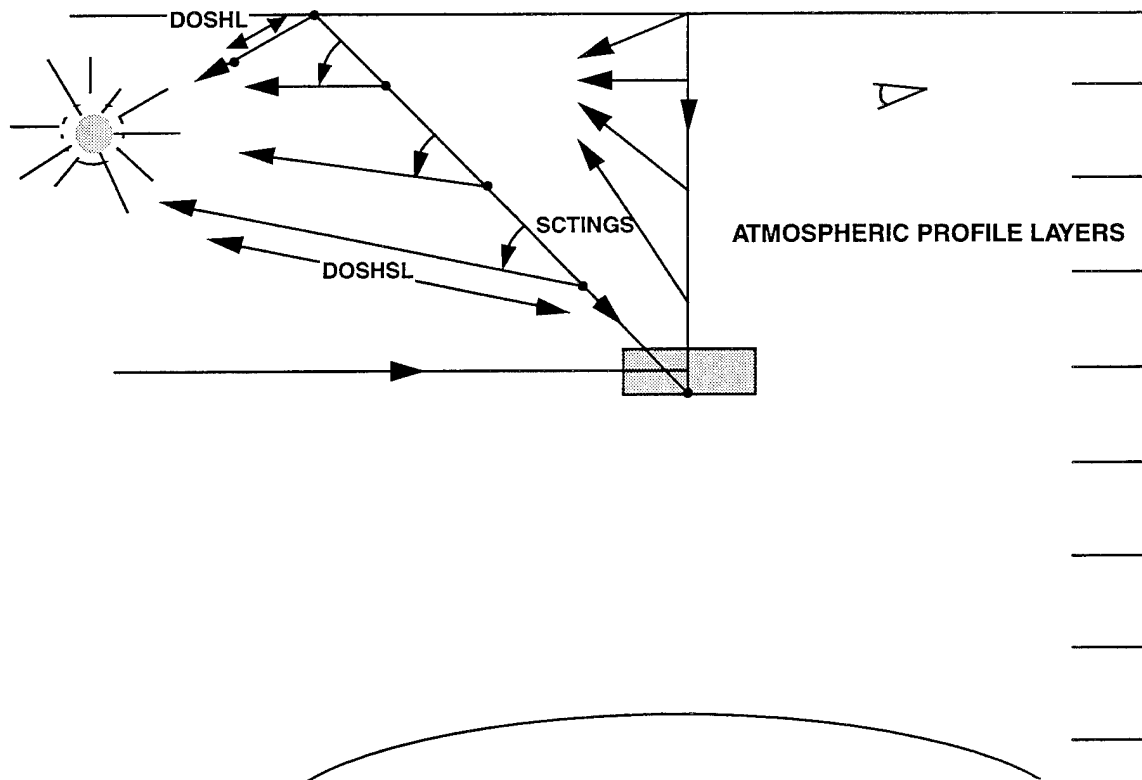
Common Block PATH2A used in:

RSHINE SRCIRR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NSHSL(NZSMAX, MLMX2,NASMAX)	INTEGER	Number of points along each ray between each point along the points along an earth/skyshine path and the sun
ISHSL(ISTMAX)	INTEGER	Pointers to the altitude profile along each earth/skyshine-solar path; since there are $4 \times 32 = 128$ possible earth/skyshine paths, and up to 200 points for each path, there are 25,600 points; each point has a ray to the sun with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.

PATH2A (continued)

DRSHSL(ISTMAX)	REAL	Differential slant ranges (km) along each earth/skyshine-solar path; since there are $4 \times 32 = 128$ possible earth/skyshine paths, and up to 200 points for each path, there 25,600 points; each point has a ray to the sun with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.
SSLFAC(MAXLAT, MAXLON,ISTMAX)	REAL	Interpolation factor for latitude variations in global atmosphere for each point along earth/skyshine-solar path
NSSLFC(2,2)	INTEGER	Limits of grid where geometry is valid



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Figure 5. Sky/Earthshine Rays at Source Intermediate Point-to-Sun Paths. There is a set of paths as shown above for each user-specified receiver-target azimuth angle. COMMON Blocks: PATH 2A, 2B, 2C, 2H, 2I, 2J, 2L, 2M, 2N.

PATH2B

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the sun. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 270 path dealt with in this COMMON block.

Common Block PATH2B used in:

RSHINE SRCIRR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NDXSH(NZSMAX, MLMX2)	INTEGER	Pointers to the starting position of each path
SCTNGS(NZSMAX, MLMX2)	REAL	Solar scattering angle (deg) along earth/skyshine paths
SLEVSH(NZSMAX)	REAL	Solar elevation angle (deg) at earth/skyshine path termination

PATH2C

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the sun. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 270 path dealt with in this COMMON block.

Common Block PATH2C used in:

RSHINE SRCIRR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NSHLN(NZSMAX, MLMX2)	INTEGER	Number of points along each ray between each point along the points along a earth/skyshine path and the moon
ISHLN(ISTMAX)	INTEGER	Pointers to the altitude profile along each earth/skyshine-lunar path; since there are $4 \times 32 = 128$ possible earth/skyshine paths, and up to 200 points for each path, there 25,600 points; each point has a ray to the moon with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.

PATH2C (continued)

DRSHLN(ISTMAX)	REAL	Differential slant ranges (km) along each earth/skyshine-lunar path; since there are $4 \times 32 = 128$ possible earth/skyshine paths, and up to 200 points for each path, there 25,600 points; each point has a ray to the moon with up to 200 points each, so there can be up to 5.12 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.
SLNFAC(MAXATM, ISTMA)	REAL	Interpolation factor for latitude variations in global atmosphere for each point along earth/skyshine-lunar path
NSLNFC(2,2)	INTEGER	Limits of grid where geometry is valid

PATH2D

This COMMON block contains the parameters for each intermediate point along a source earth/skyshine ray to the moon. See Figure 5. For example, for each skyshine ray, if there are 3 different azimuth angles, and there are 10 intermediate points along each of the skyshine rays, there will be a total of 270 path dealt with in this COMMON block.

Common Block PATH2D used in:

RSHINE SRCIRR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NDXSHL(NZSMAX, MLMX2)	INTEGER	Pointers to the starting position of each path
SCTNGL(NZSMAX, MLMX2)	REAL	Lunar scattering angle (deg) along earth/skyshine paths
XLEVSH(NZSMAX)	REAL	Lunar elevation angle (deg) at earth/skyshine path termination

PATH4

This COMMON block contains the celestial coordinates for the termination of each path.

Common Block PATH4 used in:

CALCUL COUPLE PRCALC RSHINE SCNRIO SRCIRR

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XLGALT(NAZMAX)	REAL	Galactic azimuth (deg) of observer line-of-sight
BGALT(NAZMAX)	REAL	Galactic elevation (deg) of observer line-of-sight
XLECLT(NAZMAX)	REAL	Ecliptic azimuth (deg) of observer line-of-sight
BECLT(NAZMAX)	REAL	Ecliptic elevation (deg) of observer line-of-sight
XLGALS(NASMAX, NZSMAX)	REAL	Galactic azimuth (deg) of earth/skyshine line-of-sight
BGALS(NASMAX, NZSMAX)	REAL	Galactic elevation (deg) of earth/skyshine line-of-sight
XLECLS(NASMAX, NZSMAX)	REAL	Ecliptic azimuth (deg) of earth/skyshine line-of-sight
BECLS(NASMAX, NZSMAX)	REAL	Ecliptic elevation (deg) of earth/skyshine line-of-sight
XLGALC(MAXLAT, MAXLON)	REAL	Galactic azimuth for each atmosphere (deg)
BGALC(MAXLAT, MAXLON)	REAL	Galactic elevation for each atmosphere (deg)
XLECLC(MAXLAT, MAXLON)	REAL	Ecliptic azimuth for each atmosphere (deg)
BECLC(MAXLAT, MAXLON)	REAL	Ecliptic elevation for each atmosphere (deg)

PATH4 (continued)

FRSNWL(MAXLAT, MAXLON)	REAL	Fraction snow cover at each latitude and longitude
FRWTRL(MAXLAT, MAXLON)	REAL	Fraction water at each latitude and longitude
FRICEL(MAXLAT, MAXLON)	REAL	Fraction ice at each latitude and longitude

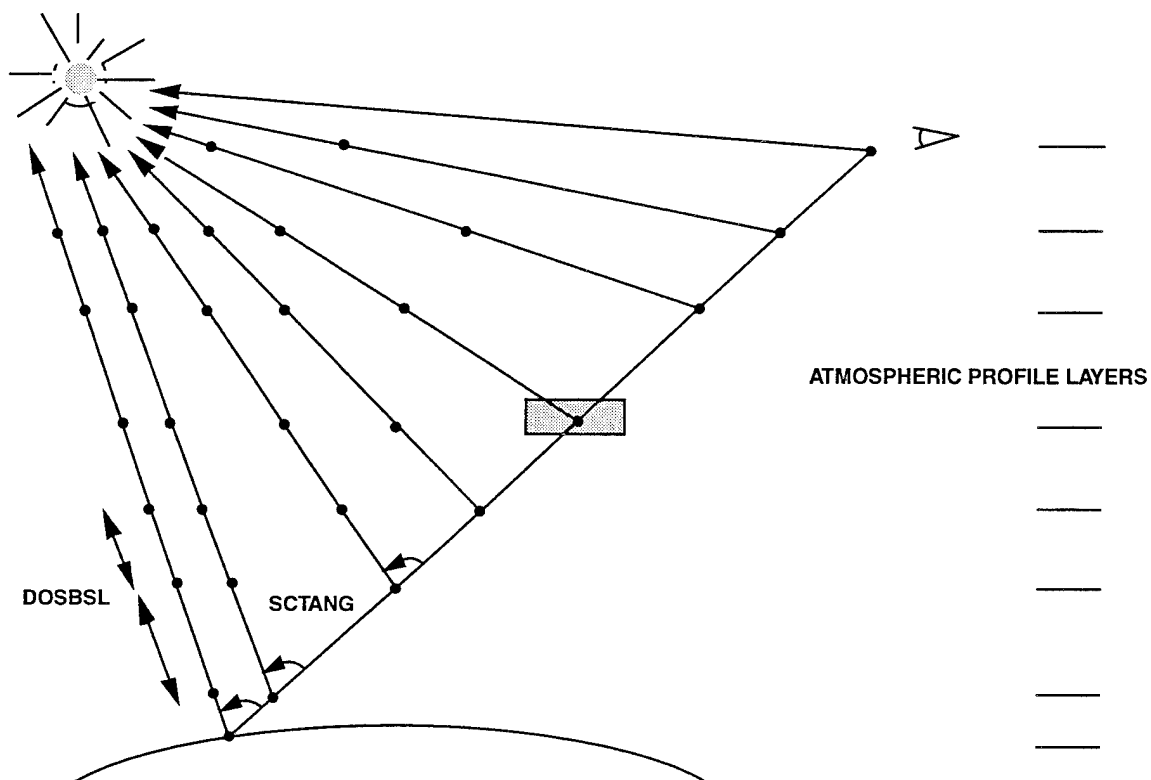
PATH5A

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the sun. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5A used in:

CALCUL DEFBACK PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NTBSL(NAZMAX, MLMX2)	INTEGER	Number of points along each observer-source-background/ solar path
NDXSL(NAZMAX, MLMX2)	INTEGER	Pointers to the starting position of each path
SCTANG(NAZMAX, MLMX2)	REAL	Scattering angle (deg) to the sun at the initial point for each path



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Figure 6. Observer-Source-Background Intermediate Point-to-Sun Paths. There is a set of paths as shown for each user-specified observer-source azimuth angle. COMMON Blocks: PATH 5A, 5B, 5C, 5D, 5E, 5F.

PATH5B

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the sun. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5B used in:

CALCUL PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ITBSL(ISTMAX)	INTEGER	Pointers to the altitude profile along each observer-source-background/solar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, each point has a ray to the sun with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.

PATH5B (continued)

DOSBSL(ISTMAX)	REAL	Differential slant ranges (km) along each observer-source-background/solar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, and each point has a ray to the sun with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.
SLXFAC(MAXLAT, MAXLON,ISTMAX)	REAL	Interpolation factor for global atmosphere for each point along observer-source-background/solar path
NSLXFC(2,2)	INTEGER	Limits of grid where geometry is valid

PATH5C

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the moon. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5C used in:

CALCUL DEFBACK PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NTBLN(NAZMAX, MLMX2)	INTEGER	Number of points along each observer-source-background/ moon path
NDXLN(NAZMAX, MLMX2)	INTEGER	Pointers to the starting position of each path
SCTNGX(NAZMAX, MLMX2)	REAL	Scattering angle (deg) to the moon at the initial point for each path

PATH5D

This COMMON block contains the parameters for the paths from each intermediate point along the observer-source-background path to the moon. There is one set of paths for each user-specified observer-source azimuth angle. For example, if there are 100 intermediate points along the observer-source-background path and there are 3 observer-source azimuth angles, the arrays in this COMMON block will deal with a total of 300 paths. See Figure 6.

Common Block PATH5D used in:

CALCUL PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ITBLN(ISTMAX)	INTEGER	Pointers to the altitude profile along each observer-source-background/lunar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, each point has a ray to the moon with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.

PATH5D (continued)

DOSBLN(ISTMAX)	REAL	Differential slant ranges (km) along each observer-source-background/lunar path; since there are NAZMAX possible azimuths, and up to MLMX2 points for each path, each point has a ray to the moon with up to MLMX2 points each, so there can be up to 0.32 million points possible; tests have shown that ISTMAX will handle most reasonable geometries; if the total number of points exceeds ISTMAX, these values are written to a scratch file and a warning message is given.
XLXFAX(MAXLAT, MAXLON,ISTMAX)	REAL	Interpolation factor for global atmosphere for each point along observer-source-background/lunar path
NXLXFC(2,2)	INTEGER	Limits of grid where geometry is valid

PATH6

This COMMON block contains the parameters for the sun-source-earth path. See Figure 7.

Common Block PATH6 used in:

CALCUL PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NBSLR(MLMAX)	INTEGER	Number of points along sun-source-earth path
ITBSLR(MLMX2, MLMAX)	INTEGER	Pointer to altitude profile along sun-source-earth path
DRBSLR(MLMX2, MLMAX)	REAL	Differential slant ranges (km) along sun-source-earth path
SOLFAC(MAXLAT, MAXLON,MLMX2, MLMAX)	REAL	Interpolation factor for global atmosphere for each point along sun-observer-earth path
NSOLFC(2,2, MLMAX)	INTEGER	Limits of grid where geometry is valid

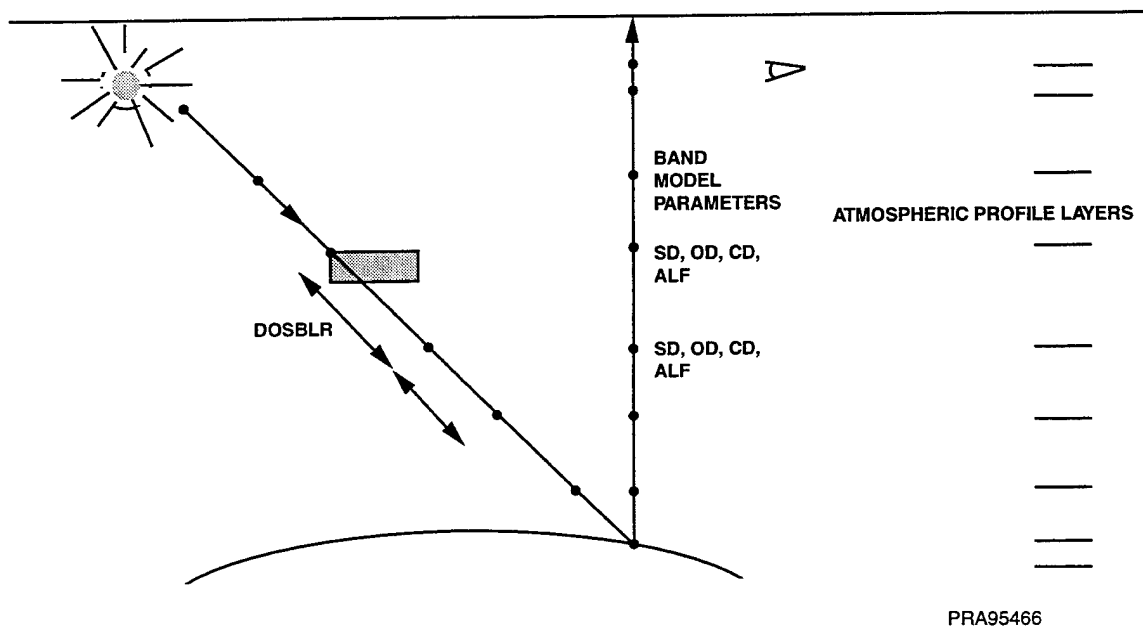


Figure 7. Sun-Source-Earth Path and Spectral Band Model Parameters for Vertical Earth-to-Space Path. COMMON Blocks: PATH6 PATH8.

PATH8

This COMMON block contains the parameters for the moon-source-earth path. See Figure 7.

Common Block PATH8 used in:

CALCUL PRCALC SCNRIO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NBLNR(MLMAX)	INTEGER	Number of points along moon-source-earth path
ITBLNR(MLMX2, MLMAX)	INTEGER	Pointer to altitude profile along moon-source-earth path
DRBLNR(MLMX2, MLMAX)	REAL	Differential slant ranges (km) along moon-source-earth path
XLNFAC(MAXLAT, MAXLON,MLMX2, MLMAX)	REAL	Interpolation factor for global atmosphere for each point along moon-source-earth path
NLUNFC(2,2, MLMAX)	INTEGER	Limits of grid where geometry is valid

PERLUN

This COMMON block contains the Brown perturbation terms for the lunar longitude, latitude, and parallax.

Common Block PERLUN used in:

EPHEML LUNPBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NLON	INTEGER	Number of longitude perturbation terms
PLON(50,5)	REAL	Longitude perturbations
NLAT	INTEGER	Number of latitude perturbation terms
PLAT(20,5)	REAL	Latitude perturbations
NPAR	INTEGER	Number of parallax perturbation terms
PPAR(20,5)	REAL	Parallax perturbations

PHFFOG

This COMMON block contains the phase functions for the advection and radiation LOWTRAN fog models.

Common Block PHFFOG used in:

PHFGBD PHFUNC

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLFG	INTEGER	Number of wavelengths
WLFG(NWLAER)	REAL	Wavelength (μm)
PHFOGS(2,NWLAER, NANG)	REAL	Phase function (sr^{-1})
PHFGSY(2,NWLAER)	REAL	Asymmetry factor

PHFMAR

This COMMON block contains marine aerosol parameters.

Common Block PHFMAR used in:
PHFUNC PHMABD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLMA	INTEGER	Number of wavelength points
WLMA(27)	REAL	Wavelength (μm)
PHMARI(4,27,NANG)	REAL	Phase function
PHMASY(4,47)	REAL	Asymmetry parameter

PHFOCE

This COMMON block contains the single scattering phase functions for the Navy Oceanic Aerosol Model.

Common Block PHFOCE used in:
PHFUNC PHOCBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLOC	INTEGER	Number of spectral points
WLOC(27)	REAL	Wavelength (μm)
PHOCEA(4,27,NANG)	REAL	Phase functions
PHOCSY(4,27)	REAL	Asymmetry parameter

PHFRUR

This COMMON block contains the single scattering phase functions for the relative humidity dependent Urban Aerosol Model.

Common Block PHFRUR used in:

PHFUNC PHRUBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLRU	INTEGER	Number of spectral points
WLRU(27)	REAL	Wavelength (μm)
PHRURL(4,27,NANG)	REAL	Phase functions
PHRUSY(4,27)	REAL	Asymmetry parameter

PHFSTR

This COMMON block contains the phase functions for the stratospheric and mesospheric aerosol models.

Common Block PHFSTR used in:

PHFUNC PHSTBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLST	INTEGER	Number of wavelengths
WLST(27)	REAL	Wavelength (μm)
PHSTRA(4,27,NANG)	REAL	Phase function (sr^{-1})
PHSTSY(4,27)	REAL	Asymmetry factor

PHFTRP

This COMMON block contains the phase functions for the relative humidity dependent tropospheric aerosol model.

Common Block PHFTRP used in:

PHFUNC PHTRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLTR	INTEGER	Number of wavelengths
WLTR(27)	REAL	Wavelength (μm)
PHTROP(4,27,NANG)	REAL	Phase function (sr^{-1})
PHTRSY(4,27)	REAL	Asymmetry factor

PHFURB

This COMMON block contains the single scattering phase functions for the relative humidity dependent Urban Aerosol Model.

Common Block PHFURB used in:

PHFUNC PHURBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NWLUR	INTEGER	Number of spectral points
WLUR(27)	REAL	Wavelength (μm)
PHURBN(4,27,NANG)	REAL	Phase functions
PHURSY(4,27)	REAL	Asymmetry parameter

PHHYDR

This COMMON block contains the phase functions for the cloud/fog models.

Common Block PHHYDR used in:
PHHYBD PHYDRO

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
WLC(NWLCLD)	REAL	Wavelength (μm)
PHCLSY(15,4, NWLCLD)	REAL	Cloud asymmetry factor
RRTMP(7)	REAL	Marshall-Palmer rain rates (mm/hr)
PHRNSY(8,4, NWLCLD)	REAL	Rain asymmetry factor
TMPRN(4)	REAL	Rain temperatures (K)
TMPSN(4)	REAL	Snow temperatures (K)

PLMDAT

This COMMON block contains the band model parameters for the plume binary data file for use in the multiple line groups.

Common Block PLMDAT used in:

ENDPT EQUABS PLMSUB TANGPT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
PLUMEF(NNNMAX, NGAS,MLMAX, MAXLAT,MAXLON)	REAL	Line strength partition function
PLUMEG(NGAS, MLMAX,MAXLAT, MAXLON)	REAL	Fine structure partition function

PLTPRM

This COMMON block contains various plotting parameters.

Common Block PLTPRM used in:

PLTBD PLTDRV RDMSRT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XAXL	REAL	Length of x-axis (inches) (7.0)
YAXL	REAL	Length of y-axis (inches) (4.0)
NMOLEC	INTEGER	Number of molecules
MOLID(NSMX)	INTEGER	Molecular index
NCURVE	INTEGER	Number of curve elements

PRBND A

This COMMON block contains the spectral band model parameters for each molecule for each layer in the atmospheric profile array (vertical path). These band parameters are recalculated for each spectral bin.

Common Block PRBND A used in:

BMOD	BNDPAR	INICPL	KDISTR	LOWTRN	PLMSUB
PTHOSB	PTHTAU				

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SD(ISMX,MLMAX, MAXLAT,MAXLON)	REAL	S/d for each molecule for a given spectral bin at each intermediate point in the atmospheric profile ($\text{amagat}^{-1} \text{ cm}^{-1}$)
OD(ISMX,MLMAX, MAXLAT,MAXLON)	REAL	1/d for each molecule for a given spectral bin at each intermediate point in the atmospheric profile ($\text{amagat}^{-1} \text{ cm}^{-1}$)
SC(ISMX,MLMAX, MAXLAT,MAXLON)	REAL	Scattering coefficient (km^{-1})
QA(ISMX)	REAL	Exponent for LOWTRAN double exponent band model
IBAND(ISMX)	INTEGER	Index for type of band model to be used for each molecule 0 - exponential 1 - Voigt band model 2 - Double exponent band model
ISPECS(NSPCMX)	INTEGER	Number of molecular species plus molecular scatter, aerosols, and hydrometeors
IMDATA(ISMX)	INTEGER	Switch set if molecular line strength greater than zero

PRBNDB

This COMMON block contains the spectral band model parameters for each molecule for each layer in the atmospheric profile array (vertical path). These band parameters are recalculated for each spectral bin.

Common Block PRBNDB used in:

BMOD BNDPAR INICPL KDISTR LOWTRN PLMSUB
PTHTAU

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
AL(ISMX,MLMAX, MAXLAT,MAXLON)	REAL	Molecular line width (cm ⁻¹) at STP
AD(ISMX,MLMAX, MAXLAT,MAXLON)	REAL	Doppler line width (cm ⁻¹) at STP
CD(ISMX,MLMAX, MAXLAT,MAXLON)	REAL	Continuum absorption coefficient (km ⁻¹)

RAINTP

This COMMON block contains the parameters for the rain models. The size parameter has the following form:

$$dN/dD = n0 * EXP(-A * D * (rate**B))$$

with drop diameter, D, in μm and the rate in mm/hr.

Common Block RAINTP used in:

RAINBD RAINEX RAINSP

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
XN0(5)	REAL	n0
ARAIN(5)	REAL	A
BRAIN(5)	REAL	B

RAINWL

This COMMON block contains the spectral parameters for the rain models.

Common Block RAINWL used in:

RAINBD RAINSP SNOWSP

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
WLRN(NWLCLD)	REAL	Wavelength (μm)
RNTMP(7)	REAL	Rain rate (mm/hr)
CAR(7,4,NWLCLD)	REAL	Rain normalized absorption coefficient
CXR(7,4,NWLCLD)	REAL	Rain normalized extinction coefficient
CSX(4,NWLCLD)	REAL	Snow normalized absorption coefficient
CSA(4,NWLCLD)	REAL	Snow normalized extinction coefficient
TEMPRN(4)	REAL	Rain parameter temperatures (K)
TEMPSN(4)	REAL	Snow parameter temperatures (K)

RMODAT

This COMMON block contains various parameters used in the plotting routines.

Common Block RMODAT used in:
 PLTDRV RDMSRT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
WAVLNG(NUMPTS, NUMCRV)	REAL	Wavelength (μm) or wavenumber (cm^{-1})
XMAX	REAL	Maximum spectral limit (μm or cm^{-1})
XMIN	REAL	Minimum spectral limit (μm or cm^{-1})
PATRAD(NUMPTS, NAZMAX,NUMCRV)	REAL	Path radiance ($\text{W}/\text{cm}^2/\text{sr}/\mu\text{m}$ or $\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
ATMAX	REAL	Maximum value of both PATRAD and BKGRAD ($\text{W}/\text{cm}^2/\text{sr}/\mu\text{m}$ or $\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
ATMIN	REAL	Minimum value of both PATRAD and BKGRAD ($\text{W}/\text{cm}^2/\text{sr}/\mu\text{m}$ or $\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
PRYMAX(NAZMAX)	REAL	Maximum value of PATRAD ($\text{W}/\text{cm}^2/\text{sr}/\mu\text{m}$ or $\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
BKGRAD(NUMPTS, NAZMAX,NUMCRV)	REAL	Background radiance ($\text{W}/\text{cm}^2/\text{sr}/\mu\text{m}$ or $\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)
BRYMAX(NAZMAX)	REAL	Maximum value of BKGRAD ($\text{W}/\text{cm}^2/\text{sr}/\mu\text{m}$)
TRAN(NUMPTS, NAZMAX,NUMCRV)	REAL	Transmission, forward in-scatter transmission, and scintillation with respect to the source
TRNMOL(NUMPTS,3, NAXMAX,NUMCRV, NSMX)	REAL	Molecular band, line wing, and total transmittance

RSTART

This COMMON block contains the switch and the local for a restarting of the calculations.

Common Block RSTART used in:

BINFIL CALCUL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NGEOMR	INTEGER	Geometry to restart
NVR	INTEGER	Spectral value to restart
NVS	INTEGER	Spectral bin to restart
LRSTRT	LOGICAL	Flag to restart or not

SCENES

This COMMON block contains the parameters to define the structured terrain scenes.

Common Block SCENES used in:

ATMPRN SCENBD SETBCK TERMPR USRBCK

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NSCENE	INTEGER	Number of scenes
SCENE(NSCEN, NMATL)	REAL	Fraction of each scene that consists of each material
CORLEN(NSCNE, NMATL)	REAL	Correlation length for each material (m)
PSDSLP(NSCNE, NMATL)	REAL	PSD slope of each material
STDEVM(NSCNE, NMATL)	REAL	Log base 10 of the standard deviation relative to the mean for each material
RGCORL(NSCEN)	REAL	Roughness correlation length (m)
RGSTDV(NSCEN)	REAL	Log base 10 of the roughness standard deviation relative to the mean
RGPWRL(NSCEN)	REAL	Roughness PSD slope

SHURUN

This COMMON block contains the parameters for the Schumann-Runge band parameters for molecular oxygen in the ultraviolet.

Common Block SHURUN used in:

ABSO2 O2UVBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
VSHO2(2)	REAL	Wavenumber limits (cm^{-1})
DVSHO2	REAL	Increment (cm^{-1})
SHNO2(424)	REAL	Logarithm (base 10) of absorption coefficient

SILEMS

This COMMON block contains the volumetric emissivity of zodiacal light.

Common Block SILEMS used in:

EMISSV ZOD1BD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NPTWL	INTEGER	Number of wavelength values
NDIST	INTEGER	Number of distance values
VOLMIS(291,33)	REAL	Volumetric emissivity of zodiacal light ($\text{W}/\text{cm}^2/\text{sr}/\text{cm}^{-1}$)

SNWDAT

This COMMON block contains the parameters for the snow models.

Common Block SNWDAT used in:
SNOWBD SNOWEX

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ASNW(6,3)	REAL	Polynomial coefficients for crystal velocity
BSNW(6,2)	REAL	Polynomial coefficients for crystal diameter
RHOWTR(56)	REAL	Water density (gm/cm^3) as a function of temperature
RHOICE	REAL	Ice density (gm/m^3)

SO2XS

This COMMON block contains the cross-sections of sulfur dioxide between 24,820 and 52,625 cm^{-1} .

Common Block SO2XS used in:

ABSSO2 SO2BD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
VBEG	REAL	Initial wavenumber (cm^{-1})
VEND	REAL	Final wavenumber (cm^{-1})
VINCR	REAL	Wavenumber increment (cm^{-1})
CRSSO2(NMAX)	REAL	Cross-section for sulfur dioxide ($\text{amagat}^{-1} \text{cm}^{-1}$)

SOLIR1

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 0 and 10,000 cm^{-1} .

Common Block SOLIR1 used in:

SLRCNT SOLAR SOLRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SOLAR1(10000)	REAL	Solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
SOLRCN	REAL	Solar constant (W/cm^2)

SOLIR2

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 10,001 and 20,000 cm^{-1} .

Common Block SOLIR2 used in:

SLRCNT SOLAR SOLRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SOLAR2(10000)	REAL	Solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
SOLRCN	REAL	Solar constant (W/cm^2)

SOLIR3

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 20,001 and 30,000 cm^{-1} .

Common Block SOLIR3 used in:

SLRCNT SOLAR SOLRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SOLAR3(10000)	REAL	Solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
SOLRCN	REAL	Solar constant (W/cm^2)

SOLIR4

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance between 30,001 and 40,000 cm^{-1} .

Common Block SOLIR4 used in:

SLRCNT SOLAR SOLRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SOLAR4(10000)	REAL	Solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
SOLRCN	REAL	Solar constant (W/cm^2)

SOLIR5

This COMMON block contains the spectral irradiance of the sun at the earth for the mean earth-sun distance above 40,000 cm^{-1} .

Common Block SOLIR5 used in:

SLRCNT SOLAR SOLRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SOLAR5(10000)	REAL	Solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)
SOLRCN	REAL	Solar constant (W/cm^2)
NPTSB	INTEGER	Number of spectral points for 50,001 - 57,420 cm^{-1}
DVB	REAL	Resolution (cm^{-1})
SOLARB(760)	REAL	Solar irradiance ($\text{W}/\text{cm}^2/\text{cm}^{-1}$)

STDMOL

This COMMON Block contain the molecular concentrations for the model atmospheres.

Common Block STDMOL used in:

EQABS STMLBD USRDEF

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
AMOL(NL,24,7)	REAL	Molecular concentration profiles for each of the major molecular species for each model atmosphere (ppmv)

SWPARM

This COMMON block contains various parameters used in the short wave broad band heat flux calculations taken from Lacis and Hansen.

Common Block SWPARM used in:

BRBNBD SOLBND

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
AK(3,8)	REAL	Unknown parameter
PSW(3,8)	REAL	Unknown parameter
BF(3)	REAL	Fraction of solar flux in each band
ALAM(3)	REAL	Wavelength (μm)
IKBAND(3)	INTEGER	Number of elements per band

TMPOCN

This COMMON block contains the ocean temperatures.

Common Block TMPOCN used in:

OCNTBD SEATMP

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
OCNTMP(4,36,72)	REAL	Ocean temperatures (K)
POTEMP(3,36)	REAL	Average mean potential temperatures (°C)

TRACEG

This COMMON block contains the LOWTRAN band parameter for the trace gases.

Common Block TRACEG used in:
LOWTRN TRACBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CPNH3(431)	REAL	LOWTRAN band model parameters for ammonia
CPNO(62)	REAL	LOWTRAN band model parameters for nitric oxide
CPNO2(142)	REAL	LOWTRAN band model parameters for hydrogen dioxide
CPSO2(226)	REAL	LOWTRAN band model parameters for sulfur dioxide

TRANSP

This COMMON block contain the transmission for each molecular species, aerosol, and hydrometeor.

Common Block TRANSP used in:

PRCALC TRNSMT

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
SPCTRN(ISMX,3, NAZMAX)	REAL	Transmission for each of the atmospheric components

UFMIX

This COMMON block contains the LOWTRAN band parameters for the uniformly mixed gases.

Common Block UFMIX used in:
LOWTRN UFIXBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
CPCO(173)	REAL	LOWTRAN band model parameters for carbon monoxide
CPCH4(493)	REAL	LOWTRAN band model parameters for methane
CPN20(704)	REAL	LOWTRAN band model parameters for nitrous oxide
CPO2(382)	REAL	LOWTRAN band model parameters for oxygen

UFTAPE

This COMMON block contains the parameters required to read the MODTRAN band model tape, UFTAPE.

Common Block UFTAPE used in:

ABSMOL UFTPBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NBLOCK	INTEGER	Number of blocks of data on UFTAPE
IFREQ(273)	INTEGER	Initial frequency for each block of data on UFTAPE (cm ⁻¹)
IPARAM(273)	INTEGER	Number of spectral data sets in each block of data on UFTAPE

UPRATM

This COMMON block contains the parameters for the upper model atmosphere profiles (i.e., above 120 km).

Common Block UPRATM used in:

EQABS EXOATM SETALT UPPRBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ZU(NLUPR)	REAL	Altitude (km)
TSTD(NLUPR)	REAL	Standard temperature (K)
PSTD(NLUPR)	REAL	Standard pressure (mb)
TUS(NTEXO, NLUPR,3)	REAL	Seasonal temperatures (K) for a given exoatmospheric temperature
PUS(NTEXO, NLUPR,3)	REAL	Seasonal pressures (mb) for a given exoatmospheric pressure
TMPEXO(NTEXO)	REAL	Exoatmospheric temperatures (K) for TUS and PUS
TUX(NLUPR, MAXLAT,MAXLON)	REAL	Final temperatures (K) for upper atmosphere
PUX(NLUPR, MAXLAT,MAXLON)	REAL	Final pressures (mb) for upper atmosphere

USERDF

This COMMON block contains the parameters for the user-defined atmosphere model.

Common Block USERDF used in:

ASPECT	DEFAULT	EQABS	GETASP	HAZE	ISTAER
SETALT	STRCN2	USRDEF			

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NLUSER	INTEGER	Number of altitudes
ZUSER(MLMAX)	REAL	Altitude (km)
INDXH	INTEGER	Index for user-defined haze profile
HZUSER(MLMAX)	REAL	User-defined haze profile (km^{-1})
INDXC	INTEGER	Index for user-defined structure constant profile
CN2USR(MLMAX)	REAL	User-defined structure constant profile ($\text{m}^{-2/3}$)
INDXA	INTEGER	Index for user-defined aerosol profile
IARUSR(MLMAX)	INTEGER	User-defined aerosol profile
NASUSR	INTEGER	Number of user-defined earth/skyshine elevation angles
ASPUSR(NASMAX)	REAL	User-defined earth/skyshine elevation angles (deg)
MPUSR	INTEGER	Index for user-defined pressure
PUSER(MLMAX)	REAL	User-defined pressure (mb)
MTUSR	INTEGER	Index for user-defined temperature
TUSER(MLMAX)	REAL	User-defined temperature (K)
MCUSR(ISMX)	INTEGER	Indices for user-defined molecular concentrations
AUSER(MLMAX, ISMX)	REAL	User-defined molecular concentrations (ppmv)
FLUSR	LOGICAL	Flag for completing profile with model atmosphere

USERNM

This COMMON block contains the user-defined atmosphere name.

Common Block USERNM used in:

USRDEF BBTEMP SUMFIL VISUAL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
HMODEL	CHARACTER*40	User-defined atmosphere name

VSADTA

This COMMON block contains the parameters for the vertical structure profile of the aerosol density between 0 and 2 km above ground level.

Common Block VSADTA used in:

ENDPT EQABS EQUABS INITL TANGPT VSA

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
HMAX	REAL	Maximum altitude (km) at which vertical structure profile will be calculated. Default value is 2 km, unless unless cloud/fog top is lower.
ZVSA(NVSA, MAXLAT,MAXLON)	REAL	Altitude (km)
RHVSA(NVSA, MAXLAT,MAXLON)	REAL	Relative humidity
HZVSA(NVSA, MAXLAT,MAXLON)	REAL	Extinction coefficient (km^{-1}) at 0.55 μm

WETNES

This COMMON block contains the volumetric moisture for vegetation and soil.

Common Block WETNES used in:
DIREMS EMISBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
MV(13)	REAL	Volumetric moisture on vegetation and soil

WNLOHI

This COMMON block contains the spectral LOWTRAN band model coefficients.

Common Block WNLOHI used in:

LOWTRN WVBNBD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
MVH2O	INTEGER	Number of water vapor bands
MVCO2	INTEGER	Number of carbon dioxide bands
MVO3	INTEGER	Number of ozone bands
MVN2O	INTEGER	Number of nitrous oxide bands
MVCO	INTEGER	Number of carbon monoxide bands
MVCH4	INTEGER	Number of methane bands
MVO2	INTEGER	Number of oxygen bands
MVSO2	INTEGER	Number of sulfur dioxide bands
MVNO2	INTEGER	Number of nitrogen dioxide bands
MVNO	INTEGER	Number of nitric oxide bands
MVNH3	INTEGER	Number of ammonia bands
IWLH2O(14)	INTEGER	Lower limit for water vapor band (cm^{-1})
IWLCO2(10)	INTEGER	Lower limit for carbon dioxide band (cm^{-1})
IWLO3(5)	INTEGER	Lower limit for ozone band (cm^{-1})
IWLN2O(11)	INTEGER	Lower limit for nitrous oxide band (cm^{-1})
IWLCO(3)	INTEGER	Lower limit for carbon monoxide band (cm^{-1})
IWLCH4(4)	INTEGER	Lower limit for methane band (cm^{-1})
IWLO2(6)	INTEGER	Lower limit for oxygen band (cm^{-1})
IWLSO2(4)	INTEGER	Lower limit for sulfur dioxide band (cm^{-1})
IWLNO2(3)	INTEGER	Lower limit for nitrogen dioxide band (cm^{-1})
IWLNO(1)	INTEGER	Lower limit for nitric oxide band (cm^{-1})
IWLNH3(2)	INTEGER	Lower limit for ammonia band (cm^{-1})
IWHH2O(14)	INTEGER	Upper limit for water vapor band (cm^{-1})
IWHCO2(10)	INTEGER	Upper limit for carbon dioxide band (cm^{-1})
IWHO3(5)	INTEGER	Upper limit for ozone band (cm^{-1})
IWHN2O(11)	INTEGER	Upper limit for nitrous oxide band (cm^{-1})
IWHCO(3)	INTEGER	Upper limit for carbon monoxide band (cm^{-1})
IWHCH4(4)	INTEGER	Upper limit for methane band (cm^{-1})

WNLOHI (continued)

IWHO2(6)	INTEGER	Upper limit for oxygen band (cm^{-1})
IWHSO2(4)	INTEGER	Upper limit for sulfur dioxide band (cm^{-1})
IWHNO2(3)	INTEGER	Upper limit for nitrogen dioxide band (cm^{-1})
IWHNO(1)	INTEGER	Upper limit for nitric oxide band (cm^{-1})
IWHNH3(2)	INTEGER	Upper limit for ammonia band (cm^{-1})
ANH3(2)	REAL	Ammonia exponent
ACO2(10)	REAL	Carbon dioxide exponent
ACO(3)	REAL	Carbon monoxide exponent
ACH4(4)	REAL	Methane exponent
ANO2(3)	REAL	Nitrogen dioxide exponent
AN2O(11)	REAL	Nitrous oxide exponent
AO2(6)	REAL	Oxygen exponent
AO3(5)	REAL	Ozone exponent
ASO2(4)	REAL	Sulfur dioxide exponent
AH2O(14)	REAL	Water vapor exponent
ANO(1)	REAL	Nitric oxide exponent
AANH3(2)	REAL	Ammonia exponential sum fit term
BBNH3(2)	REAL	Ammonia exponential sum fit term
CCNH3(2)	REAL	Ammonia exponential sum fit term
AACO2(10)	REAL	Carbon dioxide exponential sum fit term
BBCO2(10)	REAL	Carbon dioxide exponential sum fit term
CCCO2(10)	REAL	Carbon dioxide exponential sum fit term
AACO(3)	REAL	Carbon monoxide exponential sum fit term
BBCO(3)	REAL	Carbon monoxide exponential sum fit term
CCCO(3)	REAL	Carbon monoxide exponential sum fit term
AACH4(4)	REAL	Methane exponential sum fit term
BBCH4(4)	REAL	Methane exponential sum fit term
CCCH4(4)	REAL	Methane exponential sum fit term
AANO2(3)	REAL	Nitrogen dioxide exponential sum fit term
BBNO2(3)	REAL	Nitrogen dioxide exponential sum fit term
CCNO2(3)	REAL	Nitrogen dioxide exponential sum fit term
AAN2O(11)	REAL	Nitrous oxide exponential sum fit term
BBN2O(11)	REAL	Nitrous oxide exponential sum fit term
CCN2O(11)	REAL	Nitrous oxide exponential sum fit term
AAO2(6)	REAL	Oxygen exponential sum fit term
BBO2(6)	REAL	Oxygen exponential sum fit term
CCO2(6)	REAL	Oxygen exponential sum fit term

WNLOHI (continued)

AAO3(5)	REAL	Ozone exponential sum fit term
BBO3(5)	REAL	Ozone exponential sum fit term
CCO3(5)	REAL	Ozone exponential sum fit term
AASO2(4)	REAL	Sulfur dioxide exponential sum fit term
BBSO2(4)	REAL	Sulfur dioxide exponential sum fit term
CCSO2(4)	REAL	Sulfur dioxide exponential sum fit term
AAH2O(14)	REAL	Water vapor exponential sum fit term
BBH2O(14)	REAL	Water vapor exponential sum fit term
CCH2O(14)	REAL	Water vapor exponential sum fit term
AANO(1)	REAL	Nitric oxide exponential sum fit term
BBNO(1)	REAL	Nitric oxide exponential sum fit term
CCNO(1)	REAL	Nitric oxide exponential sum fit term
PH2O(14)	REAL	Water vapor pressure exponent
PCO2(10)	REAL	Carbon dioxide pressure exponent
PO3(5)	REAL	Ozone pressure exponent
PN2O(11)	REAL	Nitrous oxide pressure exponent
PCO(3)	REAL	Carbon monoxide pressure exponent
PCH4(4)	REAL	Methane pressure exponent
PO2(6)	REAL	Oxygen pressure exponent
PSO2(4)	REAL	Sulfur dioxide pressure exponent
PNO2(3)	REAL	Nitrogen dioxide pressure exponent
PNO(1)	REAL	Nitric oxide pressure exponent
PNH3(2)	REAL	Ammonia pressure exponent
TH2O(14)	REAL	Water vapor temperature exponent
TCO2(10)	REAL	Carbon dioxide temperature exponent
TO3(5)	REAL	Ozone temperature exponent
TN2O(11)	REAL	Nitrous oxide temperature exponent
TCO(3)	REAL	Carbon monoxide temperature exponent
TCH4(4)	REAL	Methane temperature exponent
TO2(6)	REAL	Oxygen temperature exponent
TSO2(4)	REAL	Sulfur dioxide temperature exponent
TNO2(3)	REAL	Nitrogen dioxide temperature exponent
TNO(1)	REAL	Nitric oxide temperature exponent
TNH3(2)	REAL	Ammonia temperature exponent

ZOBNB

This COMMON block contains the zodiacal light parameters.

Common Block ZOBNB used in:

DBANDS ZO2BD

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
NPTZOD(3)	INTEGER	Number of points in each band
TMPZOD(3)	REAL	Temperature of dust (K)
ALBEDO(3)	REAL	Albedo of dust
TAU(3)	REAL	
OMEGA(3)	REAL	
XIF(3)	REAL	
DEL(3)	REAL	
Q(3)	REAL	
THEMIS(811)	REAL	
KRONIS(632)	REAL	
EOS(632)	REAL	

ZPLANE

This COMMON block contains the zodiacal symmetry plane parameters.

Common Block ZPLANE used in:

ZOD2BD ZODICL

<u>Variable Name</u>	<u>Type</u>	<u>Description</u>
ZNODE	REAL	Ascending node (deg)
ZINC	REAL	Inclination (deg)
ZN	REAL	Normalized dust density at 1 AU (particles/m ³)
ZALPHA	REAL	Radial dependence factor

6.0 PARAMETER DATA DICTIONARY

The description and value of each PARAMETER variable, in addition to the modules in which it is contained, are presented in Table 1. All PARAMETER variables are declared INTEGER.

Table 1. PARAMETER Variables.

PARAMETER	VALUE	DESCRIPTION
MOLMAX	26	Number of different band molecules whose band model parameters can be read in
ISMX	MOLMAX+8	Number of species used in calculations
ISTMAX	30000	Maximum size of a COMMON block for raypath parameters
MLMAX	140	Maximum number of altitude points
MLMX2	2*MLMAX	Maximum number of points for a ray
NASMAX	15	Maximum number of earth/skyshine aspect angles
NAZMAX	30	Maximum number of observer-source azimuths
NBAND	16	Maximum number of elements in exponential sum expansion for multiple scattering
NFRQ	76	Number of frequency values in microwave water refractivity data base
NGAS	6	Number of molecules in plume binary data file
NGMAX	15	Maximum number of geometries
NMATL	28	Maximum number of background materials
NNNMAX	5	Number of line groups used for SIRRM calculations
NSCEN	42	Maximum number of background scenes

Table 1. PARAMETER Variables (continued).

PARAMETER	VALUE	DESCRIPTION
NTIME	500	Maximum number of time increments for heat transfer data base
NWLWTR	169	Number of spectral water refractivity data base
NXMIE	101	Maximum number of bins for particle size distribution for Mie calculations
NZSMAX	4	Maximum number of earth/skyshine azimuth angles
NXMAX	100	Maximum number of extra altitudes
NANTMX	125	Maximum number of antecedent temporal points
NVSA	9	Number of altitude points for Vertical Structure Algorithm
NWLCLD	79	Number of spectral points for hydrometeors
NWLAER	47	Number of spectral points for aerosols
NSTTMP	16	Number of stratospheric aerosol temperatures
NANG	65	Number of scattering angles for phase function
NL	50	Number of altitude layers in model atmospheres
NLUPR	8	Number of altitude layers in upper atmosphere profiles
NTEXO	11	Number of exospheric temperature profiles
MAXLAT	3	Maximum number of latitudes used for global atmosphere
MAXLON	1	Maximum number of longitudes used for global atmosphere
NVSMAX	20	Maximum number of spectral bands

Table 1. PARAMETER Variables (continued).

PARAMETER	VALUE	DESCRIPTION
NLMAX	10	Maximum number of subsurface layers for background temperature calculations
NZBNDR	3	Number of altitudes in the boundary layer haze profiles
NZTROP	9	Number of altitudes in the troposphere haze profiles
NZSTRA	17	Number of altitudes in the stratospheric haze profiles
NZUPR	14	Number of altitudes in the upper atmosphere haze profiles
MLIDMX	45	Number of molecular species that MOSART recognizes
NSMX	MLIDMX+8	Number of species that MOSART recognizes
NDV	200	Maximum number of spectral points used in slit function convolutions
NSLTD (in ASCBIN)	5	Maximum number of variables to be convolved
NSLTD (in PLTGEN)	3* NAZMAX* (1+ISMX)	Maximum number of variables to be convolved
MLUSR	34	Maximum number of user-defined altitudes for MODTRAN input file
MAXTMP	5	Number of temperatures in band model parameters
NMAX (in ABSO3)	3080	Number of spectral points for ozone band model
NMAX (in ABSSO2)	5562	Number of spectral points for sulfur dioxide band model

Table 1. PARAMETER Variables (continued).

PARAMETER	VALUE	DESCRIPTION
NMAX (in MIE)	20000	Maximum number of bins for integrating over the size distribution
NPTS (in DENWTR)	56	Number of temperature values
NPTS (in ENDPD)	2000	Maximum number of intermediate altitudes
NPTS (in EVAPOR)	18	Number of temperature values
NPTS (in EXGALS)	7	Number of spectral values
NPTS (in SCINTL)	10	Number of scintillation levels
MPTS (in SCINTL)	14	Number of aperture diameters
MPTS (in COLOR)	83	Number of spectral values in CIE color curves
NPMAX	250	Maximum number of spectral points in a MODTRAN data base logical record
NTMPMX	5	Number of temperature values in the MODTRAN data base
MXLNRC	16384	Maximum length for a direct access logical record
NLINES	10	Number of logical records used to evaluate writing and reading direct access file
NUMPTS	3000	Maximum number of spectral points in a curve segment
NUMCRV	5	Maximum number of curve segments in a plot
NLAYER	20	Number of layers in subsurface heat conduction calculation

Table 1. PARAMETER Variables (continued).

PARAMETER	VALUE	DESCRIPTION
NTEMP	5	Number of temperatures in band parameter data bases
NWL	29	Number of spectral points for hydrogen peroxide band model
NVMAX (in AMMNIA)	11	Number of spectral points for ammonia band model
NVMAX (in VISUAL)	3600	Number of spectral points that can be read in VISUAL
NVAR6	6	Number of years of historical data
NYR1	44	Number of years of long-term historical CO ₂ data (1743-1959)
NYR2	258	Number of recent CO ₂ measurements
NYRMAX	175	Number of years for the conversion of UT to Ephemeris Time
NWLMX	100	Maximum number of spectral points in user-defined aerosol
NALB	30	Number of spectral values of lunar albedo
NEL	37	Number of values for variations in lunar irradiance due to phase
NBIN	21	Number of bins for integration over snow size distribution
NSPH (in SPHICE)	11	Number of temperatures in specific heat of ice calculation
NSPH (in SPHWTR)	19	Number of temperatures in specific heat of water calculations
NAIT	10	Maximum number of points for an Aitken iterated polynomial interpolation

7.0 CALLING STRUCTURE

The calling structure (i.e., which routine calls which other routines and which routines are called by a routine) is provided below, together with the prerequisite calling order of each program, and the COMMON block reference list.

7.1 MOSART

7.1.1 MOSART Subprogram References

MOSART calls:						
CALCUL	CNSTNT	CONFIG	DBINIT	EPHEMS	EQUABS	
INITL	IOERR	PROMPT	RDFLTR	SLPOS	TITLCR	
CALCUL calls:						
BRBNDR	INDXBK	IOERR	OPNSCR	PRCALC	PTHDR	
RESOLV	SCNRIO	SETBCK	SRCFLX	SRCGEO	SRCIRR	
SUMFIL						
BRBNDR calls:						
AECALC	AIRTMP	BBARSL	EPHEMS	FLUXLW	HTBLNC	
IOERR	OPATH	PRETEM	SATUR	SEATMP	SLRCNT	
SOLBND	SPCLYR	XTERP				
AECALC calls:						
PLANCK						
PLANCK calls: none						
AIRTMP calls: none						
BBARSL calls:						
PLANCK	XTERP					
XTERP calls:						
IBNSRC						
IBNSRC calls: none						
EPHEMS calls:						
EPHEML	EPHTIM	PLANET	SLPOS	SPTRIG		
EPHEML calls: none						
EPHTIM calls: none						
PLANET calls: none						
SLPOS calls:						
GEOM	HORIZN					
GEOM calls:						
ENDPT	INIGEO	RAYPTH				
ENDPT calls:						
AERSOL	EQABS	HAZE	HYDROM	ISTAER	STRCN2	
XTERP						
AERSOL calls:						
DESAER	MARINE	MIEPHS	PROFAC	XTERP		
DESAER calls: none						
MARINE calls:						
PROFAC						
PROFAC calls:						
IBNSRC						
MIEPHS calls:						
COAT	DNDR	EMTREF	INDEXI	INDEXW	MIE	
PROFAC						
COAT calls:						
NCYCLE						
NCYCLE calls: none						
DNDR calls:						
GAMMLN						
GAMMLN calls: none						

EMTREF calls: none
 INDEXI calls:
 XTERP
 INDEXW calls:
 XTERP
 MIE calls:
 NCYCLE
 EQABS calls:
 BNDMLG MDLATM PARTIT REFRAC RELHUM SATUR
 XTERP
 BNDMLG calls: none
 MDLATM calls: none
 PARTIT calls: none
 REFRAC calls:
 PFR SUPK
 PFR calls: none
 SUPK calls: none
 RELHUM calls:
 SATUR
 SATUR calls: none
 HAZE calls:
 HLOWT XTERP
 HLOWT calls: none
 HYDROM calls:
 CIREX PROFAC RAINEX SATUR SNOWEX XTERP
 CIREX calls: none
 RAINEX calls: none
 SNOWEX calls: none
 ISTAER calls:
 HLOWT
 STRCN2 calls:
 REFRAC XTERP
 INIGEO calls: none
 RAYPTH calls:
 TANGPT
 TANGPT calls:
 AERSOL EQABS HAZE HYDROM ISTAER STRCN2
 XTERP
 HORIZN calls:
 RAYPTH
 SPTRIG calls: none
 FLUXLW calls: none
 HTBLNC calls:
 SRFLUX
 SRFLUX calls:
 EVAPOR SATUR
 EVAPOR calls:
 XTERP
 IOERR calls:
 GERROR
 GERROR calls: none
 OPATH calls:
 LAYLW SATUR TRANLW
 LAYLW calls: none
 TRANLW calls: none
 PRETEM calls: none
 SEATMP calls: none
 SLRCNT calls: none
 SOLBND calls:
 BBO3 CLDLYR SRAT SRTLAY SWAT UDLAY
 BBO3 calls: none
 CLDLYR calls:
 BETA BETAU
 BETA calls: none
 BETAU calls: none

SRAT calls: none
 SRTLAY calls:
 BETA
 SWAT calls:
 DDIF GAM RAB RBE UDIF
 DDIF calls: none
 GAM calls: none
 RAB calls: none
 RBE calls: none
 UDIF calls: none
 UDLAY calls: none
 SPCLYR calls:
 DENAIR DENWTR SPHAIR SPHICE SPHWTR THCAIR
 THCICE THCSNW THCWTR
 DENAIR calls:
 VIRIAL
 VIRIAL calls:
 XTERP
 DENWTR calls: none
 SPHAIR calls: none
 SPHICE calls:
 XTERP
 SPHWTR calls:
 XTERP
 THCAIR calls: none
 THCICE calls:
 XTERP
 THCSNW calls: none
 THCWTR calls:
 XTERP
 INDXBK calls:
 GBLBCK
 GBLBCK calls:
 AIRTMP RDGBL RDSCN
 RDGBL calls:
 IOERR SEAICE
 SEAICE calls: none
 RDSCN calls:
 CITIES IBKCNV IOERR
 CITIES calls: none
 IBKCNV calls: none
 OPNSCR calls:
 IOERR
 PRCALC calls:
 ATMPRN BCKGND BCKPRN BNDPAR BNTPTH COUPLE
 DISPRN DPLDT FILTER INDXBK INTEG IOERR
 KDISTR MLSCAT PLANCK PLMSUB PTHOSB PTHTAU
 RESOLV RSHINE SCINTL SLUNAR SMPCAL SOLAR
 SOLRAD TERMPR XPNDAR ZROINT
 ATMPRN calls:
 INDXBK IOERR PRALT RELHUM SETBCK
 PRALT calls:
 IBNSRC
 SETBCK calls:
 INTR2D MODBCK
 INTR2D calls: none
 MODBCK calls: none
 BCKGND calls:
 BDRF DEMSXX EMTREF EXGALS FRESNL GALRAD
 INDEXI INDEXW PLANCK REFEST SETBCK SLUNAR
 SOLAR STARAD XTERP ZODICL
 BDRF calls:
 DIREFL SHADOW
 DIREFL calls: none

SHADOW calls:
 DERF
 DERF calls: none
 DEMSXX calls:
 DIREMS EMTREF INDEXI INDEXW SEAWTR SOIL
 DIREMS calls:
 EHBSL0 FRESNL PLANCK
 EHBSL0 calls:
 POLY
 POLY calls: none
 FRESNL calls: none
 SEAWTR calls: none
 SOIL calls: none
 EXGALS calls:
 PLANCK XTERP
 GALRAD calls:
 PLANCK
 REFEST calls: none
 SLUNAR calls:
 SOLAR XTERP
 SOLAR calls:
 EVEN
 EVEN calls: none
 STARAD calls:
 PLANCK
 ZODICL calls:
 DBANDS EMISSV EPHTIM GETGLC
 DBANDS calls:
 PLANCK SOLAR ZLAT
 ZLAT calls: none
 EMISSV calls:
 PLANCK SOLAR
 GETGLC calls: none
 BCKPRN calls:
 IOERR
 BNDPAR calls:
 AMOLSC BMOD PHFUNC PHMLSC RAINSP SNOWSP
 XTERP
 AMOLSC calls:
 DEPOL REFRAC
 DEPOL calls:
 XTERP
 BMOD calls:
 ABCCCL4 ABHNO4 ABN205 ABSCFC ABSCLO ABSH20
 ABSMOL ABSN2 ABSN20 ABSNO2 ABSO2 ABSO3
 ABSSO2 AH2O2 AMMNIA EVEN H2OCNT O2CNT
 PARTIT PROFAC RADFLD
 ABCCCL4 calls:
 XTERP
 ABHNO4 calls:
 XTERP
 ABN205 calls:
 XTERP
 ABSCFC calls:
 XTERP
 ABSCLO calls:
 XTERP
 ABSH20 calls: none
 ABSMOL calls:
 IOERR
 ABSN2 calls: none
 ABSN20 calls: none
 ABSNO2 calls: none
 ABSO2 calls:
 XTERP

ABSO3 calls: none
 ABSSO2 calls: none
 AH2O2 calls:
 XTERP
 AMMNIA calls: none
 H2OCNT calls: none
 O2CNT calls: none
 RADFLD calls: none
 PHFUNC calls:
 CSPHFN PHYDRO PROFAC
 CSPHFN calls: none
 PHYDRO calls:
 CSPHFN PROFAC XTERP
 PHMLSC calls:
 DEPOL
 RAINSP calls:
 PROFAC XTERP
 SNOWSP calls:
 PROFAC
 BNTPTH calls: none
 COUPLE calls:
 BCKGND INICPL PROFAC XTERP
 INICPL calls:
 BETA BETAU ESFIT SRTLAY UDLAY
 ESFIT calls: none
 DISPRN calls:
 IOERR
 DPLDT calls: none
 FILTER calls:
 XTERP
 INTEG calls: none
 KDISTR calls: none
 MLSCAT calls:
 BETAU RADTRY
 RADTRY calls: none
 PLMSUB calls:
 COMFNC
 COMFNC calls: none
 PTHOSB calls:
 RADTRX
 RADTRX calls: none
 PTHTAU calls:
 BNTPTH TRNSMT
 TRNSMT calls:
 BAND
 BAND calls:
 DERF
 RESOLV calls:
 DVINCR
 DVINCR calls: none
 RSHINE calls:
 BCKGND BNTPTH IOERR MLSCAT PTHTAU RADTRX
 SOLRAD TERMPR
 SOLRAD calls:
 PTHTAU RADTRY XTERP
 TERMPR calls:
 SHADOW
 SCINTL calls:
 PROFAC XTERP
 SMPCAL calls:
 PTHTAU
 XPNDAR calls:
 XTERP
 ZROINT calls: none

PUTHDR calls:						
IOERR	PRTHDR					
PRTHDR calls:						
IOERR						
SCNRIO calls:						
CALEND	DEFBCK	ECLGAL	EQUECL	GEOM	HOREQU	
HORIZN	INTR2D	RAYPTH	SHNGEO	SPTRIG	TURBUL	
CALEND calls: none						
DEFBCK calls:						
BCKCHK	INDXBK	SETBCK	SPTRIG			
BCKCHK calls: none						
ECLGAL calls: none						
EQUECL calls: none						
HOREQU calls: none						
SHNGEO calls:						
HOREQU	INTR2D	RAYPTH	SPTRIG			
TURBUL calls: none						
SRCFLX calls: none						
SRCGEO calls:						
GEOM	HORIZN	INTR2D	SPTRIG			
SRCIRR calls:						
ASPECT	CALEND	ECLGAL	EQUECL	HOREQU	HORIZN	
INDXBK	INTR2D	IOERR	RAYPTH	SETUP	SHNGEO	
SPTRIG						
ASPECT calls:						
GETGLC						
SETUP calls: none						
SUMFIL calls:						
CHTIME	IOERR	LENSTR	PUTCLD	PUTSLR		
CHTIME calls: none						
LENSTR calls: none						
PUTCLD calls:						
IOERR						
PUTSLR calls:						
IOERR	SLRCNT					
CNSTNT calls:						
ADD	DADD	DDIV	DIV	DMUL	DSUB	
MUL	SUB					
ADD calls: none						
DADD calls: none						
DDIV calls: none						
DIV calls: none						
DMUL calls: none						
DSUB calls: none						
MUL calls: none						
SUB calls: none						
CONFIG calls: none						
DBINIT calls:						
IOERR						
EQUABS calls:						
AERSOL	CHANGE	CLDALT	EQABS	HAZE	HEYMS	
HLOWT	HYDROM	IOERR	ISTAER	NXXPAU	SETALT	
SKYNOI	STRCN2	VISRH	XTERP			
CHANGE calls:						
XTERP						
CLDALT calls:						
RDGBL	TMPCLD					
TMPCLD calls: none						
HEYMS calls: none						
NXXPAU calls:						
IBNSRC	PROFAC	XTERP				
SETALT calls:						
XTERP						
SKYNOI calls:						
REFRAC						

VISRH calls: none						
INITL calls:						
BEAUFT	BINFIL	CALEND	CIRRUS	DEFAULT	DFLT2	
DFLT8	EXOATM	EXOTMP	FILOPN	FILRT	GBLBCK	
GETASP	GETATM	GETBCK	GETCLD	GETEXO	GETPOS	
GETSLR	GETVAR	GETVEC	IOERR	ISRAEL	LWCASE	
MDLATM	MIEINP	PARSE	RDLINE	SATUR	SETFLG	
STGEOM	UPCASE	USRDEF	VSA	ZROHDR		
BEAUFT calls: none						
BINFIL calls:						
CHKRST	CHKVER	DISEND	FLSTAT	IOERR	RDLINE	
UPCASE						
CHKRST calls:						
IOERR						
CHKVER calls:						
IOERR						
DISEND calls:						
IOERR						
FLSTAT calls:						
IOERR	UPCASE					
UPCASE calls: none						
RDLINE calls:						
IOERR	LCTRIM	LENSTR				
LCTRIM calls: none						
CIRRUS calls: none						
DEFAULT calls:						
EXOATM	GBLBCK					
EXOATM calls:						
XTERP						
DFLT2 calls:						
IDAERO	MDLATM					
IDAERO calls: none						
DFLT8 calls:						
DVINCR	GETVEC	RDLINE	UPCASE			
GETVEC calls:						
IOERR	LCTRIM	LENSTR				
EXOTMP calls: none						
FILOPN calls:						
IOERR	RDLINE	UPCASE				
FILRT calls:						
LCTRIM						
GETASP calls:						
GETVEC	IGTINT	RDLINE	UPCASE			
IGTINT calls:						
IOERR						
GETATM calls:						
GETVAR	IGTINT	IGTVEC	LWCASE	MRNDFL	NCHAER	
NCHATM	NCHAZE	NCHSEA	RDLINE	UPCASE		
GETVAR calls:						
IOERR						
IGTVEC calls:						
IOERR	LCTRIM	LENSTR				
LWCASE calls: none						
MRNDFL calls: none						
NCHAER calls:						
LCTRIM	UPCASE					
NCHATM calls:						
LCTRIM	UPCASE					
NCHAZE calls:						
LCTRIM	UPCASE					
NCHSEA calls:						
LCTRIM	UPCASE					
GETBCK calls:						
GETVAR	GETVEC	IGTINT	RDLINE	UPCASE	USRBCK	

USRBCK calls:	GETVAR	GETVEC	IGTINT	IGTVEC	IOERR	PARSE
	RDLINE	UPCASE				
PARSE calls:	LCSTRIM	LENSTR				
GETCLD calls:	GETVAR	IGTINT	RDLINE	UPCASE	USRCLD	
USRCLD calls:	GETVAR	IGTINT	IOERR	PARSE	RDLINE	UPCASE
GETEXO calls:	GETVAR	IGTINT	PARSE	RDLINE	UPCASE	
GETPOS calls:	CALEND	CHTIME	GETVAR	IGTINT	LWCASE	MONTH
	RDLINE	UPCASE				
MONTH calls:	LCSTRIM	UPCASE				
GETSLR calls:	GETVAR	RDLINE	SPTRIG	UPCASE		
ISRAEL calls: none						
MIEINP calls:	GETVAR	GETVEC	IGTINT	IOERR	LWCASE	PARSE
	RDLINE	UPCASE				
SETFLG calls: none						
STGEOM calls:	GETVAR	IGTINT	LWCASE	UPCASE		
USRDEF calls:	GBLBCK	GETVAR	IGTINT	IOERR	LWCASE	MDLATM
	PARSE	RDLINE	UPCASE	XMCONV	XTERP	
XMCONV calls:	SATUR	XTERP				
VSA calls: none						
ZROHDR calls: none						
PROMPT calls: none						
RDFLTR calls:	GETVAR	IOERR	LCSTRIM	LENSTR	LWCASE	PARSE
	RDLINE	UPCASE				
TITLCR calls:	FDATE					
FDATE calls: none						

7.1.2 MOSART Cross-Reference List

ABCCL4 called by:
 BMOD
 ABHNO4 called by:
 BMOD
 ABN2O5 called by:
 BMOD
 ABSCFC called by:
 BMOD
 ABSCL0 called by:
 BMOD
 ABSH20 called by:
 BMOD
 ABSMOL called by:
 BMOD
 ABSN2 called by:
 BMOD
 ABSN20 called by:
 BMOD
 ABSNO2 called by:
 BMOD
 ABSO2 called by:
 BMOD

ABSO3 called by:	BMOD					
ABSSO2 called by:	BMOD					
ADD called by:	CNSTNT					
AECALC called by:	BRBNDR					
AERSOL called by:	ENDPT	EQUABS	TANGPT			
AH2O2 called by:	BMOD					
AIRTMP called by:	BRBNDR	GBLBCK				
AMMNIA called by:	BMOD					
AMOLSC called by:	BNDPAR					
ARSABD called by:	AERSOL	HYDROM	MARINE			
ARSLBD called by:	AERSOL	BBARSL	BNDPAR	HYDROM	MARINE	PHFUNC
	PHYDRO	PRCALC	RSHINE			
ARSXBD called by:	AERSOL	HYDROM	MARINE			
ASPECT called by:	SRCIRR					
ATMPRN called by:	PRCALC					
ATMSBD called by:	ATMPRN	BCKPRN	BRBNDR	CALCUL	DFLT2	EQABS
	EQUABS	GBLBCK	INITL	PRCALC	SCNRIO	SETALT
	SETBCK	SHNGEO	SRCGEO	SRCIRR	USRDEF	
BAND called by:	TRNSMT					
BBARSL called by:	BRBNDR					
BBO3 called by:	SOLBND					
BCKCHK called by:	DEFBCK					
BCKGND called by:	COUPLE	PRCALC	RSHINE			
BCKPRN called by:	PRCALC					
BDRF called by:	BCKGND					
BEAUFT called by:	INITL					
BETA called by:	CLDLYR	INICPL	SRTLAY			
BETAU called by:	CLDLYR	INICPL	MLSCAT			
BINFIL called by:	INITL					
BKGDBD called by:	ATMPRN	BCKGND	BRBNDR	COUPLE	GETBCK	INITL
	SETBCK	SPCLYR	USRBCK			
BKSTBD called by:	AERSOL	PHFUNC				
BMOD called by:	BNDPAR					
BNDMLG called by:	EQABS					

BNDPAR	called by:					
	PRCALC					
BNTPTH	called by:					
	PRCALC	PTHTAU	RSHINE			
BRBNBD	called by:					
	CLDLYR	FLUXLW	SOLBND	TRANLW		
BRBNDR	called by:					
	CALCUL					
CALCUL	called by:					
	MOSART					
CALEND	called by:					
	GETPOS	INITL	SCNRIO	SRCIRR		
CFCBD	called by:					
	ABSCFC					
CHANGE	called by:					
	EQUABS					
CHKRST	called by:					
	BINFIL					
CHKVER	called by:					
	BINFIL					
CHRCBD	called by:					
	ATMPRN	BRBNDR	EQUABS	PUTCLD	SUMFIL	USRBCK
CHTIME	called by:					
	GETPOS	SUMFIL				
CIREX	called by:					
	HYDROM					
CIRRB	called by:					
	PHYDRO					
CIRRUS	called by:					
	INITL					
CITIES	called by:					
	RDSCN					
CLDAL	called by:					
	EQUABS					
CLDLYR	called by:					
	SOLBND					
CLDRBD	called by:					
	ENDPT	EQUABS	HYDROM	PUTCLD	RAINS	TANGPT
	USRCLD					
CNSTNT	called by:					
	MOSART					
COAT	called by:					
	MIEPHS					
COMFNC	called by:					
	PLMSUB					
CONFIG	called by:					
	MOSART					
COUPLE	called by:					
	PRCALC					
CROSD	called by:					
	ABCCL4	ABHNO4	ABN2O5	ABSCLO		
CSPHFN	called by:					
	PHFUNC	PHYDRO				
DADD	called by:					
	CNSTNT					
DBANDS	called by:					
	ZODICL					
DBINIT	called by:					
	MOSART					
DDIF	called by:					
	SWAT					
DDIV	called by:					
	CNSTNT					
DEFALT	called by:					
	INITL					

DEFBCK called by:	SCNRIO				
DEMSXX called by:	BCKGND				
DENAIR called by:	SPCLYR				
DENWTR called by:	SPCLYR				
DEPOL called by:	AMOLSC	PHMLSC			
DERF called by:	BAND	SHADOW			
DESAER called by:	AERSOL				
DEV CBD called by:	ABSMOL	ATMPRN	BCKPRN	BRBNDR	CALCUL
	DEFAULT	DFLT8	EQUABS	FILRT	FLSTAT
	GETASP	GETATM	GETBCK	GETCLD	GETEXO
	GETSLR	INITL	MIEINP	MOSART	PRCALC
	PUTHDR	PUTSLR	RDFLTR	RDGBL	RDSCN
	USRBCK	USRCLD			
DFLT2 called by:	INITL				
DFLT8 called by:	INITL				
DIREFL called by:	BDRF				
DIREMS called by:	DEMSXX				
DISEND called by:	BINFIL				
DISPRN called by:	PRCALC				
DIV called by:	CNSTNT				
DMUL called by:	CNSTNT				
DNDR called by:	MIEPHS				
DPLDT called by:	PRCALC				
DSRTBD called by:	DESAER				
DSUB called by:	CNSTNT				
DVINCR called by:	DFLT8	RESOLV			
ECLGAL called by:	SCNRIO	SRCIRR			
ECOSBD called by:	IBKCNV				
EHBSL0 called by:	DIREMS				
EMISBD called by:	DEMSXX	SOIL			
EMISSV called by:	ZODICL				
EMTREF called by:	BCKGND	DEMSXX	MIEPHS		
ENDPT called by:	GEOM				
EPHEML called by:	EPHEMS				
EPHEMS called by:	BRBNDR	MOSART			

EPHTIM called by:	EPHEMS	ZODICL		
EQABS called by:	ENDPT	EQUABS	TANGPT	
EQUABS called by:	MOSART			
EQUECL called by:	SCNRIO	SRCIRR		
ESFIT called by:	INICPL			
EVAPOR called by:	SRFLUX			
EVEN called by:	BMOD	SOLAR		
EXGALS called by:	BCKGND			
EXMLBD called by:	EQABS	USRDEF		
EXOATM called by:	DEFAULT	INITL		
EXOTMP called by:	INITL			
FDATE called by:	TITLCR			
FILOPN called by:	INITL			
FILRT called by:	INITL			
FILTER called by:	PRCALC			
FLSTAT called by:	BINFIL			
FLUXLW called by:	BRBNDR			
FRESNL called by:	BCKGND	DIREMS		
GALRAD called by:	BCKGND			
GAM called by:	SWAT			
GAMMLN called by:	DNDR			
GBLBCK called by:	DEFAULT	INDXBK	INITL	USRDEF
GEOM called by:	SCNRIO	SLPOS	SRCGEO	
GERROR called by:	IOERR			
GETASP called by:	INITL			
GETATM called by:	INITL			
GETBCK called by:	INITL			
GETCLD called by:	INITL			
GETEXO called by:	INITL			
GETGLC called by:	ASPECT	ZODICL		
GETPOS called by:	INITL			
GETSLR called by:	INITL			

GETVAR called by:						
GETATM	GETBCK	GETCLD	GETEXO	GETPOS	GETSLR	
INITL	MIEINP	RDFLTR	STGEOM	USRBCK	USRCLD	
USRDEF						
GETVEC called by:						
DFLT8	GETASP	GETBCK	INITL	MIEINP	USRBCK	
GLCFBD called by:						
GETGLC						
H2OBD called by:						
H2OCNT						
H2OCNT called by:						
BMOD						
HAZE called by:						
ENDPT	EQUABS	TANGPT				
HAZEBD called by:						
HAZE						
HEYMS called by:						
EQUABS						
HLOWT called by:						
EQUABS	HAZE	ISTAER				
HOREQU called by:						
SCNRIO	SHNGEO	SRCIRR				
HORIZN called by:						
SCNRIO	SLPOS	SRCGEO	SRCIRR			
HTBLNC called by:						
BRBNDR						
HYDROM called by:						
ENDPT	EQUABS	TANGPT				
IBKCNV called by:						
RDSCN						
IBNSRC called by:						
BNDPAR	NXXPAU	PRALT	PROFAC	XTERP		
ICEBD called by:						
INDEXI						
IDAERO called by:						
DFLT2						
IGTINT called by:						
GETASP	GETATM	GETBCK	GETCLD	GETEXO	GETPOS	
MIEINP	STGEOM	USRBCK	USRCLD	USRDEF		
IGTVEC called by:						
GETATM	USRBCK					
INDEXI called by:						
BCKGND	DEMSXX	MIEPHS				
INDEXW called by:						
BCKGND	DEMSXX	MIEPHS				
INDXBK called by:						
ATMPRN	CALCUL	DEFBCK	PRCALC	SRCIRR		
INFLBD called by:						
RDFLTR						
INICPL called by:						
COUPLE						
INIGEO called by:						
GEOM						
INITL called by:						
MOSART						
INPTBD called by:						
INITL						
INTEG called by:						
PRCALC						
INTR2D called by:						
SCNRIO	SETBCK	SHNGEO	SRCGEO	SRCIRR		

IOERR called by:	ABSMOL	ATMPRN	BCKPRN	BINFIL	BRBNDR	CALCUL
	CHKRST	CHKVER	DBINIT	DISEND	DISPRN	EQUABS
	FILOPN	FLSTAT	GETVAR	GETVEC	IGTINT	IGTVEC
	INITL	MIEINP	MOSART	OPNSCR	PRCALC	PRTHDR
	PUTCLD	PUTHDR	PUTSLR	RDFLTR	RDGBL	RDLINE
	RDCSN	RSHINE	SRCIRR	SUMFIL	USRBCK	USRCLD
	USRDEF					
ISRAEL called by:	INITL					
ISTAER called by:	ENDPT	EQUABS	TANGPT			
KDISTR called by:	PRCALC					
LAGRBD called by:	ESFIT					
LAYLW called by:	OPATH					
LCTRIM called by:	FILRT	GETVEC	IGTVEC	MONTH	NCHAER	NCHATM
	NCHAZE	NCHSEA	PARSE	RDFLTR	RDLINE	
LENSTR called by:	GETVEC	IGTVEC	PARSE	RDFLTR	RDLINE	SUMFIL
LUNPBD called by:	EPHEML					
LWCASE called by:	GETATM	GETPOS	INITL	MIEINP	RDFLTR	STGEOM
	USRDEF					
MARINE called by:	AERSOL					
MARNBD called by:	MARINE					
MDLATM called by:	DFLT2	EQABS	INITL	USRDEF		
MIE called by:	MIEPHS					
MIEINP called by:	INITL					
MIEPHS called by:	AERSOL					
MLSCAT called by:	PRCALC	RSHINE				
MODBCK called by:	SETBCK					
MOLPBD called by:	BMOD	BNDPAR	BRBNDR	DENAIR	ENDPT	EQABS
	EQUABS	PARTIT	PLMSUB	PRCALC	PRETEM	PUTHDR
	SCNRIO	TANGPT	XMCONV			
MONTH called by:	GETPOS					
MOSART not called						
MRNDFL called by:	GETATM					
MUL called by:	CNSTNT					
NCHAER called by:	GETATM					
NCHATM called by:	GETATM					
NCHAZE called by:	GETATM					
NCHSEA called by:	GETATM					
NCYCLE called by:	COAT	MIE				

NO2BD called by:	ABSNO2					
NXXPAU called by:	EQUABS					
O2CBD called by:	O2CNT					
O2CNT called by:	BMOD					
O2UVBD called by:	ABSO2					
O3CWBD called by:	ABSO3					
O3HHBD called by:	ABSO3					
OCNTBD called by:	SEATMP					
OPATH called by:	BRBNDR					
OPNSCR called by:	BNDPAR	CALCUL				
PARSE called by:	GETEXO	INITL	MIEINP	RDFLTR	USRBCK	USRCLD
	USRDEF					
PARTIT called by:	BMOD	EQABS				
PFR called by:	REFRAC					
PHFGBD called by:	PHFUNC					
PHFUNC called by:	BNDPAR					
PHHYBD called by:	PHYDRO					
PHMABD called by:	PHFUNC					
PHMLSC called by:	BNDPAR					
PHOCBD called by:	PHFUNC					
PHRUBD called by:	PHFUNC					
PHSTBD called by:	PHFUNC					
PHTRBD called by:	PHFUNC					
PHURBD called by:	PHFUNC					
PHYDRO called by:	PHFUNC					
PLANCK called by:	AECALC	BBARSL	BCKGND	DBANDS	DIREMS	EMISSV
	EXGALS	GALRAD	PRCALC	STARAD		
PLANET called by:	EPHEMS					
PLMSUB called by:	PRCALC					
POLY called by:	EHBSL0					
PRALT called by:	ATMPRN					
PRCALC called by:	CALCUL					
PRETEM called by:	BRBNDR					

PROFAC called by:	AERSOL	BMOD	COUPLE	HYDROM	MARINE	MIEPHS
	NXXPAU	PHFUNC	PHYDRO	RAINSF	SCINTL	SNOWSP
PROMPT called by:	MOSART					
PRTHDR called by:	PUTHDR					
PTHOSB called by:	PRCALC					
PTHTAU called by:	PRCALC	RSHINE	SMPCAL	SOLRAD		
PUTCLD called by:	SUMFIL					
PUTHDR called by:	CALCUL					
PUTSLR called by:	SUMFIL					
RAB called by:	SWAT					
RADFLD called by:	BMOD					
RADTRX called by:	PTHOSB	RSHINE				
RADTRY called by:	MLSCAT	SOLRAD				
RAINBD called by:	RAINEX	RAINSF	SNOWSP			
RAINEX called by:	HYDROM					
RAINSF called by:	BNDPAR					
RAYPTH called by:	GEOM	HORIZN	SCNRIO	SHNGEO	SRCIRR	
RBE called by:	SWAT					
RDFLTR called by:	MOSART					
RDGBL called by:	CLDALT	GBLBCK				
RDLIN called by:	BINFIL	DFLT8	FILOPN	GETASP	GETATM	GETBCK
	GETCLD	GETEXO	GETPOS	GETSLR	INITL	MIEINP
	RDFLTR	USRBCK	USRCLD	USRDEF		
RDESCN called by:	GBLBCK					
REFEST called by:	BCKGND					
REFRAC called by:	AMOLSC	EQABS	SKYNOI	STRCN2		
REFRBD called by:	REFRAC					
RELHUM called by:	ATMPRN	EQABS				
RESOLV called by:	CALCUL	PRCALC				
RSHINE called by:	PRCALC					
SATUR called by:	BRBNDR	EQABS	HYDROM	INITL	OPATH	RELHUM
	SRFLUX	XMCONV				
SCENBD called by:	ATMPRN	SETBCK	TERMPR	USRBCK		
SCINTL called by:	PRCALC					

SCNRIO	called by:				
	CALCUL				
SEAICE	called by:				
	RDGBL				
SEATMP	called by:				
	BRBNDR				
SEAWTR	called by:				
	DEMSXX				
SETALT	called by:				
	EQUABS				
SETBCK	called by:				
	ATMPRN	BCKGND	CALCUL	DEFBCK	
SETFLG	called by:				
	INITL				
SETUP	called by:				
	SRCIRR				
SHADOW	called by:				
	BDRF	TERMPR			
SHNGEO	called by:				
	SCNRIO	SRCIRR			
SICEBD	called by:				
	SEAICE				
SKYNOI	called by:				
	EQUABS				
SLPOS	called by:				
	EPHEMS	MOSART			
SLR1BD	called by:				
	SLRCNT	SOLAR			
SLR2BD	called by:				
	SOLAR				
SLR3BD	called by:				
	SOLAR				
SLR4BD	called by:				
	SOLAR				
SLR5BD	called by:				
	SOLAR				
SLRCNT	called by:				
	BRBNDR	PUTSLR			
SLUNAR	called by:				
	BCKGND	PRCALC			
SMPCAL	called by:				
	PRCALC				
SNOWBD	called by:				
	SNOWEX				
SNOWEX	called by:				
	HYDROM				
SNOWSP	called by:				
	BNDPAR				
SO2BD	called by:				
	ABSSO2				
SOIL	called by:				
	DEMSXX				
SOLAR	called by:				
	BCKGND	DBANDS	EMISSV	PRCALC	SLUNAR
SOLBND	called by:				
	BRBNDR				
SOLRAD	called by:				
	PRCALC	RSHINE			
SPCLYR	called by:				
	BRBNDR				
SPHAIR	called by:				
	SPCLYR				
SPHICE	called by:				
	SPCLYR				

SPHWTR called by:					
SPCLYR					
SPTRIG called by:					
DEFBCK	EPHEMS	GETSLR	SCNRIO	SHNGEO	SRCGEO
SRCIRR					
SRAT called by:					
SOLBND					
SRCFLX called by:					
CALCUL					
SRCGEO called by:					
CALCUL					
SRCIRR called by:					
CALCUL					
SRFLUX called by:					
HTBLNC					
SRTLAY called by:					
INICPL	SOLBND				
STARAD called by:					
BCKGND					
STGEOM called by:					
INITL					
STMLBD called by:					
EQABS	USRDEF				
STRCN2 called by:					
ENDPT	EQUABS	TANGPT			
SUB called by:					
CNSTNT					
SUMFIL called by:					
CALCUL					
SUPK called by:					
REFRAC					
SWAT called by:					
SOLBND					
TANGPT called by:					
RAYPTH					
TERMPR called by:					
PRCALC	RSHINE				
THCAIR called by:					
SPCLYR					
THCICE called by:					
SPCLYR					
THCSNW called by:					
SPCLYR					
THCWTR called by:					
SPCLYR					
TITLCR called by:					
MOSART					
TMPCLD called by:					
CLDALT					
TRANLW called by:					
OPATH					
TRNSMT called by:					
PTHTAU					
TURBUL called by:					
SCNRIO					
UDIF called by:					
SWAT					
UDLAY called by:					
INICPL	SOLBND				
UFTPBD called by:					
ABSMOL					

UPCASE called by:	BINFIL	DFLT8	FILOPN	FLSTAT	GETASP	GETATM
	GETBCK	GETCLD	GETEXO	GETPOS	GETSLR	INITL
	MIEINP	MONTH	NCHAER	NCHATM	NCHAZE	NCHSEA
	RDFLTR	STGEOM	USRBCK	USRCLD	USRDEF	
UPPRBD called by:	EQABS	EXOATM	SETALT			
USRBCK called by:	GETBCK					
USRCLD called by:	GETCLD					
USRDEF called by:	INITL					
VIRIAL called by:	DENAIR					
VIRLBD called by:	VIRIAL					
VISRH called by:	EQUABS					
VSA called by:	INITL					
WTRBD called by:	INDEXW					
XMCONV called by:	USRDEF					
XPNDAR called by:	PRCALC					
XTERP called by:	ABCCL4	ABHNO4	ABN2O5	ABSCFC	ABSCLO	ABSO2
	AERSOL	AH2O2	BBARSL	BCKGND	BNDPAR	BRBNDR
	CHANGE	COUPLE	DEPOL	ENDPT	EQABS	EQUABS
	EVAPOR	EXGALS	EXOATM	FILTER	HAZE	HYDROM
	INDEXI	INDEXW	NXXPAU	PHYDRO	RAINSP	SCINTL
	SETALT	SLUNAR	SOLRAD	SPHICE	SPHWTR	STRCN2
	TANGPT	THCICE	THCWTR	USRDEF	VIRIAL	XMCONV
	XPNDAR					
ZLAT called by:	DBANDS					
ZOD1BD called by:	EMISSV					
ZOD2BD called by:	DBANDS	ZODICL				
ZODICL called by:	BCKGND					
ZROHDR called by:	INITL					
ZROINT called by:	PRCALC					

7.1.3 MOSART Pre-Requisite Order List

MOSART	TITLCR	FDATE	RDFLTR	PROMPT	INITL
ZROHDR	VSA	USRDEF	XMCONV	STGEOM	SETFLG
MIEINP	ISRAEL	GETSLR	GETPOS	MONTH	GETEXO
GETCLD	USRCLD	GETBCK	USRBCK	PARSE	GETATM
NCHSEA	NCHAZE	NCHATM	NCHAER	MRNDFL	LWCASE
IGTVEC	GETVAR	GETASP	IGTINT	FILRT	FILOPN
EXOTMP	DFLT8	GETVEC	DFLT2	IDAERO	DEFALT
EXOATM	CIRRUS	BINFIL	RDLINE	LCRTRIM	FLSTAT
UPCASE	DISEND	CHKVER	CHKRST	BEAUFRT	EQUABS
VISRH	SKYNOI	SETALT	NXXPAU	HEYMS	CLDALT
TMPCLD	CHANGE	DBINIT	CONFIG	CNSTNT	SUB
MUL	DSUB	DMUL	DIV	DDIV	DADD
ADD	CALCUL	SUMFIL	PUTSLR	PUTCLD	LENSTR

CHTIME	SRCIRR	SETUP	ASPECT	SRCGEO	SRCFLX
SCNRIO	TURBUL	SHNGEO	HOREQU	EQUECL	ECLGAL
DEFBCK	BCKCHK	CALEND	PTHDR	PRTHDR	PRCALC
ZROINT	XPNDAR	SMPCAL	SCINTL	RSHINE	TERMPR
SOLRAD	PTHTAU	TRNSMT	BAND	BNTPTH	MLSCAT
RADTRY	RESOLV	DVINCR	PTHOSB	RADTRX	PLMSUB
COMFNC	KDISTR	INTEG	FILTER	DPLDT	DISPRN
COUPLE	INICPL	ESFIT	BCKGND	ZODICL	GETGLC
EMISSV	DEANDS	ZLAT	STARAD	SLUNAR	SOLAR
REFEST	GALRAD	EXGALS	DEMSXX	SOIL	SEAWTR
DIREMS	FRESNL	EHBSLO	POLY	BDRF	SHADOW
DERF	DIREFL	BNDPAR	SNOWSP	RAINSP	PHMLSC
PHFUNC	PHYDRO	CSPHFN	BMOD	RADFLD	O2CNT
H2OCNT	EVEN	AMMNIA	AH2O2	ABSSO2	ABSO3
ABSO2	ABSNO2	ABSN2O	ABSN2	ABSMOL	ABSH2O
ABSCLO	ABSCFC	ABN2O5	ABHNO4	ABCC4	AMOLSC
DEPOL	BCKPRN	ATMPRN	SETBCK	MODBCK	INTR2D
PRALT	INDXBK	GBLBCK	RDSCN	IBKCNV	CITIES
RDGBL	SEAICE	OPNSCR	BRBNDR	SPCLYR	THCWTR
THCSNW	THCICE	THCAIR	SPHWTR	SPHICE	SPHAIR
DENWTR	DENAIR	VIRIAL	SOLBND	UDLAY	SWAT
UDIF	RBE	RAB	GAM	DDIF	SRTLAY
SRAT	CLDLYR	BETAU	BETA	BBO3	SLRCNT
SEATMP	PRETEM	OPATH	TRANLW	LAYLW	IOERR
GERROR	HTBLNC	SRFLUX	EVAPOR	FLUXLW	EPHEMS
SPTRIG	SLPOS	HORIZN	GEOM	RAYPTH	TANGPT
INIGEO	ENDPT	STRCN2	ISTAER	HYDROM	SNOWEX
RAINEX	CIREX	HAZE	HLOWT	EQABS	RELHUM
SATUR	REFRAC	SUPK	PFR	PARTIT	MDLATM
BNDMLG	AERSOL	MIEPHS	MIE	INDEXW	INDEXI
EMTREF	DNDR	GAMMLN	COAT	NCYCLE	MARINE
PROFAC	DESAER	PLANET	EPHTIM	EPHEML	BBARSL
XTERP	IBNSRC	AIRTMP	AECALC	PLANCK	

7.1.4 MOSART Common Block Cross-Reference List

Common Block DEVCNM used in:					
DBINIT	DEVCBD	FILRT	MOSART	RDGBL	RDSCN
SUMFIL					
Common Block DEVICE used in:					
ABSMOL	ATMPRN	BCKPRN	BRBNDR	CALCUL	DBINIT
DEFAULT	DEVCBD	DFLT8	EQUABS	FLSTAT	GETASP
GETATM	GETBCK	GETCLD	GETPOS	GETSLR	INITL
MIEINP	MOSART	PRCALC	PUTCLD	PTHDR	PUTSLR
RDFLTR	RDGBL	RDSCN	SUMFIL	USRBCK	USRCLD
Common Block FLAGS used in:					
ATMPRN	BCKCHK	BCKPRN	BINFIL	CALCUL	EPHEMS
EQABS	HAZE	INICPL	INITL	ISRAEL	MOSART
PRCALC	PUTSLR	RSHINE	SCNRIO	SETFLG	SRCIRR
SUMFIL	TERMPR				
Common Block HEADER used in:					
ATMPRN	BCKGND	BCKPRN	BNDPAR	BRBNDR	CALCUL
COUPLE	DEFAULT	DEFBCK	ENDPT	EQABS	EQUABS
GETASP	GETATM	GETBCK	GETCLD	INICPL	INIGEO
INITL	KDISTR	MOSART	PRCALC	PRTHDR	PTHOSB
PUTCLD	PTHDR	PUTSLR	RSHINE	SCNRIO	SETBCK
SRCFLX	SRCIRR	SUMFIL	TANGPT	USRDEF	ZROHDR
Common Block INITIAL used in:					
BBARSL	BMOD	BNDPAR	BRBNDR	CALCUL	COUPLE
ENDPT	EPHEMS	EQUABS	GEOM	HYDROM	INICPL
INIGEO	INITL	MOSART	PLMSUB	PRCALC	PRETEM
PTHOSB	PTHDR	RAYPTH	RSHINE	SCNRIO	SETALT
SHNGEO	SOLBND	SRCGEO	SRCIRR	TANGPT	

Common Block CRSECT used in:	ABCCCL4	ABHNO4	ABN205	ABSCLO	CROSB	
Common Block CFCBM used in:	ABSCFC	CFCBD				
Common Block CONSTN used in:	ABSMOL	AIRTMP	AMOLSC	ASPECT	ATMPRN	BAND
	BCKGND	BCKPRN	BDRF	BETA	BETAU	BMOD
	BNDPAR	BRBNDR	CNSTNT	COAT	COMFNC	COUPLE
	CSPHFN	DBINIT	DESAER	DFLT2	DFLT8	DIREMS
	DNDR	DPLDT	ECLGAL	ENDPT	EPHEML	EPHEMS
	EQABS	EQUABS	EQUECL	ESFIT	EXGALS	EXOTMP
	FILTER	FRESNL	GALRAD	GEOM	GETSLR	HOREQU
	HORIZN	HTBLNC	INICPL	INIGEO	INITL	MARINE
	MIE	MIEPHS	MLSCAT	MODBCK	PHFUNC	PHMLSC
	PHYDRO	PLANCK	PLANET	PRCALC	PRETEM	PROFAC
	PTHOSB	PTHTAU	RADTRX	RADTRY	RAINEX	REFEST
	RSHINE	SATUR	SCINTL	SCNRIO	SETALT	SETUP
	SHADOW	SHNGEO	SKYNOI	SLPOS	SLUNAR	SNOWEX
	SOLBND	SPCLYR	SPTRIG	SRCGEO	SRCIRR	SRTLAY
	STARAD	STGEOM	STRCN2	SUPK	TERMPR	UDLAY
	USRDEF	XTERP	ZLAT	ZODICL		
Common Block MOLECP used in:	ABSMOL	BBARSL	BMOD	BNDPAR	DBINIT	DFLT8
	DVINCR	EMISSV	ENDPT	EQABS	EQUABS	KDISTR
	PLMSUB	PRCALC	PTHOSB	PTHTAU	PTHDR	SCNRIO
	SUMFIL	TANGPT	USRDEF			
Common Block UFTAPE used in:	ABSMOL	UFTPBD				
Common Block NO2XS used in:	ABSNO2	NO2BD				
Common Block HERZBG used in:	ABSO2	O2UVBD				
Common Block SHURUN used in:	ABSO2	O2UVBD				
Common Block O3CWB used in:	ABSO3	O3CWBD				
Common Block O3HHB used in:	ABSO3	O3HHBD				
Common Block SO2XS used in:	ABSSO2	SO2BD				
Common Block AEROSL used in:	AERSOL	ARSLBD	BBARSL	BNDPAR	HYDROM	MARINE
	PHFUNC	PHYDRO	PRCALC	RSHINE		
Common Block AERSCA used in:	AERSOL	BBARSL	BNDPAR	PHFUNC		
Common Block AERSLA used in:	AERSOL	ARSABD	HYDROM	MARINE		
Common Block AERSLX used in:	AERSOL	ARSXBD	HYDROM	MARINE		
Common Block AERUSR used in:	AERSOL	PHFUNC				
Common Block BSTAER used in:	AERSOL	BKSTBD	PHFUNC			
Common Block USERDF used in:	ASPECT	DEFAULT	EQABS	GETASP	HAZE	ISTAER
	SETALT	STRCN2	USRDEF			
Common Block ATMDAT used in:	ATMPRN	ATMSBD	BCKPRN	BRBNDR	CALCUL	DFLT2
	EQABS	EQUABS	INITL	PRCALC	SCNRIO	SETALT
	SETBCK	SHNGEO	SRCGEO	SRCIRR	USRDEF	
Common Block BACKGD used in:	ATMPRN	BCKGND	BKGDBD	BRBNDR	COUPLE	GETBCK
	INITL	SETBCK	SPCLYR	USRBCK		

Common	Block CHRCNM	used in:				
	ATMPRN	BRBNDR	CHRCBD	EQUABS	PUTCLD	SUMFIL
	USRBCK					
Common	Block INTSTO	used in:				
	ATMPRN	DISPRN	INTEG	PRCALC	RSHINE	ZROINT
Common	Block OUTPUT	used in:				
	ATMPRN	BCKPRN	BRBNDR	EQUABS	INITL	
Common	Block SCENES	used in:				
	ATMPRN	SCENBD	SETBCK	TERMPR	USRBCK	
Common	Block BCKDAT	used in:				
	BCKPRN	DISPRN	EQUABS	INTEG	KDISTR	PRCALC
	PTHDR	SCNRIO	ZROINT			
Common	Block RSTART	used in:				
	BINFIL	CALCUL				
Common	Block MOLCON	used in:				
	BMOD	BNDPAR	BRBNDR	ENDPT	EQABS	EQUABS
	MOLPBD	PLMSUB	PRCALC	PRETEM	PTHDR	SCNRIO
	TANGPT					
Common	Block MOLDAT	used in:				
	BMOD	DENAIR	EQABS	MOLPBD	PARTIT	XMCONV
Common	Block PRBND	used in:				
	BMOD	BNDPAR	INICPL	KDISTR	PLMSUB	PTHOSB
	PTHTAU					
Common	Block PRBNDB	used in:				
	BMOD	BNDPAR	INICPL	KDISTR	PLMSUB	PTHTAU
Common	Block AERSCC	used in:				
	BNDPAR	HYDROM				
Common	Block ARSLSC	used in:				
	BNDPAR	INICPL	MLSCAT	PHFUNC	PRCALC	PTHOSB
	RSHINE					
Common	Block CGWTS	used in:				
	BNDPAR	PTHTAU				
Common	Block CLDUSR	used in:				
	BNDPAR	HYDROM	PHYDRO	USRCLD		
Common	Block ANTECD	used in:				
	BRBNDR	DEFAULT	INITL			
Common	Block BRBNDR	used in:				
	BRBNDR	CALCUL	SRCFLX			
Common	Block LYRSTO	used in:				
	CALCUL	COUPLE	INICPL	MLSCAT	PRCALC	PTHOSB
	RSHINE					
Common	Block PATH1	used in:				
	CALCUL	PLMSUB	PRCALC	PTHOSB	SCNRIO	
Common	Block PATH1A	used in:				
	CALCUL	PLMSUB	PRCALC	SCNRIO		
Common	Block PATH4	used in:				
	CALCUL	COUPLE	PRCALC	RSHINE	SCNRIO	SRCIRR
Common	Block PATH5A	used in:				
	CALCUL	DEFBCK	PRCALC	SCNRIO		
Common	Block PATH5B	used in:				
	CALCUL	PRCALC	SCNRIO			
Common	Block PATH5C	used in:				
	CALCUL	DEFBCK	PRCALC	SCNRIO		
Common	Block PATH5D	used in:				
	CALCUL	PRCALC	SCNRIO			
Common	Block PATH6	used in:				
	CALCUL	PRCALC				
Common	Block PATH8	used in:				
	CALCUL	PRCALC				
Common	Block CLDPAR	used in:				
	BRBNDR	CLDLR	FLUXLW			
Common	Block MIECOT	used in:				
	COAT	MIE	MIEPHS			
Common	Block MSPARM	used in:				
	COUPLE	INICPL	PRCALC			

Common	Block ZODBND	used in:				
	DBANDS	ZOD2BD				
Common	Block CDRYDS	used in:				
	DEMSXX	EMISBD				
Common	Block WETNES	used in:				
	DEMSXX	EMISBD				
Common	Block DESDAT	used in:				
	DESAER	DSRTBD				
Common	Block MATERL	used in:				
	DNDR	MIEINP	MIEPHS			
Common	Block SILEMS	used in:				
	EMISSV	ZOD1BD				
Common	Block CLDRN	used in:				
	CLDRBD	ENDPT	EQUABS	GETCLD	HYDROM	PUTCLD
	RAINSR	TANGPT	USRCLD			
Common	Block PLMDAT	used in:				
	ENDPT	EQUABS	PLMSUB	TANGPT		
Common	Block VSADTA	used in:				
	ENDPT	EQABS	EQUABS	INITL	TANGPT	VSA
Common	Block PERLUN	used in:				
	EPHEML	LUNPBD				
Common	Block EXTMOL	used in:				
	EQABS	EXMLBD	USRDEF			
Common	Block STDMOL	used in:				
	EQABS	STMLBD	USRDEF			
Common	Block UPRATM	used in:				
	EQABS	EXOATM	SETALT	UPPRBD		
Common	Block LAGUER	used in:				
	ESFIT	LAGRBD				
Common	Block FLTRDT	used in:				
	FILTER	RDFLTR				
Common	Block MACHIN	used in:				
	DEV CBD	FLSTAT				
Common	Block CLIMAT	used in:				
	FLUXLW	OPATH	PRETEM	SRAT		
Common	Block OMATLW	used in:				
	FLUXLW	OPATH	SOLBND	TRANLW		
Common	Block GAUSSL	used in:				
	GETGLC	GLCFBD				
Common	Block CONTNS	used in:				
	H2OBD	H2OCNT				
Common	Block HZDATA	used in:				
	HAZE	HAZEBD				
Common	Block ECOCNV	used in:				
	ECOSBD	IBKCNV				
Common	Block ICEREF	used in:				
	ICEBD	INDEXI				
Common	Block INDXWR	used in:				
	INDEXW	WTRBD				
Common	Block INPTDT	used in:				
	INITL	INPTBD				
Common	Block KDISDT	used in:				
	KDISTR	PRCALC				
Common	Block NAVMAR	used in:				
	MARINE	MARNBD				
Common	Block O2C	used in:				
	O2CBD	O2CNT				
Common	Block PHFFOG	used in:				
	PHFGBD	PHFUNC				
Common	Block PHFMAR	used in:				
	PHFUNC	PHMABD				
Common	Block PHFOCE	used in:				
	PHFUNC	PHOCBD				
Common	Block PHFRUR	used in:				
	PHFUNC	PHRUBD				

Common Block PHFSTR	used in:		
PHFUNC	PHSTBD		
Common Block PHFTRP	used in:		
PHFUNC	PHTRBD		
Common Block PHFURB	used in:		
PHFUNC	PHURBD		
Common Block CRASYM	used in:		
CIRRB	PHYDRO		
Common Block PHHYDR	used in:		
PHHYBD	PHYDRO		
Common Block CURGDA	used in:		
PRCALC	PTHTAU	RSHINE	
Common Block CURGDB	used in:		
PRCALC	PTHTAU	RSHINE	
Common Block CURGDC	used in:		
PRCALC	PTHOSB	PTHTAU	RSHINE
Common Block OPTDEP	used in:		
PRCALC	PTHTAU	RSHINE	
Common Block TRANSP	used in:		
PRCALC	TRNSMT		
Common Block RAINTP	used in:		
RAINBD	RAINEX	RAINS	
Common Block RAINWL	used in:		
RAINBD	RAINS	SNOWS	
Common Block INFLTR	used in:		
INFLBD	RDFLTR		
Common Block MMWREF	used in:		
REFRAC	REFRBD		
Common Block PATH2	used in:		
RSHINE	SRCIRR		
Common Block PATH2A	used in:		
RSHINE	SRCIRR		
Common Block PATH2B	used in:		
RSHINE	SRCIRR		
Common Block PATH2C	used in:		
RSHINE	SRCIRR		
Common Block PATH2D	used in:		
RSHINE	SRCIRR		
Common Block SICE	used in:		
SEAICE	SICEBD		
Common Block TMPOCN	used in:		
OCNTBD	SEATMP		
Common Block SOLIR1	used in:		
SLR1BD	SLRCNT	SOLAR	
Common Block SNWDAT	used in:		
SNOWBD	SNOWEX		
Common Block SOLIR2	used in:		
SLR2BD	SOLAR		
Common Block SOLIR3	used in:		
SLR3BD	SOLAR		
Common Block SOLIR4	used in:		
SLR4BD	SOLAR		
Common Block SOLIR5	used in:		
SLR5BD	SOLAR		
Common Block SWPARM	used in:		
BRBNBD	SOLBND		
Common Block USERNM	used in:		
SUMFIL	USRDEF		
Common Block FLXTAB	used in:		
BRBNBD	TRANLW		
Common Block VIRDAT	used in:		
VIRIAL	VIRLBD		
Common Block ZPLANE	used in:		
ZOD2BD	ZODICL		

Common Block ECOSYS used in:
 ECOSBD
 Common Block INPNDX used in:
 INPTBD

7.2 ASCBIN

7.2.1 ASCBIN Subprogram References

ASCBIN calls:						
CNSTNT	CONFIG	CONVAB	FILRT	IOERR	PROMPT	
SETFIL	TABLEA	TABLEB	TABLEH	TABLET	UPCASE	
CNSTNT calls:						
ADD	DADD	DDIV	DIV	DMUL	DSUB	
MUL	SUB					
ADD calls: none						
DADD calls: none						
DDIV calls: none						
DIV calls: none						
DMUL calls: none						
DSUB calls: none						
MUL calls: none						
SUB calls: none						
CONFIG calls: none						
CONVAB calls:						
IOERR	SETFIL					
IOERR calls:						
GERROR						
GERROR calls: none						
SETFIL calls:						
IOERR						
FILRT calls:						
LCTRIM						
LCTRIM calls: none						
PROMPT calls: none						
TABLEA calls:						
FILTER	GETHDR	IOERR	PROMPT	RDFLTR	SLITFN	
UPCASE						
FILTER calls:						
XTERP						
XTERP calls:						
IBNSRC						
IBNSRC calls: none						
GETHDR calls:						
IOERR						
RDFLTR calls:						
GETVAR	IOERR	LCTRIM	LENSTR	LWCASE	PARSE	
RDLINE	UPCASE					
GETVAR calls:						
IOERR						
LENSTR calls: none						
LWCASE calls: none						
PARSE calls:						
LCTRIM	LENSTR					
RDLINE calls:						
IOERR	LCTRIM	LENSTR				
UPCASE calls: none						
SLITFN calls: none						
TABLEB calls:						
FILTER	GETHDR	IOERR	PROMPT	RDFLTR	SLITFN	
UPCASE						
TABLEH calls:						
GETHDR	IOERR	PROMPT				

TABLET calls:				
GETHDR	IOERR	PROMPT	SLITFN	

7.2.2 ASCBIN Cross-Reference List

ADD called by:					
CNSTNT					
ASCBIN not called					
CNSTNT called by:					
ASCBIN					
CONFIG called by:					
ASCBIN					
CONVAB called by:					
ASCBIN					
DADD called by:					
CNSTNT					
DDIV called by:					
CNSTNT					
DEV CBD called by:					
ASCBIN	FILRT	RDFLTR			
DIV called by:					
CNSTNT					
DMUL called by:					
CNSTNT					
DSUB called by:					
CNSTNT					
FILRT called by:					
ASCBIN					
FILTER called by:					
TABLEA	TABLEB	TABLET			
GERROR called by:					
IOERR					
GETHDR called by:					
TABLEA	TABLEB	TABLEH	TABLET		
GETVAR called by:					
RDFLTR					
IBNSRC called by:					
XTERP					
INFLBD called by:					
RDFLTR					
IOERR called by:					
ASCBIN	CONVAB	GETHDR	GETVAR	RDFLTR	RDLINE
SETFIL	TABLEA	TABLEB	TABLEH	TABLET	
LCTRIM called by:					
FILRT	PARSE	RDFLTR	RDLINE		
LENSTR called by:					
PARSE	RDFLTR	RDLINE			
LWCASE called by:					
RDFLTR					
MOLNBD called by:					
TABLET					
MUL called by:					
CNSTNT					
PARSE called by:					
RDFLTR					
PROMPT called by:					
ASCBIN	TABLEA	TABLEB	TABLEH	TABLET	
RDFLTR called by:					
TABLEA	TABLEB				
RDLINE called by:					
RDFLTR					
SETFIL called by:					
ASCBIN	CONVAB				

SLITFN called by:
 TABLEA TABLEB TABLET
 SUB called by:
 CONSTNT
 TABLEA called by:
 ASCBIN
 TABLEB called by:
 ASCBIN
 TABLEH called by:
 ASCBIN
 TABLET called by:
 ASCBIN
 UPCASE called by:
 ASCBIN RDFLTR TABLEA TABLEB TABLET
 XTERP called by:
 FILTER

7.2.3 ASCBIN Pre-Requisite Order List

ASCBIN	TABLET	TABLEH	TABLEB	TABLEA	SLITFN
RDFLTR	UPCASE	RDLINE	PARSE	LENSTR	LWCASE
GETVAR	PROMPT	GETHDR	FILTER	XTERP	IBNSRC
FILRT	LCTRIM	CONVAB	SETFIL	IOERR	GERROR
CONFIG	CONSTNT	SUB	MUL	DSUB	DMUL
DIV	DDIV	DADD	ADD		

7.2.4 ASCBIN Common Block Cross-Reference List

Common Block DEVCMN used in:
 ASCBIN DEV CBD FILRT
 Common Block DEVICE used in:
 ASCBIN DEV CBD RDFLTR
 Common Block CONSTN used in:
 CONSTNT FILTER XTERP
 Common Block FLTRDT used in:
 FILTER RDFLTR
 Common Block HEADER used in:
 GETHDR TABLEA TABLEB TABLEH TABLET
 Common Block INFLTR used in:
 INFLBD RDFLTR
 Common Block MOLNMX used in:
 MOLNBD TABLET
 Common Block MACHIN used in:
 DEV CBD

7.3 BBTEMP

7.3.1 BBTEMP Subprogram References

BBTEMP calls:
 CONSTNT CONFIG FILRT FILTER GETHDR INVPLK
 IOERR PROMPT RDFLTR SETFLG SUMFIL
 CONSTNT calls:
 ADD DADD DDIV DIV DMUL DSUB
 MUL SUB
 ADD calls: none
 DADD calls: none
 DDIV calls: none
 DIV calls: none
 DMUL calls: none
 DSUB calls: none
 MUL calls: none

SUB calls: none
 CONFIG calls: none
 FILRT calls:
 LCTRIM
 LCTRIM calls: none
 FILTER calls:
 XTERP
 XTERP calls:
 IBNSRC
 IBNSRC calls: none
 GETHDR calls:
 IOERR
 IOERR calls:
 GERROR
 GERROR calls: none
 INVPLK calls: none
 PROMPT calls: none
 RDFLTR calls:
 GETVAR IOERR LCTRIM LENSTR LWCASE PARSE
 RDLINE UPCASE
 GETVAR calls:
 IOERR
 LENSTR calls: none
 LWCASE calls: none
 PARSE calls:
 LCTRIM LENSTR
 RDLINE calls:
 IOERR LCTRIM LENSTR
 UPCASE calls: none
 SETFLG calls: none
 SUMFIL calls:
 CHTIME IOERR LENSTR PUTCLD PUTSLR
 CHTIME calls: none
 PUTCLD calls:
 IOERR
 PUTSLR calls:
 IOERR SLRCNT
 SLRCNT calls: none

7.3.2 BBTEMP Cross-Reference List

ADD called by:
 CNSTNT
 BBTEMP not called
 CHRCBD called by:
 PUTCLD SUMFIL
 CHTIME called by:
 SUMFIL
 CLDRBD called by:
 PUTCLD
 CNSTNT called by:
 BBTEMP
 CONFIG called by:
 BBTEMP
 DADD called by:
 CNSTNT
 DDIV called by:
 CNSTNT
 DEVCBD called by:
 BBTEMP FILRT PUTCLD PUTSLR RDFLTR SUMFIL
 DIV called by:
 CNSTNT
 DMUL called by:
 CNSTNT

DSUB called by:
 CNSTNT
 FILRT called by:
 BBTEMP
 FILTER called by:
 BBTEMP
 GERROR called by:
 IOERR
 GETHDR called by:
 BBTEMP
 GETVAR called by:
 RDFLTR
 IBNSRC called by:
 XTERP
 INFLBD called by:
 RDFLTR
 INVPLK called by:
 BBTEMP
 IOERR called by:
 BBTEMP
 RDLIN GETHDR GETVAR PUTCLD PUTSLR RDFLTR
 SUMFIL
 LCTRIM called by:
 FILRT PARSE RDFLTR RDLIN
 LENSTR called by:
 PARSE RDFLTR RDLIN SUMFIL
 LWCASE called by:
 RDFLTR
 MUL called by:
 CNSTNT
 PARSE called by:
 RDFLTR
 PROMPT called by:
 BBTEMP
 PUTCLD called by:
 SUMFIL
 PUTSLR called by:
 SUMFIL
 RDFLTR called by:
 BBTEMP
 RDLIN called by:
 RDFLTR
 SETFLG called by:
 BBTEMP
 SLR1BD called by:
 SLRCNT
 SLRCNT called by:
 PUTSLR
 SUB called by:
 CNSTNT
 SUMFIL called by:
 BBTEMP
 UPCASE called by:
 RDFLTR
 XTERP called by:
 FILTER

7.3.3 BBTEMP Pre-Requisite Order List

BBTEMP	SUMFIL	PUTSLR	SLRCNT	PUTCLD	CHTIME
SETFLG	RDFLTR	UPCASE	RDLIN	PARSE	LENSTR
LWCASE	GETVAR	PROMPT	INVPLK	GETHDR	IOERR
GERROR	FILTER	XTERP	IBNSRC	FILRT	LCTRIM
CONFIG	CNSTNT	SUB	MUL	DSUB	DMUL
DIV	DDIV	DADD	ADD		

7.3.4 BBTEMP Common Block Cross-Reference List

Common Block CONSTN	used in:				
BBTEMP	CNSTNT	FILTER	INVPLK	XTERP	
Common Block DEVICE	used in:				
BBTEMP	DEVCBD	PUTCLD	PUTSLR	RDFLTR	SUMFIL
Common Block FLAGS	used in:				
BBTEMP	PUTSLR	SETFLG	SUMFIL		
Common Block HEADER	used in:				
BBTEMP	GETHDR	PUTCLD	PUTSLR	SUMFIL	
Common Block MOLECP	used in:				
BBTEMP	SUMFIL				
Common Block USERNM	used in:				
BBTEMP	SUMFIL				
Common Block FLTRDT	used in:				
FILTER	RDFLTR				
Common Block CHRCNM	used in:				
CHRCBD	PUTCLD	SUMFIL			
Common Block CLDRN	used in:				
CLDRBD	PUTCLD				
Common Block INFLTR	used in:				
INFLBD	RDFLTR				
Common Block SOLIR1	used in:				
SLR1BD	SLRCNT				
Common Block DEVCNM	used in:				
DEVCBD	FILRT	SUMFIL			
Common Block MACHIN	used in:				
DEVCBD					

7.4 CRFILE

7.4.1 CRFILE Subprogram References

CRFILE calls:					
CONFIG	CRBKGD	CRFLTR	CRINPT	CRUAER	CRUATM
CRUCLD	FILRT	IOERR	MENU	PROMPT	RDMDTN
CONFIG calls: none					
CRBKGD calls:					
IOERR					
IOERR calls:					
GERROR					
GERROR calls: none					
CRFLTR calls:					
IOERR	LCTRIM	LENSTR	PROMPT	UPCASE	
LCTRIM calls: none					
LENSTR calls: none					
PROMPT calls: none					
UPCASE calls: none					
CRINPT calls:					
CALEND	CHTIME	CRUATM	GETVAR	IGTINT	IOERR
LCTRIM	LWCASE	MENU	MONTH	PROMPT	UPCASE
CALEND calls: none					
CHTIME calls: none					
CRUATM calls:					
CALEND	CHTIME	GETVAR	IGTINT	IOERR	LCTRIM
LWCASE	MSAG	PROMPT	UPCASE		
GETVAR calls:					
IOERR					
IGTINT calls:					
IOERR					
LWCASE calls: none					

MSAG calls:						
CALEND	EPHTIM	MDRI				
EPHTIM calls: none						
MDRI calls:						
AFTERP	DNCALC	DNO	DREAD	GTD6	INTERP	
OHCALC	POZONE	SINTRP	SUN	TDEP	VP	
AFTERP calls: none						
DNCALC calls:						
SOLZEN						
SOLZEN calls:						
LATPHI	SUBSOL					
LATPHI calls: none						
SUBSOL calls: none						
DNO calls:						
SINTRP						
SINTRP calls: none						
DREAD calls: none						
GTD6 calls:						
DENSM	GLATF	GLOB6S	GTS6	VTST		
DENSM calls:						
SPLINE	SPLINI	SPLINT				
SPLINE calls: none						
SPLINI calls: none						
SPLINT calls: none						
GLATF calls: none						
GLOB6S calls: none						
GTS6 calls:						
CCOR	DENSU	DNET	GLOB6S	GLOBE6	VTST	
CCOR calls: none						
DENSU calls:						
SPLINE	SPLINI	SPLINT				
DNET calls: none						
GLOBE6 calls:						
TSELEC						
TSELEC calls: none						
VTST calls: none						
INTERP calls: none						
OHCALC calls: none						
POZONE calls: none						
SUN calls:						
DECEQT						
DECEQT calls: none						
TDEP calls: none						
VP calls: none						
MENU calls:						
IOERR	PROMPT					
MONTH calls:						
LCTRIM	UPCASE					
CRUAER calls:						
IOERR						
CRUCLD calls:						
IOERR						
FILRT calls:						
LCTRIM						
RDMDTN calls:						
CNVJTK	IOERR	PROMPT				
CNVJTK calls:						
IOERR						

7.4.2 CRFILE Cross-Reference List

AFTERP called by:
 MDRI

CALEND called by:						
CRINPT	CRUATM		MSAG			
CCOR called by:						
GTS6						
CHRCBD called by:						
MENU						
CHTIME called by:						
CRINPT	CRUATM					
CNVJTK called by:						
RDMDTN						
CONFIG called by:						
CRFILE						
CRBKGD called by:						
CRFILE						
CRFILE not called						
CRFLTR called by:						
CRFILE						
CRINPT called by:						
CRFILE						
CRUAER called by:						
CRFILE						
CRUATM called by:						
CRFILE	CRINPT					
CRUCLD called by:						
CRFILE						
DECEQT called by:						
SUN						
DENSM called by:						
GTD6						
DENSU called by:						
GTS6						
DEVCBD called by:						
CRBKGD	CRFILE	CRFLTR	CRINPT	CRUAER	CRUATM	
CRUCLD	FILRT	MDRI				
DNCALC called by:						
MDRI						
DNET called by:						
GTS6						
DNO called by:						
MDRI						
DREAD called by:						
MDRI						
EPHTIM called by:						
MSAG						
FILRT called by:						
CRFILE						
GERROR called by:						
IOERR						
GETVAR called by:						
CRINPT	CRUATM					
GLATF called by:						
GTD6						
GLOB6S called by:						
GTD6	GTS6					
GLOBE6 called by:						
GTS6						
GTD6 called by:						
MDRI						
GTD6BK called by:						
GTD6						
GTS6 called by:						
GTD6						
IGTINT called by:						
CRINPT	CRUATM					

INARBD called by:						
CRUAER						
INBKBD called by:						
CRBKGD						
INCLBD called by:						
CRUCLD						
INFLBD called by:						
CRFLTR						
INPTBD called by:						
CRINPT	CRUATM	RDMDTN				
INTERP called by:						
MDRI						
IOERR called by:						
CNVJTK	CRBKGD	CRFILE	CRFLTR	CRINPT	CRUAER	
CRUATM	CRUCLD	GETVAR	IGTINT	MENU	RDMDTN	
LATPHI called by:						
SOLZEN						
LCTRIM called by:						
CRFLTR	CRINPT	CRUATM	FILRT	MONTH		
LENSTR called by:						
CRFLTR						
LWCASE called by:						
CRINPT	CRUATM					
MDRI called by:						
MSAG						
MENU called by:						
CRFILE	CRINPT					
MONTH called by:						
CRINPT						
MSAG called by:						
CRUATM						
NRLBD called by:						
DREAD	MDRI					
OHCALC called by:						
MDRI						
POZONE called by:						
MDRI						
PROMPT called by:						
CRFILE	CRFLTR	CRINPT	CRUATM	MENU	RDMDTN	
RDMDTN called by:						
CRFILE						
SINTRP called by:						
DNO	MDRI					
SOLZEN called by:						
DNCALC						
SPLINE called by:						
DENSM	DENSU					
SPLINI called by:						
DENSM	DENSU					
SPLINT called by:						
DENSM	DENSU					
SUBSOL called by:						
SOLZEN						
SUN called by:						
MDRI						
TDEP called by:						
MDRI						
TSELEC called by:						
GLOBE6						
UPCASE called by:						
CRFLTR	CRINPT	CRUATM	MONTH			
VP called by:						
MDRI						
VTST called by:						
GTD6	GTS6					

7.4.3 CRFILE Pre-Requisite Order List

CRFILE	RDMDTN	CNVJTK	FILRT	CRUCLD	CRUAER
CRINPT	MONTH	MENU	CRUATM	MSAG	MDRI
VP	TDEP	SUN	DECEQT	POZONE	OHCALC
INTERP	GTD6	GTS6	VTST	GLOBE6	TSELEC
GLOB6S	DNET	DENSU	CCOR	GLATF	DENSM
SPLINT	SPLINI	SPLINE	DREAD	DNO	SINTRP
DNCALC	SOLZEN	SUBSOL	LATPHI	AFTERP	EPHTIM
CALEND	LWCASE	IGTINT	GETVAR	CHTIME	CRFLTR
UPCASE	PROMPT	LENSTR	LCRTRIM	CRBKGD	IOERR
GERROR	CONFIG				

7.4.4 CRFILE Common Block Cross-Reference List

Common Block DEVICE used in:					
CRFILE	DEVCBD				
Common Block INBKGD used in:					
CRBKGD	INBKBD				
Common Block MACHIN used in:					
CRBKGD	CRFLTR	CRINPT	CRUAER	CRUATM	CRUCLD
DEVCBD					
Common Block INFLTR used in:					
CRFLTR	INFLBD				
Common Block HEADER used in:					
CRINPT	CRUATM				
Common Block INPNDX used in:					
CRINPT	CRUATM	INPTBD	RDMDTN		
Common Block INPTDT used in:					
CRINPT	CRUATM	INPTBD	RDMDTN		
Common Block INUAER used in:					
CRUAER	INARBD				
Common Block INUCLD used in:					
CRUCLD	INCLBD				
Common Block PARMB used in:					
DENSM	DENSU	GTD6			
Common Block DBASE used in:					
DREAD	INTERP				
Common Block NRLDEV used in:					
DREAD	NRLBD				
Common Block LPOLY used in:					
GLOB6S	GLOBE6				
Common Block CSW used in:					
GLOB6S	GLOBE6	GTD6	GTS6	TSELEC	VTST
Common Block GTS3C used in:					
GTD6	GTS6				
Common Block MESO6 used in:					
GTD6	GTS6				
Common Block LOWER6 used in:					
GTD6	GTD6BK	GTS6			
Common Block PARM6 used in:					
GTD6	GTD6BK	GTS6			
Common Block MAVG6 used in:					
GTD6	GTD6BK				
Common Block DMIX used in:					
GTD6	GTS6				
Common Block METSEL used in:					
GTD6	GTD6BK	GTS6			
Common Block DEVCNM used in:					
DEVCBD	FILRT	MDRI			
Common Block NRLFIL used in:					
MDRI	NRLBD				

Common Block SPECIE used in:
 MDRI NRLBD
 Common Block CHRCNM used in:
 CHRCBD MENU

7.5 FACET

7.5.1 FACET Subprogram References

FACET calls:						
CNSTNT	CONFIG	FILTER	GETHDR	GETVAR	GETVEC	
IOERR	LWCASE	PARSE	PROMPT	RDFLTR	RDLINE	
SETFLG	SUMFIL	SURFAC	UPCASE	XTERP		
CNSTNT calls:						
ADD	DADD	DDIV	DIV	DMUL	DSUB	
MUL	SUB					
ADD calls: none						
DADD calls: none						
DDIV calls: none						
DIV calls: none						
DMUL calls: none						
DSUB calls: none						
MUL calls: none						
SUB calls: none						
CONFIG calls: none						
FILTER calls:						
XTERP						
XTERP calls:						
IBNSRC						
IBNSRC calls: none						
GETHDR calls:						
IOERR						
IOERR calls:						
GERROR						
GERROR calls: none						
GETVAR calls:						
IOERR						
GETVEC calls:						
IOERR	LCTRIM	LENSTR				
LCTRIM calls: none						
LENSTR calls: none						
LWCASE calls: none						
PARSE calls:						
LCTRIM	LENSTR					
PROMPT calls: none						
RDFLTR calls:						
GETVAR	IOERR	LCTRIM	LENSTR	LWCASE	PARSE	
RDLINE	UPCASE					
RDLINE calls:						
IOERR	LCTRIM	LENSTR				
UPCASE calls: none						
SETFLG calls: none						
SUMFIL calls:						
CHTIME	IOERR	LENSTR	PUTCLD	PUTSLR		
CHTIME calls: none						
PUTCLD calls:						
IOERR						
PUTSLR calls:						
IOERR	SLRCNT					
SLRCNT calls: none						
SURFAC calls:						
BDRF	DIREMS	FRESNL	PLANCK	PROFAC	REFEST	
ROUGH	SHADOW	XTERP				

BDRF calls:
 DIREFL SHADOW
 DIREFL calls: none
 SHADOW calls:
 DERF
 DERF calls: none
 DIREMS calls:
 EHBSL0 FRESNL PLANCK
 EHBSL0 calls:
 POLY
 POLY calls: none
 FRESNL calls: none
 PLANCK calls: none
 PROFAC calls:
 IBNSRC
 REFEST calls: none
 ROUGH calls:
 EHBSL0

7.5.2 FACET Cross-Reference List

ADD called by:
 CNSTNT
 BDRF called by:
 SURFAC
 CHRCBD called by:
 PUTCLD SUMFIL
 CHTIME called by:
 SUMFIL
 CLDRBD called by:
 PUTCLD
 CNSTNT called by:
 FACET
 CONFIG called by:
 FACET
 DADD called by:
 CNSTNT
 DDIV called by:
 CNSTNT
 DERF called by:
 SHADOW
 DEVCBD called by:
 FACET PUTCLD PUTSLR RDFLTR SUMFIL
 DIREFL called by:
 BDRF
 DIREMS called by:
 SURFAC
 DIV called by:
 CNSTNT
 DMUL called by:
 CNSTNT
 DSUB called by:
 CNSTNT
 EHBSL0 called by:
 DIREMS ROUGH
 FACET not called
 FILTER called by:
 FACET
 FRESNL called by:
 DIREMS SURFAC
 GERROR called by:
 IOERR
 GETHDR called by:
 FACET

GETVAR called by:	FACET	RDFLTR				
GETVEC called by:	FACET					
IBNSRC called by:	PROFAC	XTERP				
INFLBD called by:	FACET	RDFLTR				
IOERR called by:	FACET	GETHDR	GETVAR	GETVEC	PUTCLD	PUTSLR
	RDFLTR	RDLIN	SUMFIL			
LCTRM called by:	GETVEC	PARSE	RDFLTR	RDLIN		
LENSTR called by:	GETVEC	PARSE	RDFLTR	RDLIN	SUMFIL	
LWCASE called by:	FACET	RDFLTR				
MUL called by:	CNSTNT					
PARSE called by:	FACET	RDFLTR				
PLANCK called by:	DIREMS	SURFAC				
POLY called by:	EHBSL0					
PROFAC called by:	SURFAC					
PROMPT called by:	FACET					
PUTCLD called by:	SUMFIL					
PUTSLR called by:	SUMFIL					
RDFLTR called by:	FACET					
RDLIN called by:	FACET	RDFLTR				
REFEST called by:	SURFAC					
ROUGH called by:	SURFAC					
SETFLG called by:	FACET					
SHADOW called by:	BDRF	FACET	SURFAC			
SLR1BD called by:	SLRCNT					
SLRCNT called by:	PUTSLR					
SUB called by:	CNSTNT					
SUMFIL called by:	FACET					
SURFAC called by:	FACET					
UPCASE called by:	FACET	RDFLTR				
XTERP called by:	FACET	FILTER	SURFAC			

7.5.3 FACET Pre-Requisite Order List

FACET	SURFAC	ROUGH	REFEST	PROFAC	DIREMS
PLANCK	FRESNL	EHBSL0	POLY	BDRF	SHADOW

DERF	DIREFL	SUMFIL	PUTSLR	SLRCNT	PUTCLD
CHTIME	SETFLG	RDFLTR	UPCASE	RDLINE	PARSE
LWCASE	GETVAR	PROMPT	GETVEC	LENSTR	LCTRIM
GETHDR	IOERR	GERROR	FILTER	XTERP	IBNSRC
CONFIG	CNSTNT	SUB	MUL	DSUB	DMUL
DIV	DDIV	DADD	ADD		

7.5.4 FACET Common Block Cross-Reference List

Common Block CONSTN used in:					
BDRF	CNSTNT	DIREMS	FACET	FILTER	FRESNL
PLANCK	PROFAC	REFEST	ROUGH	SHADOW	SURFAC
XTERP					
Common Block DEVICE used in:					
DEVCBD	FACET	PUTCLD	PUTSLR	RDFLTR	SUMFIL
Common Block HEADER used in:					
FACET	GETHDR	PUTCLD	PUTSLR	SUMFIL	
Common Block MATRLD used in:					
FACET	SURFAC				
Common Block MOLECP used in:					
FACET	SUMFIL				
Common Block USERNM used in:					
FACET	SUMFIL				
Common Block FLTRDT used in:					
FILTER	RDFLTR				
Common Block CHRCNM used in:					
CHRCBD	PUTCLD	SUMFIL			
Common Block CLDRN used in:					
CLDRBD	PUTCLD				
Common Block FLAGS used in:					
PUTSLR	SETFLG	SUMFIL			
Common Block INFLTR used in:					
INFLBD	RDFLTR				
Common Block SOLIR1 used in:					
SLR1BD	SLRCNT				
Common Block DEVCNM used in:					
DEVCBD	SUMFIL				
Common Block MACHIN used in:					
DEVCBD					

7.6 FPTEST

7.6.1 FPTEST Subprogram References

FPTEST calls:					
CKSTAT	CNSTNT	CONFIG	FLCOL1	IOERR	LRECHK
PROMPT	TITLCR				
CKSTAT calls:					
ZSTAT					
ZSTAT calls: none					
CNSTNT calls:					
ADD	DADD	DDIV	DIV	DMUL	DSUB
MUL	SUB				
ADD calls: none					
DADD calls: none					
DDIV calls: none					
DIV calls: none					
DMUL calls: none					
DSUB calls: none					
MUL calls: none					
SUB calls: none					
CONFIG calls: none					

FLCOL1 calls:
 IOERR
 IOERR calls:
 GERROR
 GERROR calls: none
 LRECHK calls:
 IOERR
 PROMPT calls: none
 TITLCR calls:
 FDATE
 FDATE calls: none

7.6.2 FPTEST Cross-Reference List

ADD called by:
 CNSTNT
 CKSTAT called by:
 FPTEST
 CNSTNT called by:
 FPTEST
 CONFIG called by:
 FPTEST
 DADD called by:
 CNSTNT
 DDIV called by:
 CNSTNT
 DEVCBD called by:
 FPTEST
 DIV called by:
 CNSTNT
 DMUL called by:
 CNSTNT
 DSUB called by:
 CNSTNT
 FDATE called by:
 TITLCR
 FLCOL1 called by:
 FPTEST
 FPTEST not called
 GERROR called by:
 IOERR
 IOERR called by:
 FLCOL1 FPTEST LRECHK
 LRECHK called by:
 FPTEST
 MUL called by:
 CNSTNT
 PROMPT called by:
 FPTEST
 SUB called by:
 CNSTNT
 TITLCR called by:
 FPTEST
 ZSTAT called by:
 CKSTAT

7.6.3 FPTEST Pre-Requisite Order List

FPTEST	TITLCR	FDATE	PROMPT	LRECHK	FLCOL1
IOERR	GERROR	CONFIG	CNSTNT	SUB	MUL
DSUB	DMUL	DIV	DDIV	DADD	ADD
CKSTAT	ZSTAT				

7.6.4 FPTEST Common Block Cross-Reference List

Common Block CONSTN used in:
 CNSTNT FPTEST
Common Block DEVICE used in:
 DEV CBD FPTEST
Common Block MACHIN used in:
 DEV CBD FPTEST
Common Block DEVCNM used in:
 DEV CBD

7.7 INSTDB

7.7.1 INSTDB Subprogram References

INSTDB calls:
 CONFIG IOERR LCTRIM PROMPT RDSCN UPCASE
CONFIG calls: none
IOERR calls:
 GERROR
GERROR calls: none
LCTRIM calls: none
PROMPT calls: none
RDSCN calls:
 CITIES IBKCNV IOERR
CITIES calls: none
IBKCNV calls: none
UPCASE calls: none

7.7.2 INSTDB Cross-Reference List

CITIES called by:
 RDSCN
CONFIG called by:
 INSTDB
DEV CBD called by:
 INSTDB RDSCN
ECOSBD called by:
 IBKCNV
GERROR called by:
 IOERR
IBKCNV called by:
 RDSCN
INSTDB not called
IOERR called by:
 INSTDB RDSCN
LCTRIM called by:
 INSTDB
MOLNBD called by:
 INSTDB
PROMPT called by:
 INSTDB
RDSCN called by:
 INSTDB
UPCASE called by:
 INSTDB

7.7.3 INSTDB Pre-Requisite Order List

INSTDB	UPCASE	RDSCN	IOERR	GERROR	IBKCNV
CITIES	PROMPT	LCTRIM	CONFIG		

7.7.4 INSTDB Common Block Cross-Reference List

Common Block DEVCNM used in:		
DEVCBD	INSTDB	RDSCN
Common Block DEVICE used in:		
DEVCBD	INSTDB	RDSCN
Common Block MOLNMX used in:		
INSTDB	MOLNBD	
Common Block ECOCNV used in:		
ECOSBD	IBKCNV	
Common Block ECOSYS used in:		
ECOSBD		
Common Block MACHIN used in:		
DEVCBD		

7.8 MRFLTR

7.8.1 MRFLTR Subprogram References

MRFLTR calls:					
ATMOUT	CNSTNT	CONFIG	DBINIT	GETHDR	INITL
IOERR	PROMPT	RDFLTR	SETFLG	SUMFIL	
ATMOUT calls:					
ATMINT	ATMPRN	BCKINT	BCKPRN	GETHDR	IOERR
ZROINT					
ATMINT calls:					
FILTER	IOERR				
FILTER calls:					
XTERP					
XTERP calls:					
IBNSRC					
IBNSRC calls: none					
IOERR calls:					
GERROR					
GERROR calls: none					
ATMPRN calls:					
INDXBK	IOERR	PRALT	RELHUM	SETBCK	
INDXBK calls:					
GBLBCK					
GBLBCK calls:					
AIRTMP	RDGBL	RDSCN			
AIRTMP calls: none					
RDGBL calls:					
IOERR	SEAICE				
SEAICE calls: none					
RDSCN calls:					
CITIES	IBKCNV	IOERR			
CITIES calls: none					
IBKCNV calls: none					
PRALT calls:					
IBNSRC					
RELHUM calls:					
SATUR					
SATUR calls: none					
SETBCK calls:					
INTR2D	MODBCK				
INTR2D calls: none					
MODBCK calls: none					
BCKINT calls:					
FILTER	IOERR				
BCKPRN calls:					
IOERR					

GETHDR calls:						
IOERR						
ZROINT calls: none						
CNSTNT calls:						
ADD	DADD	DDIV	DIV	DMUL	DSUB	
MUL	SUB					
ADD calls: none						
DADD calls: none						
DDIV calls: none						
DIV calls: none						
DMUL calls: none						
DSUB calls: none						
MUL calls: none						
SUB calls: none						
CONFIG calls: none						
DBINIT calls:						
IOERR						
INITL calls:						
BEAUF	BINFIL	CALEND	CIRRUS	DEFAULT	DFLT2	
DFLT8	EXOATM	EXOTMP	FILOPN	FILRT	GBLBCK	
GETASP	GETATM	GETBCK	GETCLD	GETEXO	GETPOS	
GETSLR	GETVAR	GETVEC	IOERR	ISRAEL	LWCASE	
MDLATM	MIEINP	PARSE	RDLINE	SATUR	SETFLG	
STGEOM	UPCASE	USRDEF	VSA	ZROHDR		
BEAUF	calls: none					
BINFIL	calls:					
CHKRST	CHKVER	DISEND	FLSTAT	IOERR	RDLINE	
UPCASE						
CHKRST	calls:					
IOERR						
CHKVER	calls:					
IOERR						
DISEND	calls:					
IOERR						
FLSTAT	calls:					
IOERR						
UPCASE	UPCASE					
UPCASE	calls: none					
RDLINE	calls:					
IOERR	LCTRIM	LENSTR				
LCTRIM	calls: none					
LENSTR	calls: none					
CALEND	calls: none					
CIRRUS	calls: none					
DEFAULT	calls:					
EXOATM	GBLBCK					
EXOATM	calls:					
XTERP						
DFLT2	calls:					
IDAERO	MDLATM					
IDAERO	calls: none					
MDLATM	calls: none					
DFLT8	calls:					
DVINCR	GETVEC	RDLINE	UPCASE			
DVINCR	calls: none					
GETVEC	calls:					
IOERR	LCTRIM	LENSTR				
EXOTMP	calls: none					
FILOPN	calls:					
IOERR	RDLINE	UPCASE				
FILRT	calls:					
LCTRIM						
GETASP	calls:					
GETVEC	IGTINT	RDLINE	UPCASE			
IGTINT	calls:					
IOERR						

GETATM calls:						
GETVAR	IGTINT	IGTVEC	LWCASE	MRNDFL	NCHAER	
NCHATM	NCHAZE	NCHSEA	RDLINE	UPCASE		
GETVAR calls:						
IOERR						
IGTVEC calls:						
IOERR	LCTRIM	LENSTR				
LWCASE calls: none						
MRNDFL calls: none						
NCHAER calls:						
LCTRIM	UPCASE					
NCHATM calls:						
LCTRIM	UPCASE					
NCHAZE calls:						
LCTRIM	UPCASE					
NCHSEA calls:						
LCTRIM	UPCASE					
GETBCK calls:						
GETVAR	GETVEC	IGTINT	RDLINE	UPCASE	USRBCK	
USRBCK calls:						
GETVAR	GETVEC	IGTINT	IGTVEC	IOERR	PARSE	
RDLINE	UPCASE					
PARSE calls:						
LCTRIM	LENSTR					
GETCLD calls:						
GETVAR	IGTINT	RDLINE	UPCASE	USRCLD		
USRCLD calls:						
GETVAR	IGTINT	IOERR	PARSE	RDLINE	UPCASE	
GETEXO calls:						
GETVAR	IGTINT	PARSE	RDLINE	UPCASE		
GETPOS calls:						
CALEND	CHTIME	GETVAR	IGTINT	LWCASE	MONTH	
RDLINE	UPCASE					
CHTIME calls: none						
MONTH calls:						
LCTRIM	UPCASE					
GETSLR calls:						
GETVAR	RDLINE	SPTRIG	UPCASE			
SPTRIG calls: none						
ISRAEL calls: none						
MIEINP calls:						
GETVAR	GETVEC	IGTINT	IOERR	LWCASE	PARSE	
RDLINE	UPCASE					
SETFLG calls: none						
STGEOM calls:						
GETVAR	IGTINT	LWCASE	UPCASE			
USRDEF calls:						
GBLBCK	GETVAR	IGTINT	IOERR	LWCASE	MDLATM	
PARSE	RDLINE	UPCASE	XMCONV	XTERP		
XMCONV calls:						
SATUR	XTERP					
VSA calls: none						
ZROHDR calls: none						
PROMPT calls: none						
RDFLTR calls:						
GETVAR	IOERR	LCTRIM	LENSTR	LWCASE	PARSE	
RDLINE	UPCASE					
SUMFIL calls:						
CHTIME	IOERR	LENSTR	PUTCLD	PUTSLR		
PUTCLD calls:						
IOERR						
PUTSLR calls:						
IOERR	SLRCNT					
SLRCNT calls: none						

7.8.2 MRFLTR Cross-Reference List

ADD called by:					
CNSTNT					
AIRTMP called by:					
GBLBCK					
ATMINT called by:					
ATMOUT					
ATMOUT called by:					
MRFLTR					
ATMPRN called by:					
ATMOUT					
ATMSBD called by:					
ATMPRN	BCKPRN	DFLT2	GBLBCK	INITL	SETBCK
USRDEF					
BCKINT called by:					
ATMOUT					
BCKPRN called by:					
ATMOUT					
BEAUFT called by:					
INITL					
BINFIL called by:					
INITL					
BKGDBD called by:					
ATMPRN	GETBCK	INITL	SETBCK	USRBCK	
CALEND called by:					
GETPOS	INITL				
CHKRST called by:					
BINFIL					
CHKVER called by:					
BINFIL					
CHRCBD called by:					
ATMPRN	PUTCLD	SUMFIL	USRBCK		
CHTIME called by:					
GETPOS	SUMFIL				
CIRRUS called by:					
INITL					
CITIES called by:					
RDSCN					
CLDRBD called by:					
PUTCLD	USRCLD				
CNSTNT called by:					
MRFLTR					
CONFIG called by:					
MRFLTR					
DADD called by:					
CNSTNT					
DBINIT called by:					
MRFLTR					
DDIV called by:					
CNSTNT					
DEFAULT called by:					
INITL					
DEV CBD called by:					
ATMINT	ATMOUT	ATMPRN	BCKINT	BCKPRN	DBINIT
DEFAULT	DFLT8	FILRT	FLSTAT	GBLBCK	GETASP
GETATM	GETBCK	GETCLD	GETEXO	GETPOS	GETSLR
INITL	MIEINP	MRFLTR	PUTCLD	PUTSLR	RDFLTR
RDGBL	RDSCN	SUMFIL	USRBCK	USRCLD	
DFLT2 called by:					
INITL					
DFLT8 called by:					
INITL					

DISEND called by:						
BINFIL						
DIV called by:						
CNSTNT						
DMUL called by:						
CNSTNT						
DSUB called by:						
CNSTNT						
DVINCR called by:						
DFLT8						
ECOSBD called by:						
IBKCNV						
EXMLBD called by:						
USRDEF						
EXOATM called by:						
DEFAULT	INITL					
EXOTMP called by:						
INITL						
FILOPN called by:						
INITL						
FILRT called by:						
INITL						
FILTER called by:						
ATMINT	BCKINT					
FLSTAT called by:						
BINFIL						
GBLBCK called by:						
DEFAULT	INDXBK	INITL	USRDEF			
GERROR called by:						
IOERR						
GETASP called by:						
INITL						
GETATM called by:						
INITL						
GETBCK called by:						
INITL						
GETCLD called by:						
INITL						
GETEXO called by:						
INITL						
GETHDR called by:						
ATMOUT	MRFLTR					
GETPOS called by:						
INITL						
GETSLR called by:						
INITL						
GETVAR called by:						
GETATM	GETBCK	GETCLD	GETEXO	GETPOS	GETSLR	
INITL	MIEINP	RDFLTR	STGEOM	USBCK	USRCLD	
USRDEF						
GETVEC called by:						
DFLT8	GETASP	GETBCK	INITL	MIEINP	USBCK	
IBKCNV called by:						
RDSCN						
IBNSRC called by:						
PRALT	XTERP					
IDAERO called by:						
DFLT2						
IGTINT called by:						
GETASP	GETATM	GETBCK	GETCLD	GETEXO	GETPOS	
MIEINP	STGEOM	USBCK	USRCLD	USRDEF		
IGTVEC called by:						
GETATM	USBCK					
INDXBK called by:						
ATMPRN						

INFLBD called by:
 RDFLTR
 INITL called by:
 MRFLTR
 INPTBD called by:
 INITL
 INTR2D called by:
 SETBCK
 IOERR called by:
 ATMINT ATMOUT ATMPRN BCKINT BCKPRN BINFIL
 CHKRST CHKVER DBINIT DISEND FILOPN FLSTAT
 GETHDR GETVAR GETVEC IGTINT IGTVEC INITL
 MIEINP MRFLTR PUTCLD PUTSLR RDFLTR RDGBL
 RDLINE RDSCN SUMFIL USBCK USRCLD USRDEF
 ISRAEL called by:
 INITL
 LCTRIM called by:
 FILRT GETVEC IGTVEC MONTH NCHAER NCHATM
 NCHAZE NCHSEA PARSE RDFLTR RDLINE
 LENSTR called by:
 GETVEC IGTVEC PARSE RDFLTR RDLINE SUMFIL
 LWCASE called by:
 GETATM GETPOS INITL MIEINP RDFLTR STGEOM
 USRDEF
 MDLATM called by:
 DFLT2 INITL USRDEF
 MIEINP called by:
 INITL
 MODBCK called by:
 SETBCK
 MOLPBD called by:
 XMCONV
 MONTH called by:
 GETPOS
 MRFLTR not called
 MRNDFL called by:
 GETATM
 MUL called by:
 CNSTNT
 NCHAER called by:
 GETATM
 NCHATM called by:
 GETATM
 NCHAZE called by:
 GETATM
 NCHSEA called by:
 GETATM
 PARSE called by:
 GETEXO INITL MIEINP RDFLTR USBCK USRCLD
 USRDEF
 PRALT called by:
 ATMPRN
 PROMPT called by:
 MRFLTR
 PUTCLD called by:
 SUMFIL
 PUTSLR called by:
 SUMFIL
 RDFLTR called by:
 MRFLTR
 RDGBL called by:
 GBLBCK

RDLINE called by:						
BINFIL	DFLT8	FILOPN	GETASP	GETATM	GETBCK	
GETCLD	GETEXO	GETPOS	GETSLR	INITL	MIEINP	
RDFLTR	USRBCK	USRCLD	USRDEF			
RDSCN called by:						
GBLBCK						
RELHUM called by:						
ATMPRN						
SATUR called by:						
INITL	RELHUM	XMCONV				
SCENBD called by:						
ATMPRN	SETBCK	USRBCK				
SEAICE called by:						
RDGBL						
SETBCK called by:						
ATMPRN						
SETFLG called by:						
INITL	MRFLTR					
SICEBD called by:						
SEAICE						
SLR1BD called by:						
SLRCNT						
SLRCNT called by:						
PUTSLR						
SPTRIG called by:						
GETSLR						
STGEOM called by:						
INITL						
STMLBD called by:						
USRDEF						
SUB called by:						
CNSTNT						
SUMFIL called by:						
MRFLTR						
UPCASE called by:						
BINFIL	DFLT8	FILOPN	FLSTAT	GETASP	GETATM	
GETBCK	GETCLD	GETEXO	GETPOS	GETSLR	INITL	
MIEINP	MONTH	NCHAER	NCHATM	NCHAZE	NCHSEA	
RDFLTR	STGEOM	USRBCK	USRCLD	USRDEF		
UPPRBD called by:						
EXOATM						
USRBCK called by:						
GETBCK						
USRCLD called by:						
GETCLD						
USRDEF called by:						
INITL						
VSA called by:						
INITL						
XMCONV called by:						
USRDEF						
XTERP called by:						
EXOATM	FILTER	USRDEF	XMCONV			
ZROHDR called by:						
INITL						
ZROINT called by:						
ATMOUT						

7.8.3 MRFLTR Pre-Requisite Order List

MRFLTR	SUMFIL	PUTSLR	SLRCNT	PUTCLD	RDFLTR
PROMPT	INITL	ZROHDR	VSA	USRDEF	XMCONV
STGEOM	SETFLG	MIEINP	ISRAEL	GETSLR	SPTRIG
GETPOS	MONTH	CHTIME	CALEND	GETEXO	GETCLD

USRCLD	GETBCK	USRBCK	PARSE	GETATM	NCHSEA
NCHAZE	NCHATM	NCHAER	MRNDFL	LWCASE	IGTVEC
GETVAR	GETASP	IGTINT	FILRT	FILOPN	EXOTMP
DFLT8	GETVEC	DVINCR	DFLT2	MDLATM	IDAERO
DEFALT	EXOATM	CIRRUS	BINFIL	RDLINE	LENSTR
LCTRIM	FLSTAT	UPCASE	DISEND	CHKVER	CHKRST
BEAUF	DBINIT	CONFIG	CNSTNT	SUB	MUL
DSUB	DMUL	DIV	DDIV	DADD	ADD
ATMOUT	ZROINT	GETHDR	BCKPRN	BCKINT	ATMPRN
SETBCK	MODEBCK	INTR2D	RELHUM	SATUR	PRALT
INDXBK	GBLBCK	RDSCN	IBKCNV	CITIES	RDGBL
SEAICE	AIRTMP	ATMINT	IOERR	GERROR	FILTER
XTERP	IBNSRC				

7.8.4 MRFLTR Common Block Cross-Reference List

Common Block BCKDAT used in:					
ATMOUT	BCKINT	BCKPRN	MRFLTR	ZROINT	
Common Block DEVICE used in:					
ATMINT	ATMOUT	ATMPRN	BCKINT	BCKPRN	DBINIT
DEFALT	DEV CBD	DFLT8	FLSTAT	GETASP	GETATM
GETBCK	GETCLD	GETPOS	GETSLR	INITL	MIEINP
MRFLTR	PUTCLD	PUTSLR	RDFLTR	RDGBL	RDSCN
SUMFIL	USRBCK	USRCLD			
Common Block FLAGS used in:					
ATMPRN	BCKPRN	BINFIL	INITL	ISRAEL	MRFLTR
PUTSLR	SETFLG	SUMFIL			
Common Block HEADER used in:					
ATMOUT	ATMPRN	BCKPRN	DEFALT	GETASP	GETATM
GETBCK	GETCLD	GETHDR	INITL	MRFLTR	PUTCLD
PUTSLR	SETBCK	SUMFIL	USRDEF	ZROHDR	
Common Block INITAL used in:					
INITL	MRFLTR				
Common Block CONSTN used in:					
AIRTMP	ATMOUT	ATMPRN	BCKPRN	CNSTNT	DBINIT
DFLT2	DFLT8	EXOTMP	FILTER	GETSLR	INITL
MODEBCK	SATUR	SPTRIG	STGEOM	USRDEF	XTERP
Common Block INTSTO used in:					
ATMINT	ATMPRN	ZROINT			
Common Block ATMDAT used in:					
ATMPRN	ATMSBD	BCKPRN	DFLT2	INITL	SETBCK
USRDEF					
Common Block BACKGD used in:					
ATMPRN	BKGDBD	GETBCK	INITL	SETBCK	USRBCK
Common Block CHRCNM used in:					
ATMPRN	CHRCBD	PUTCLD	SUMFIL	USRBCK	
Common Block OUTPUT used in:					
ATMPRN	BCKPRN	INITL			
Common Block SCENES used in:					
ATMPRN	SCENBD	SETBCK	USRBCK		
Common Block RSTART used in:					
BINFIL					
Common Block ANTECD used in:					
DEFALT	INITL				
Common Block USERDF used in:					
DEFALT	GETASP	USRDEF			
Common Block MOLECP used in:					
DBINIT	DFLT8	DVINCR	SUMFIL	USRDEF	
Common Block UPRATM used in:					
EXOATM	UPPRBD				
Common Block FLTRDT used in:					
FILTER	RDFLTR				
Common Block MACHIN used in:					
DEV CBD	FLSTAT				

Common Block CLDRN used in:					
CLDRBD	GETCLD	PUTCLD	USRCLD		
Common Block ECOCNV used in:					
ECOSBD	IBKCNV				
Common Block INPTDT used in:					
INITL	INPTBD				
Common Block VSADTA used in:					
INITL	VSA				
Common Block MATERL used in:					
MIEINP					
Common Block INFLTR used in:					
INFLBD	RDFLTR				
Common Block SICEDT used in:					
SEAICE	SICEBD				
Common Block SOLIR1 used in:					
SLR1BD	SLRCNT				
Common Block DEVCNM used in:					
DBINIT	DEV CBD	FILRT	RDGBL	RDSCN	SUMFIL
Common Block USERNM used in:					
SUMFIL	USRDEF				
Common Block CLDUSR used in:					
USRCLD					
Common Block EXTMOL used in:					
EXMLBD	USRDEF				
Common Block STDMOL used in:					
STMLBD	USRDEF				
Common Block MOLDAT used in:					
MOLPBD	XMCONV				
Common Block ECOSYS used in:					
ECOSBD					
Common Block INPNDX used in:					
INPTBD					
Common Block MOLCON used in:					
MOLPBD					

7.9 PLTGEN

7.9.1 PLTGEN Subprogram References

PLTGEN calls:					
CLSGKS	CONFIG	GETHDR	IOERR	LCTRIM	OPNGKS
PLTDRV	PROMPT	UPCASE			
CLSGKS calls: none					
CONFIG calls: none					
GETHDR calls:					
IOERR					
IOERR calls:					
GERROR					
GERROR calls: none					
LCTRIM calls: none					
OPNGKS calls: none					
PLTDRV calls:					
AGSETC	AGSETF	AGSETI	APPEND	EZMXY	IOERR
PROMPT	RDMSRT	UPCASE			
AGSETC calls: none					
AGSETF calls: none					
AGSETI calls: none					
APPEND calls:					
LENSTR					
LENSTR calls: none					
EZMXY calls: none					
PROMPT calls: none					

RDMSRT calls:
 IOERR SLITFN
 SLITFN calls: none
 UPCASE calls: none

7.9.2 PLTGEN Cross-Reference List

AGSETC called by:
 PLTDRV
 AGSETF called by:
 PLTDRV
 AGSETI called by:
 PLTDRV
 AGUTOL called by:
 PLTDRV PLTGEN
 APPEND called by:
 PLTDRV
 CHRCBD called by:
 PLTDRV
 CLSGKS called by:
 PLTGEN
 CONFIG called by:
 PLTGEN
 EZMXY called by:
 PLTDRV
 GERROR called by:
 IOERR
 GETHDR called by:
 PLTGEN
 IOERR called by:
 GETHDR PLTDRV PLTGEN RDMSRT
 LCTRIM called by:
 PLTGEN
 LENSTR called by:
 APPEND
 OPNGKS called by:
 PLTGEN
 PLTBD called by:
 PLTDRV RDMSRT
 PLTDRV called by:
 PLTGEN
 PLTGEN not called
 PROMPT called by:
 PLTDRV PLTGEN
 RDMSRT called by:
 PLTDRV
 SLITFN called by:
 RDMSRT
 UPCASE called by:
 PLTDRV PLTGEN

7.9.3 PLTGEN Pre-Requisite Order List

PLTGEN	PLTDRV	UPCASE	RDMSRT	SLITFN	PROMPT
EZMXY	APPEND	LENSTR	AGSETI	AGSETF	AGSETC
OPNGKS	LCTRIM	GETHDR	IOERR	GERROR	CONFIG
CLSGKS					

7.9.4 PLTGEN Common Block Cross-Reference List

Common Block HEADER used in:
 GETHDR PLTDRV PLTGEN RDMSRT

Common Block CHRCNM	used in:	
CHRCBD		PLTDRV
Common Block CHRPRM	used in:	
PLTBD		PLTDRV
Common Block PLTPRM	used in:	
PLTBD		PLTDRV
		RDMSRT
Common Block RMODAT	used in:	
PLTDRV		RDMSRT

7.10 SCNGEN

7.10.1 SCNGEN Subprogram References

SCNGEN calls:					
CNSTNT	COEFF	CONFIG	FM2D	GETVAR	IGTINT
IOERR	LWCASE	PARSE	PROMPT	RDLINE	SCALE
TDFFT	TILEIT	UNI	UPCASE	XTERP	
CNSTNT calls:					
ADD	DADD	DDIV	DIV	DMUL	DSUB
MUL	SUB				
ADD calls: none					
DADD calls: none					
DDIV calls: none					
DIV calls: none					
DMUL calls: none					
DSUB calls: none					
MUL calls: none					
SUB calls: none					
COEFF calls:					
GAUS					
GAUS calls:					
RUNIF					
RUNIF calls:					
UNI					
UNI calls: none					
CONFIG calls: none					
FM2D calls:					
GAUS					
GETVAR calls:					
IOERR					
IOERR calls:					
GERROR					
GERROR calls: none					
IGTINT calls:					
IOERR					
LWCASE calls: none					
PARSE calls:					
LCTRIM	LENSTR				
LCTRIM calls: none					
LENSTR calls: none					
PROMPT calls: none					
RDLINE calls:					
IOERR	LCTRIM	LENSTR			
SCALE calls:					
CORF					
CORF calls:					
GAMMA	KNU				
GAMMA calls: none					
KNU calls:					
GAMMA					
TDFFT calls:					
FOUR1					
FOUR1 calls: none					

TILEIT calls: none
 UPCASE calls: none
 XTERP calls:
 IBNSRC
 IBNSRC calls: none

7.10.2 SCNGEN Cross-Reference List

ADD called by:
 CNSTNT
 CNSTNT called by:
 SCNGEN
 COEFF called by:
 SCNGEN
 CONFIG called by:
 SCNGEN
 CORF called by:
 SCALE
 DADD called by:
 CNSTNT
 DDIV called by:
 CNSTNT
 DIV called by:
 CNSTNT
 DMUL called by:
 CNSTNT
 DSUB called by:
 CNSTNT
 FM2D called by:
 SCNGEN
 FOUR1 called by:
 TDFFT
 GAMMA called by:
 CORF KNU
 GAUS called by:
 COEFF FM2D
 GERROR called by:
 IOERR
 GETVAR called by:
 SCNGEN
 IBNSRC called by:
 XTERP
 IGTINT called by:
 SCNGEN
 IOERR called by:
 GETVAR IGTINT RDLINE SCNGEN
 KNU called by:
 CORF
 LCTRIM called by:
 PARSE RDLINE
 LENSTR called by:
 PARSE RDLINE
 LWCASE called by:
 SCNGEN
 MUL called by:
 CNSTNT
 PARSE called by:
 SCNGEN
 PROMPT called by:
 SCNGEN
 RDLINE called by:
 SCNGEN
 RUNIF called by:
 GAUS

SCALE called by:
 SCNGEN
 SCNGEN not called
 SUB called by:
 CNSTNT
 TDFFT called by:
 SCNGEN
 TILEIT called by:
 SCNGEN
 UNI called by:
 RUNIF SCNGEN
 UPCASE called by:
 SCNGEN
 XTERP called by:
 SCNGEN

7.10.3 SCNGEN Pre-Requisite Order List

SCNGEN	XTERP	IBNSRC	UPCASE	TILEIT	TDFFT
FOUR1	SCALE	CORF	KNU	GAMMA	RDLINE
PROMPT	PARSE	LENSTR	LCTRM	LWCASE	IGTINT
GETVAR	IOERR	GERROR	FM2D	CONFIG	COEFF
GAUS	RUNIF	UNI	CNSTNT	SUB	MUL
DSUB	DMUL	DIV	DDIV	DADD	ADD

7.10.4 SCNGEN Common Block Cross-Reference List

Common Block CONSTN used in:
 CNSTNT COEFF FOUR1 KNU SCNGEN XTERP
 Common Block PIXEL used in:
 SCNGEN

7.11 TERTEM

7.11.1 TERTEM Subprogram References

TERTEM calls:

AECALC	CNSTNT	CONFIG	FILRT	GETHDR	GETVAR
GETVEC	HTBLNC	IGTINT	INTR2D	IOERR	LWCASE
PARSE	PROFAC	PROMPT	RDLINE	RDUSRM	SATUR
SEATMP	SPCLYR	UPCASE	XTERP		

AECALC calls:
 PLANCK
 PLANCK calls: none
 CNSTNT calls:
 ADD DADD DDIV DIV DMUL DSUB
 MUL SUB
 ADD calls: none
 DADD calls: none
 DDIV calls: none
 DIV calls: none
 DMUL calls: none
 DSUB calls: none
 MUL calls: none
 SUB calls: none
 CONFIG calls: none
 FILRT calls:
 LCTRM
 LCTRM calls: none
 GETHDR calls:
 IOERR

IOERR calls:
 GERROR
 GERROR calls: none
 GETVAR calls:
 IOERR
 GETVEC calls:
 IOERR LCTRIM LENSTR
 LENSTR calls: none
 HTBLNC calls:
 SRFLUX
 SRFLUX calls:
 EVAPOR SATUR
 EVAPOR calls:
 XTERP
 XTERP calls:
 IBNSRC
 IBNSRC calls: none
 SATUR calls: none
 IGTINT calls:
 IOERR
 INTR2D calls: none
 LWCASE calls: none
 PARSE calls:
 LCTRIM LENSTR
 PROFAC calls:
 IBNSRC
 PROMPT calls: none
 RDLINE calls:
 IOERR LCTRIM LENSTR
 RDUSRM calls:
 GETVAR NCHTER RDLINE UPCASE
 NCHTER calls:
 LCTRIM UPCASE
 UPCASE calls: none
 SEATMP calls: none
 SPCLYR calls:
 DENAIR DENWTR SPHAIR SPHICE SPHWTR THCAIR
 THCICE THCSNW THCWTR
 DENAIR calls:
 VIRIAL
 VIRIAL calls:
 XTERP
 DENWTR calls: none
 SPHAIR calls: none
 SPHICE calls:
 XTERP
 SPHWTR calls:
 XTERP
 THCAIR calls: none
 THCICE calls:
 XTERP
 THCSNW calls: none
 THCWTR calls:
 XTERP

7.11.2 TERTEM Cross-Reference List

ADD called by:
 CNSTNT
 AECALC called by:
 TERTEM
 ATMSBD called by:
 TERTEM

BKGDBD called by:					
RDUSRM	SPCLYR	TERTEM			
CHRCBD called by:					
TERTEM					
CNSTNT called by:					
TERTEM					
CONFIG called by:					
TERTEM					
DADD called by:					
CNSTNT					
DDIV called by:					
CNSTNT					
DENAIR called by:					
SPCLYR					
DENWTR called by:					
SPCLYR					
DEVCBD called by:					
FILRT	TERTEM				
DIV called by:					
CNSTNT					
DMUL called by:					
CNSTNT					
DSUB called by:					
CNSTNT					
EVAPOR called by:					
SRFLUX					
EXMLBD called by:					
TERTEM					
FILRT called by:					
TERTEM					
GERROR called by:					
IOERR					
GETHDR called by:					
TERTEM					
GETVAR called by:					
RDUSRM	TERTEM				
GETVEC called by:					
TERTEM					
HTBLNC called by:					
TERTEM					
IBNSRC called by:					
PROFAC	XTERP				
IGTINT called by:					
TERTEM					
INTR2D called by:					
TERTEM					
IOERR called by:					
GETHDR	GETVAR	GETVEC	IGTINT	RDLINE	TERTEM
LCTRM called by:					
FILRT	GETVEC	NCHTER	PARSE	RDLINE	
LENSTR called by:					
GETVEC	PARSE	RDLINE			
LWCASE called by:					
TERTEM					
MOLPBD called by:					
DENAIR					
MUL called by:					
CNSTNT					
NCHTER called by:					
RDUSRM					
OCNTBD called by:					
SEATMP					
PARSE called by:					
TERTEM					

PLANCK	called by:					
	AECALC					
PROFAC	called by:					
	TERTEM					
PROMPT	called by:					
	TERTEM					
RDLINE	called by:					
	RDUSRM	TERTEM				
RDUSRM	called by:					
	TERTEM					
SATUR	called by:					
	SRFLUX	TERTEM				
SEATMP	called by:					
	TERTEM					
SPCLYR	called by:					
	TERTEM					
SPHAIR	called by:					
	SPCLYR					
SPHICE	called by:					
	SPCLYR					
SPHWTR	called by:					
	SPCLYR					
SRFLUX	called by:					
	HTBLNC					
SUB	called by:					
	CNSTNT					
TERTEM	not called					
THCAIR	called by:					
	SPCLYR					
THCICE	called by:					
	SPCLYR					
THCSNW	called by:					
	SPCLYR					
THCWTR	called by:					
	SPCLYR					
UPCASE	called by:					
	NCHTER	RDUSRM	TERTEM			
VIRIAL	called by:					
	DENAIR					
VIRLBD	called by:					
	VIRIAL					
XTERP	called by:					
	EVAPOR	SPHICE	SPHWTR	TERTEM	THCICE	THCWTR
	VIRIAL					

7.11.3 TERTEM Pre-Requisite Order List

TERTEM	SPCLYR	THCWTR	THCSNW	THCICE	THCAIR
SPHWTR	SPHICE	SPHAIR	DENWTR	DENAIR	VIRIAL
SEATMP	RDUSRM	RDLINE	NCHTER	UPCASE	GETVAR
PROMPT	PROFAC	PARSE	LWCASE	INTR2D	IGTINT
HTBLNC	SRFLUX	SATUR	EVAPOR	XTERP	IBNSRC
GETVEC	LENSTR	GETHDR	IOERR	GERROR	FILRT
LCSTRIM	CONFIG	CNSTNT	SUB	MUL	DSUB
DMUL	DIV	DDIV	DADD	ADD	AECALC
PLANCK					

7.11.4 TERTEM Common Block Cross-Reference List

Common Block ATMDAT used in:			
ATMSBD	TERTEM		
Common Block BACKGD used in:			
BKGDBD	RDUSRM	SPCLYR	TERTEM

Common Block CHRCNM used in:				
CHRCBD	TERTEM			
Common Block CONSTN used in:				
CNSTNT	HTBLNC	PLANCK	PROFAC	SATUR
TERTEM	XTERP			SPCLYR
Common Block DEVICE used in:				
DEVCBD	TERTEM			
Common Block EXTMOL used in:				
EXMLBD	TERTEM			
Common Block HEADER used in:				
GETHDR	TERTEM			
Common Block MOLDAT used in:				
DENAIR	MOLPBD			
Common Block DEVCNM used in:				
DEVCBD	FILRT			
Common Block TMPOCN used in:				
OCNTBD	SEATMP			
Common Block VIRDAT used in:				
VIRIAL	VIRLBD			
Common Block MACHIN used in:				
DEVCBD				
Common Block MOLCON used in:				
MOLPBD				

7.12 VISUAL

7.12.1 VISUAL Subprogram References

VISUAL calls:					
CNSTNT	COLOR	CONFIG	FILRT	GETHDR	HUMAN
IOERR	NRMLZ	PROMPT	SETFLG	SUMFIL	SUMIT
CNSTNT calls:					
ADD	DADD	DDIV	DIV	DMUL	DSUB
MUL	SUB				
ADD calls: none					
DADD calls: none					
DDIV calls: none					
DIV calls: none					
DMUL calls: none					
DSUB calls: none					
MUL calls: none					
SUB calls: none					
COLOR calls: none					
CONFIG calls: none					
FILRT calls:					
LCTRIM					
LCTRIM calls: none					
GETHDR calls:					
IOERR					
IOERR calls:					
GERROR					
GERROR calls: none					
HUMAN calls:					
XTERP					
XTERP calls:					
IBNSRC					
IBNSRC calls: none					
NRMLZ calls: none					
PROMPT calls: none					
SETFLG calls: none					
SUMFIL calls:					
CHTIME	IOERR	LENSTR	PUTCLD	PUTSLR	
CHTIME calls: none					

LENSTR calls: none
 PUTCLD calls:
 IOERR
 PUTSLR calls:
 IOERR SLRCNT
 SLRCNT calls: none
 SUMIT calls: none

7.12.2 VISUAL Cross-Reference List

ADD called by:	CNSTNT				
CHRCBD called by:	PUTCLD	SUMFIL			
CHTIME called by:	SUMFIL				
CLDRBD called by:	PUTCLD				
CNSTNT called by:	VISUAL				
COLOR called by:	VISUAL				
CONFIG called by:	VISUAL				
DADD called by:	CNSTNT				
DDIV called by:	CNSTNT				
DEV CBD called by:	FILRT	PUTCLD	PUTSLR	SUMFIL	VISUAL
DIV called by:	CNSTNT				
DMUL called by:	CNSTNT				
DSUB called by:	CNSTNT				
FILRT called by:	VISUAL				
GERROR called by:	IOERR				
GETHDR called by:	VISUAL				
HUMAN called by:	VISUAL				
IBNSRC called by:	XTERP				
IOERR called by:	GETHDR	PUTCLD	PUTSLR	SUMFIL	VISUAL
LCTRM called by:	FILRT				
LENSTR called by:	SUMFIL				
MUL called by:	CNSTNT				
NRMLZ called by:	VISUAL				
PROMPT called by:	VISUAL				
PUTCLD called by:	SUMFIL				
PUTSLR called by:	SUMFIL				
SETFLG called by:	VISUAL				

SLR1BD called by:
 SLRCNT
 SLRCNT called by:
 PUTSLR
 SUB called by:
 CNSTNT
 SUMFIL called by:
 VISUAL
 SUMIT called by:
 VISUAL
 VISUAL not called
 XTERP called by:
 HUMAN

7.12.3 VISUAL Pre-Requisite Order List

VISUAL	SUMIT	SUMFIL	PUTSLR	SLRCNT	PUTCLD
LENSTR	CHTIME	SETFLG	PROMPT	NRMLZ	HUMAN
XTERP	IBNSRC	GETHDR	IOERR	GERROR	FILRT
LCTRIM	CONFIG	COLOR	CNSTNT	SUB	MUL
DSUB	DMUL	DIV	DDIV	DADD	ADD

7.12.4 VISUAL Common Block Cross-Reference List

Common Block CONSTN used in:	CNSTNT	VISUAL	XTERP		
Common Block DEVICE used in:	DEVCBD	PUTCLD	PUTSLR	SUMFIL	VISUAL
Common Block FLAGS used in:	PUTSLR	SETFLG	SUMFIL	VISUAL	
Common Block HEADER used in:	GETHDR	PUTCLD	PUTSLR	SUMFIL	VISUAL
Common Block MOLECP used in:	SUMFIL	VISUAL			
Common Block USERNM used in:	SUMFIL	VISUAL			
Common Block CHRCNM used in:	CHRCBD	PUTCLD	SUMFIL		
Common Block CLDRN used in:	CLDRBD	PUTCLD			
Common Block SOLIR1 used in:	SLR1BD	SLRCNT			
Common Block DEVCNM used in:	DEVCBD	FILRT	SUMFIL		
Common Block MACHIN used in:	DEVCBD				