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Historical Electromagnetic Propagation Condition Database Description

W. L. Patterson

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SECTION 1

PURPOSE

The purpose of this report is to describe an electromagnetic propagation conditions climatological database, a subset of which is employed by the Historical Electromagnetic Propagation Conditions Summary Function (HEPC) within the Tactical Environmental Support System (TESS) (reference 1).

BACKGROUND

The HEPC function generates a climatological description of the refractive conditions for a user-specified geographic location. The climatological description is composed of five parts:

- a percent occurrence of enhanced surface-to-surface radar detection, electronic support measures (EMS) intercept and communications range,
- a surface-based duct summary,
- an elevated duct summary,
- an evaporation duct histogram,
- a general meteorology summary.

Figure 1 illustrates the description.

The statistics displayed by the HEPC function are derived from two meteorological databases, the Radiosonde Data Analysis II assembled by the GTE Sylvania Corporation and the Duct63 assembled by the National Climatic Data Center. Prior to the discussion of the HEPC database construction, it is appropriate to describe these two sources of data.

HISTORICAL PROPAGATION CONDITIONS SUMMARY

Specified location: 20.00 N 130.00 W MS = 86 (* = Insufficient data)
 Radiosonde source: 30.00 N 140.00 W MS = 123 WMO number = 4YN
 Coastal station: FIXED SHIP, NORTH PACIFIC OCEAN Hgt = 12 m
 Surface observation source: 25.00 N 125.00 W MS = 85

Percent occurrence of enhanced surface-to-surface radar/esm/com ranges:

Frequency	Average			Jan			Feb			Mar		
	day	nite	d&n	day	nite	d&n	day	nite	d&n	day	nite	d&n
100 Mhz	3	<1	2	3	<1	2	4	<1	2	3	<1	2
1 GHz	12	3	7	11	3	7	14	2	8	10	4	7
3 GHz	17	4	11	16	4	10	21	3	12	15	6	11
6 GHz	47	26	37	45	26	36	49	24	37	47	29	38
10 GHz	71	55	64	70	55	62	72	52	63	73	58	66
20 GHz	90	83	87	88	82	85	90	82	86	91	85	88

Surface based duct summary:

Parameter	Average			Jan			Feb			Mar		
	day	nite	d&n	day	nite	d&n	day	nite	d&n	day	nite	d&n
Percent occurrence	22	5	13	19	5	12	28	3	16	18	7	13
Avg thickness Km			.09			.09			.09			.09
Avg trap freq GHz			.81			.73			.96			.75
Avg 1yr grad -N/Km			225			227			220			227

Elevated duct summary:

Parameter	Average			Jan			Feb			Mar		
	day	nite	d&n	day	nite	d&n	day	nite	d&n	day	nite	d&n
Percent occurrence	38	57	48	42	56	49	37	53	45	36	61	49
Avg duct top Km			1.6			1.4			1.6			1.7
Avg thickness Km			.17			.18			.17			.17
Avg trap freq GHz			.20			.21			.19			.20
Avg 1yr grad -N/Km			222			215			218			233
Avg 1yr base Km			1.5			1.3			1.5			1.6

Evaporation duct histogram in percent occurrence.

Percent Occurrence	Average			Jan			Feb			Mar		
	day	nite	d&n	day	nite	d&n	day	nite	d&n	day	nite	d&n
0 to 4 Meters	4	5	5	5	5	5	4	5	5	4	4	4
4 to 8 Meters	11	18	15	13	18	16	12	18	15	9	17	13
8 to 12 Meters	26	33	30	26	32	29	28	34	31	26	33	29
12 to 16 Meters	30	29	30	30	29	30	30	27	28	31	30	31
16 to 20 Meters	19	12	16	19	12	15	17	11	14	20	14	17
20 to 24 Meters	7	3	5	6	3	5	7	3	5	7	2	5
24 to 28 Meters	1	<1	1	1	<1	<1	2	<1	1	2	<1	1
28 to 32 Meters	<1	<1	<1	<1	0	<1	<1	<1	<1	<1	<1	<1
32 to 36 Meters	<1	<1	<1	0	0	0	<1	0	<1	<1	<1	<1
36 to 40 Meters	0	0	0	0	0	0	0	0	0	0	0	0
above 40 Meters	0	<1	<1	0	<1	<1	0	0	0	0	0	0
Mean height Meters	13	11	12	13	11	12	13	11	12	13	12	13
# of observations	2k	2k	2k	2k	2k	2k	2k	2k	2k	2k	2k	2k

General meteorology summary:

Parameter	Average			Jan			Feb			Mar		
	day	nite	d&n	day	nite	d&n	day	nite	d&n	day	nite	d&n
# Accepted soundings	120	120	120	116	120	118	115	112	114	129	127	128
% occur EL&SB acts			3			3			3			2
% occur 2+ EL acts			3			5			3			2
Avg station N			339			343			337			337
Avg station -N/Km			48			50			48			45
Avg sfc wind m/s	7	7	7	7	7	7	7	7	7	7	7	7

Figure 1. HEPC Function output for metric units.

SECTION 2

GTE SYLVANIA RADIOSONDE DATA ANALYSIS II DESCRIPTION

General

GTE Sylvania, under contract by the Department of Defense (DoD), conducted a large scale analysis of approximately three million worldwide radiosonde soundings from 1966 to 1969 and 1973 to 1974. Numerous statistics of tropospheric ducts and super-refractive layers (SRLRs) were compiled. The basic pressure, temperature, and dew-point temperature profiles for each of the soundings were expanded and converted into a refractive index profile with 2 millibar increments. A search of each expanded profile was conducted to locate occurrences of gradients less than -157 N/Km (in the case of ducts) or less than -100 N/Km (in the case of SRLRs). Monthly estimates of the probability of occurrence of ducts and SRLRs were then computed for each of the 921 radiosonde stations. Characteristics such as height, thickness, intensity, and minimum trapping frequency were also computed.

The radiosonde Long-A tape, a truncated version of the Long Plus 2 tape data set represents the final output for the GTE Sylvania project (reference 2). The Long-A tape consists of 1842 records containing tropospheric ducting characteristics and weather-related parameters for 921 radiosonde stations distributed worldwide. Each set of two consecutive records supplies all the data for a particular station. The records are formatted in ASCII code with a length of 7104 bytes each. Appendix A lists the format for records 1 and 2 for an observation station. Appendix B is a listing of the included radiosonde stations.

Term Definitions

Layers are defined as surface (S), elevated-surface (ES), or elevated (E). Figures 2, 3, and 4 illustrate the M-unit versus height relationships for these layers.

The following is a description of each item contained within the two records. Appendix C contains a listing of the data as it appears on the GTE/Sylvania Long A data tape for station 4YN, fixed ship, North Pacific.

Station Number. World Meteorological Organization (WMO) block and station number.

Station Name. Station name by city and country together with a numerical indicator of coastal (1) or inland (0).

Record Sequence Number. Either record 1 or 2.

Latitude/Longitude. Station latitude and longitude to hundredth of a degree. Positive values represent north (west) and negative values represent south (east) latitude (longitudes).

Elevation. Station elevation above mean sea level in meters.

Local Time. Local time corresponding to midnight Greenwich Mean Time.

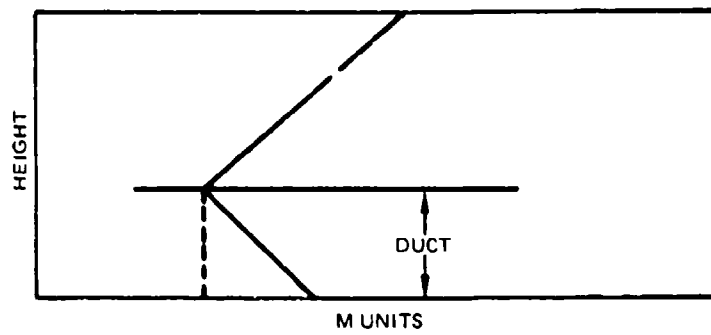


Figure 2. M-unit versus height profile for a surface duct.

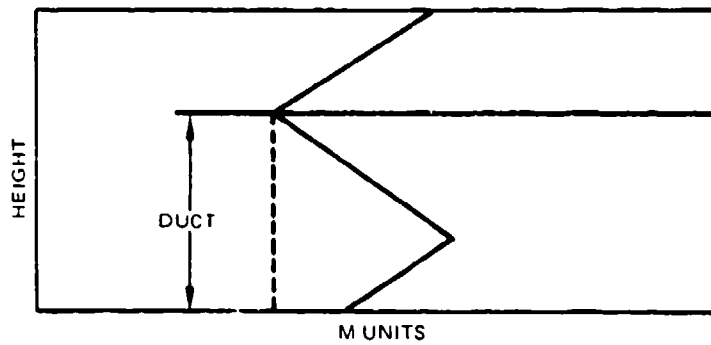


Figure 3. M-unit versus height profile for an elevated surface duct.

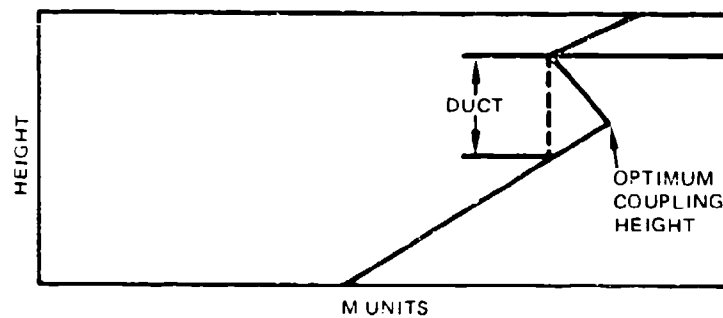


Figure 4. M-unit versus height profile for an elevated duct.

Local Time. Local time corresponding to noon Greenwich Mean Time.

Station Elevation Reliability. Errors in station elevation contribute directly to errors in duct heights and slopes. Various kinds of discrepancies were noted in the elevation of each radiosonde station. For example, during the measurement period, the station may have changed locations and thus elevations. These discrepancies have been compensated by a correction scheme. Values of 1 (most reliable) to 7 (least reliable) have been applied to the results of this compensation.

Instrument Type. A numerical designation of the two most popular types of instrument used during the last 2 years together with the percentage of the data during those 2 years for which those instruments were used. Table 1 provides the definition of the instrument designators.

Table 1. Instrument types definition.

Indicator	Definition
0	Unknown
1	USWB exposed thermister -403MC/1680MC R/S
2	Australian-variable AM R/S
3	Bendix AN; AMT-4/4B/4D/12; GMD-1 TMQ 5/TYPE 430
4	French -- Measural
5	Canadian -- Sangamo
6	Indian Chron -- AM R/S 1680 MHz
7	Indian FAN -- R/S
8	Russian -- A 22 Malahit/RKZ-2
9	Chinese
10	West German -- GRAW M60
11	Pakistani FM R/S 403 MHz
12	Finnish -- Vaisala
13	Japanese -- Code sending
14	Malaysia Asior 403
15	Italian -- Autovox IA/AMT
16	East German -- Freiberg RKS2
17	British -- KFW MK II B
18	Dim Type R.V. 4
19	Omera Decca
20	PIU Swiss Institute
21	MARS 1 K

Accepted Soundings. The number of soundings for which an expanded refractive index profile was computed and a search for ducts and SKLR was conducted.

Accepted Soundings With Surface. Number and percent of soundings for which complete surface data were available.

Accepted Soundings With Signal Level. Ducts are separated into those whose minimum trapping frequency exceeds 10,000 MHz and those with frequency less than 10,000 MHz. Since measurement errors and approximations inherent in the computational procedures are probably responsible for the occurrence of the thin, high frequency ducts, only the ducts with minimum trapping frequency less than 10,000 MHz are included in the statistics.

Accepted Soundings With 1000-mb Winds. Number and percent of soundings which contain both wind speed and direction for the 1000-mb level.

Accepted Soundings With 850-mb Winds. Number of soundings which contain both wind speed and direction for the 850 mb level.

Average Mandatory Levels. Average number of mandatory levels up to the 100 mb level contained within the soundings from the last 2-years data.

Average Significant Levels. Average number of significant levels between the surface (but not including the surface) and the 500-mb level contained within the soundings from the last 2-years data.

Pressure. Median value of the atmospheric pressure in millibars at the surface of the reporting station.

Temperature. Median value of the atmospheric temperature in degrees Celsius at the surface of the reporting station.

Dew Point. Median value of the atmospheric dew point temperature in degrees Celsius at the surface of the reporting station.

NS. Median value of the refractive index at the surface of the reporting station.

NW. Median value of the "wet" component of the refractive index at the surface of the reporting station.

dN/dZ (xx). Median value of the refractive index gradient over the first xx meters above the surface at the reporting station.

Wind Direction (xx). Estimate of the wind direction distributed over a circle at the xx pressure level.

Wind Speed (xx). Median wind speed in knots at the xx pressure level.

Number of Ducts (5 Years). Number of ducts occurring over a 5-year period of the data. There is a separate entry for E, ES, and S ducts.

Number of Soundings With Ducts. Number of soundings containing at least one duct of the type E and a combination of S and ES.

Number of Soundings With SRLRs. Number of soundings containing at least one refractive layer of the type E and a combination of S and ES.

Percent Soundings With Ducts. Percent of soundings with ducts of type E, ES, or S. Statistics are provided for various time intervals and duct occurrences.

Probability ≥ 2 Elevated Ducts. Probability of 2 or more E ducts occurring simultaneously.

Probability S and E Ducts. Probability of S and E duct occurring simultaneously.

Median Maximum Height. Median maximum height in meters of all ducting occurrences.

Coupling Factor. The difference between the M-unit value at the surface and the top of the duct.

Bottom Height. The height in meters from the surface to the bottom of the duct.

Optimum Coupling Height. The height in meters from the surface at which the M-unit gradient becomes just trapping (inflection point).

Top Height. The height in meters from the surface to the top of the duct. For S ducts, this is equivalent to the optimum coupling height.

Thickness. The distance in meters from the bottom to the top of the duct.

Intensity. The difference between the M-unit value at the inflection point in the profile and the top of the duct.

Frequency. Median, standard deviation, and mode of the maximum electromagnetic frequency trapped within the trapping layer.

Average Gradient. Median of the M-unit gradient within the duct.

Delta M. The difference between the M-unit value at the surface (for S ducts) or at the inflection point (for ES and E ducts) and the top of the duct.

Upper Slope. The M-unit gradient over the distance from the inflection point to the top of the duct.

Lower Slope. The M-unit gradient over the distance from the bottom of the duct to the inflection point.

Surface to Inflection Point. The height in meters from the surface to the inflection point in the refractive index profile.

Surface to Bottom. The height in meters from the surface to the bottom of the duct.

Statistics

The mean is the average of the values of the given duct parameter. The standard deviation is the unbiased sample standard deviation of the value of the duct parameter. The CI (mean) gives the width of the 50-percent confidence interval for the mean, assuming that the sample was taken from a normal (Gaussian) distribution. The confidence interval width for the median will, in general, be wider than the confidence interval for the mean, since the median confidence interval is based only on the relative weak assumption of symmetry of the underlying distribution. For the case of wind direction, the 25-and 75-percent confidence interval limits are based upon symmetry about the estimated wind direction for the xx pressure level.

Additional Considerations

- a. Where monthly variables are found in groups of 13, the order of the data is for January through December and annual total.
- b. Where monthly numbers and percentages appear in groups of 7818 values, the order is
 1. number then percentage, alternating for months January through December and annual total.
 2. same as (1) above but for time period 0000 GMT only
 3. same as (1) above but for time period 1200 GMT only
- c. Where groups of 3818 values are given for medians and confidence intervals, the order is
 1. the lower confidence intervals for January through December and annual totals.
 2. the medians for 12 months and annual totals
 3. the upper confidence intervals for 12 months and annual totals.

SECTION 3

DUCT63 DATABASE DESCRIPTION

General

The National Climatic Data Center, Asheville, North Carolina, under contract from the Naval Ocean Systems Center (NOSC), produced a subset analysis of its Standard Tape Deck Family 11 (STD-11) database. The STD-11 database consists of over 150 years of worldwide surface meteorological observations. These observations were assembled from ship logs, ship weather reporting forms, published ship observations, automatic buoys, teletype reports, and card decks purchased from foreign meteorological services.

The subset analysis, known as the DUCT63, covers 293 Marsden squares and spans 15 years of surface observations. A Marsden square is a region of the earth's surface defined by a grid of 10 degrees latitude by 10 degrees longitude and is assigned a unique identification number. Figure 5 shows the location and the numerical assignment of all Marsden squares. For example, Marsden square 1 is defined as the region bounded by the prime meridian to 10 degrees west longitude and from the equator to 10 degrees north latitude. Not all of the 648 possible Marsden squares are included in the DUCT63 analysis for two reasons. First, the analysis is specifically concerned with the maritime environment. Marsden squares not containing a region of ocean are excluded from the data. Second, a requirement of at least 100 valid observations per month was imposed to reduce the effects of any spurious meteorological measurements on the distributions.

Figure 5 shows the location of the Marsden squares contained within the DUCT63 analysis as the region enclosed by the heavy border.

DUCT63 Database Elements

The DUCT63 analysis contains distributions of meteorological quantities and surface-to-surface attenuation rates for frequencies of 35 and 94 GHz. These distributions are expressed as either a probability or a percentage of time that the quantity is observed within a specified range. The distributions include diurnal effects where day categories imply a positive solar angle within the Marsden square at the time of the meteorological observation. Night categories are times of observation between one hour after the local sunset and one hour before the local sunrise. Observations taken in the interval between the day and night categories are excluded from the data set.

There are two forms of distributions: a probability (or percent of time) distribution for a specific quantity (i.e., wind speed) and a joint probability distribution of two quantities. The latter form, also called a cross distribution, is specifically designed for use by NOSC in its research efforts.

The following quantities are distributed within the DUCT63 analysis and appear within the data in the order listed. Appendix D contains a complete listing of the data for Marsden square number 85.

1. Paulus evaporation duct height (meters).
2. Paulus evaporation duct height crossed with Jeske duct height.
3. Wind speed (meters per second).
4. Absolute humidity (grams per cubic meter).

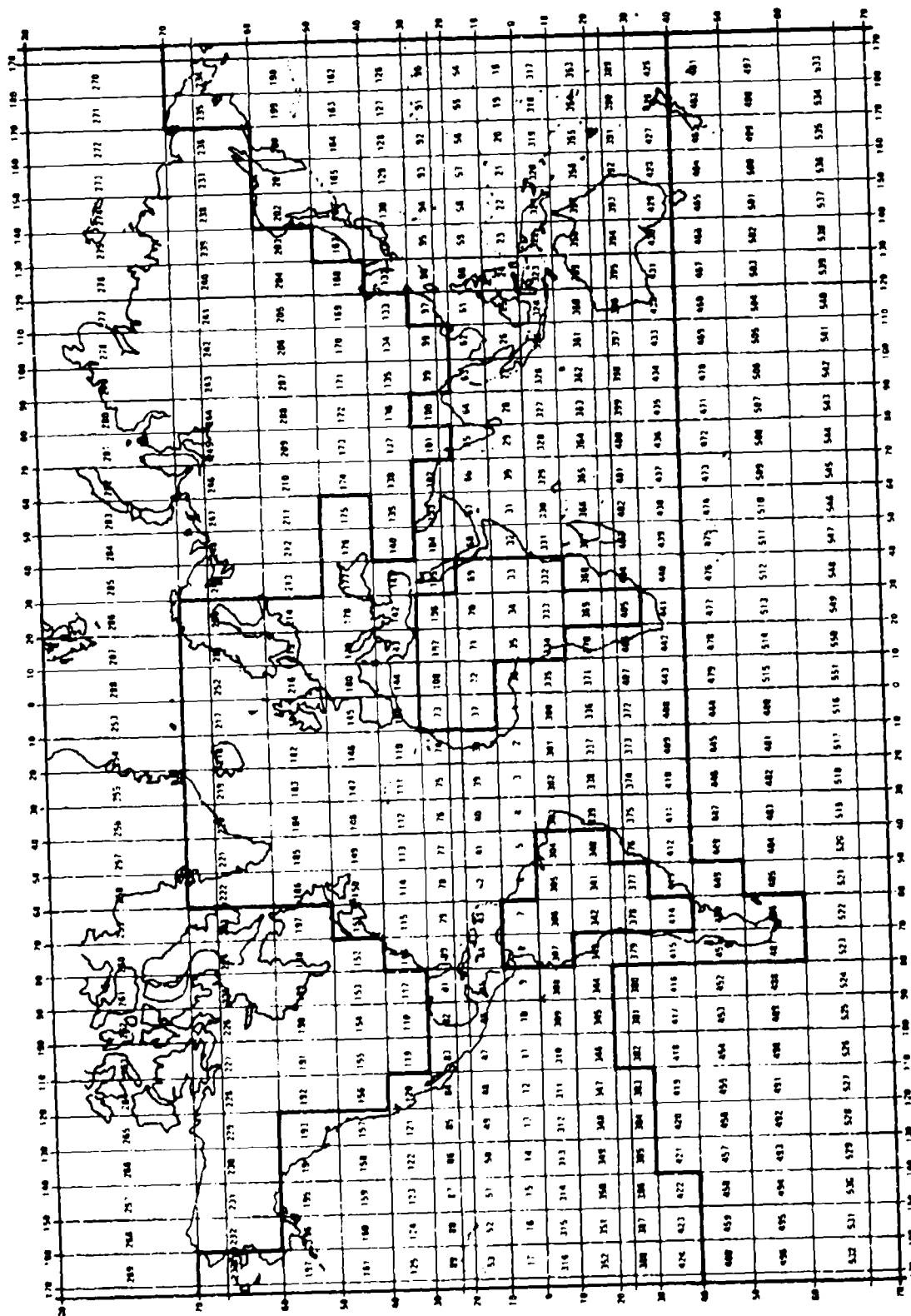


Figure 5. Marsden square numbering system for the world.

5. Modified air-sea temperature difference (deg C).
6. Rain rate (scaled millimeters per hour).
7. Attenuation rate (Gaseous) at 35 GHz (scaled dB/km).
8. Attenuation rate (Gaseous) at 94 GHz (scaled dB/km).
9. Attenuation rate (total) at 35 GHz (scaled dB/km).
10. Attenuation rate (total) at 94 GHz (scaled dB/km).
11. Paulus evaporation duct height crossed with wind speed.

Each Marsden square's data are contained within a record of 55242 bytes and formatted in ASCII code.

Each record is headed with two lines of identification data. The first line contains the Marsden square number, the mean sub square (M SUB SQ) and the period of record (POR). Marsden squares are subdivided into 1 degree sub squares and this M SUB SQ shows the mean location of all of the observations within the analysis for this square. The POR is expressed as QQRR-SSTT where QQ is the starting year, RR is the starting month, SS is the ending year and TT is the ending month. Generally, the POR is 7001-8412 indicating that the data is comprised of observations taken between January 1970 and December 1984.

The second line contains the number of records examined for the analysis, the number of records accepted as valid, the number of records which failed the quality control checks and the number of records which failed the time constraints.

Each subsequent line of data is preceded by a 10 character identification field and terminated with a 6 character card number. The format of the identification field is MSQMMDNTTT where MSQ is the Marsden square, MM is the month, DN is the day or night (1 for day, 2 for night) and TTT is the type of data. These data types are 1 for Paulus evaporation duct height, D12 for Paulus evaporation duct height crossed with Jeske duct height, W for wind speed, A for absolute humidity, M for modified air-sea temperature difference, r for rain rate, s for gaseous attenuation rate at 35 GHz, t for gaseous attenuation rate at 94 GHz, u for total attenuation rate at 35 GHz, v for total attenuation rate at 94 GHz, and M11 for Paulus evaporation duct height crossed with wind speed. For the cross distributions, the MM does not represent the month but rather, represents an index field of the cross distribution.

Details of the specific quantities and distribution characteristics are described in the following paragraphs.

Paulus Evaporation Duct Height. The Paulus formulation of evaporation duct height calculations (reference 3) is a modification to the classical Jeske method (reference 4). The major difference in the approaches is that the Paulus technique attempts to account for inaccuracies in air temperature observations which are caused by thermal influence of the ship.

The data are in month order subdivided by day and night. An observational set is divided into 27 sections (section number followed by data value). Sections 1 through 22 are the number of observations of evaporation duct height from 0 to 40 meters in 2 meter intervals with two additional categories: duct heights greater than 40 meters and duct heights that are not calculable (undefined). Sections 23 through 26 consists of the mean, first, second, and third quartile heights respectively, and section 27 is the total number of observations during the period.

Paulus Evaporation Duct Height Crossed with Jeske Duct Height. The joint probability of a duct height computed by the Paulus and Jeske methods is represented by a 22 by 22 matrix where the 22 data line pairs and the first 22 integers within each line pair represents height intervals from 0 to 40 meters in 2 meter intervals for both Paulus and Jeske duct heights. The real number and the final integer of each line pair represents the mean value of the quantity and the number of valid observations that the distribution is derived from respectively.

Surface Wind Velocity. An observation set consists of 24 elements, i.e., the number of observations of wind velocity from 0 to 20 meters per second in 1 meter per second intervals; number of observations where winds exceeded 20 meters per second; the mean wind velocity for the period; and the total number of observations during the period.

Absolute Humidity. An observation set consists of 24 elements, i.e., the number of observations of absolute humidity from less than 1 to more than 41 grams per cubic meter (g/m^3) in 2 grams per cubic meter increments; a mean absolute humidity for the period; and the total number of observations during the period.

Modified Air-Sea Temperature Difference. The modified air-sea temperature difference is defined in reference 3. Its purpose for inclusion within the DUCT63 database is to aid NOSC research efforts in the climatological description of evaporation duct heights. An observation set consists of 24 elements, i.e., the number of observations of modified air-sea temperature difference from less than -10 to greater than +10 degrees Celsius in 1 degree increments; a mean modified air-sea temperature difference for the period; and the total number of observations during the period.

Rain Rate. Rain rate is not a directly reported quantity in the STD-11 database. Rather, it is computed from the present weather code by techniques developed by Goroch (reference 5). An observation set consists of 24 elements, i.e., the number of observations of rain rate from less than 1 to greater than 5.01 mm/hr increments; the mean rate for the period; and the total number of observations during the period.

Gaseous Attenuation Rate at 35 GHz. This quantity is derived from observations of air temperature, relative humidity, and visibility. The reported visibility is used to calculate a value of the liquid water content based on the work of Johnson reported by Cook (reference 6). Methods described by Liebe (reference 7) are used to calculate the attenuation rate. Since the meteorological data is surface data, the attenuation rate is valid only for surface-to-surface propagation. It is not applicable for use with slant paths. An observation set consists of 24 elements, i.e., the number of observations of from less than 0.001 to greater than 5.01 dB/km in 0.025 dB/km increments; the mean gaseous attenuation rate for the period; and the total number of observations during the period.

Gaseous Attenuation Rate at 94 GHz. The description above applies to the gaseous attenuation rate of 94 GHz with two exceptions. First the frequency is 94 GHz and second, the observations range from less than 1 dB/km to greater than 5.01 dB/km in 0.25 dB/km increments.

Total Attenuation at 35 GHz. The major difference between the attenuation rate described for this quantity and the attenuation rate described in section 3 is that the total attenuation includes the effects of rain rate from section 3. The contributions from rain rate are modeled after the work of Falcone (reference 8). The data format is the same as for the 35 GHz gaseous attenuation rate.

Total Attenuation at 94 GHz. The comments of the preceding section are directly applicable for the total attenuation rate at 94 GHz. Again, it should be stressed that the meteorological data are observed at the surface and the attenuation rates described are strictly applicable to the surface-to-surface path. That is, the data are not applicable to a slant path.

Paulus Duct Height Crossed with Wind Speed. The Paulus duct height crossed with wind speed is designed primarily for use by NOSC in the determination of evaporation ducting. The format of the data is identical to that as described within section 3 except the integers within each line pair represents wind velocities from 0 to 22 meters per second in 1 meter per second intervals.

SECTION 4

HISTORICAL PROPAGATION CONDITION DATABASE CONSTRUCTION

HEPC Radiosonde Observations

By using the technique as described below, construction of the radiosonde based portion of the database is achieved.

The following data (for an individual radiosonde station) are read from the GTE/Sylvania Radiosonde Long A tape:

Name	Description	data type
GNSBD	N-gradient first 100 meters	median, monthly
GNSTD	N-gradient first 1000 meters	" "
PEL00	% occur elevated duct 00Z	" "
PEL12	% occur elevated duct 12Z	" "
PES00	% occur elev-sfc duct 00Z	" "
PES12	% occur elev-sfc duct 12Z	" "
PSB00	% occur sfc-base duct 00Z	" "
PSB12	% occur sfc-base duct 12Z	" "
AAG	annual average gradient for elevated-surface and surface ducts in layer	average, annual
OHEL	elev duct optm coupling hgt	median, monthly
MTEL	elev duct median thickness	" "
MDEL	elev duct M-unit deficit	" "
GMEL	elev duct M-unit gradient	" "
MFEL	elev duct trapping freq	" "
MTES	elev-sfc duct thickness	" "
MDES	elev-sfc duct M-unit deficit	" "
MFES	elev-sfc duct trapping freq	" "
MTSB	sfc-base duct thickness	" "
MDSB	sfc-base duct M-unit deficit	" "
MFSB	sfc-base duct trapping freq	" "
P2EL	probability >1 elevated duct	probability "
PSBEL	probability sfc & elev duct	" "
ACC00	number accepted soundings 00Z	number "
ACC12	number accepted soundings 12Z	" "
NS	median surface N-units	median "
SLEV	station elevation (meters)	

All N-unit gradients are converted to M-unit gradients with the following convention:

$$\text{GMSBD} = \text{GNSBD} + 156 \quad (\text{M} / \text{Km}) \quad (100 \text{ meter gradient})$$

$$\text{GMSTD} = \text{GNSTD} + 156 \quad (\text{M} / \text{Km}) \quad (1000 \text{ meter gradient})$$

$$\text{TAG} = (\text{AAG} + 156) / 1000 \quad (\text{M} / \text{Km})$$

Figure 6 illustrates the relationships of the above terms.

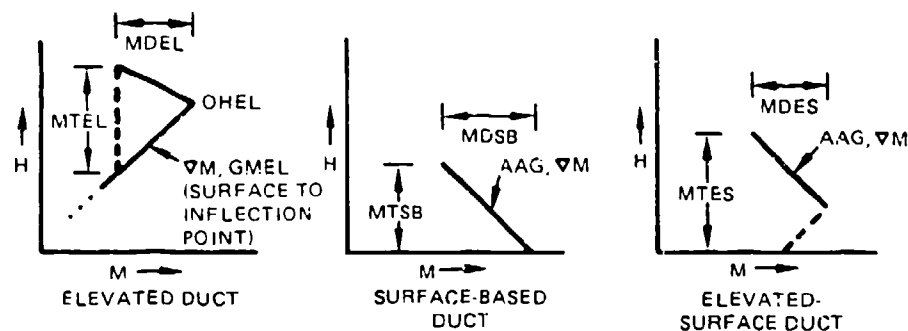


Figure 6. Variable definitions as used in elevated, surface-based and elevated-surface ducts.

The elevated-surface and the surface-based duct data is combined to produce a surface-based duct with a positive lower gradient. This is accomplished by using a weighted average of the duct thickness, M-unit deficit and the trapping frequency as described below:

$$\# \text{ elev-sfc duct } \text{ESN} = (\text{PES00} * \text{ACC00}) + (\text{PES12} * \text{ACC12})$$

$$\# \text{ sfc-based duct } \text{SBN} = (\text{PSB00} * \text{ACC00}) + (\text{PSB12} * \text{ACC12})$$

$$\# \text{ soundings with ducts } \text{TWD} = \text{ESN} + \text{SBN}$$

$$\text{weighted thickness } \text{THK} = (\text{ESN} * \text{MTES} + \text{SBN} * \text{MTSB}) / \text{TWD}$$

$$\text{weighted M deficit } \text{DM} = -(\text{ESN} * \text{MDES} + \text{SBN} * \text{MDSB}) / \text{TWD}$$

$$\text{weighted trap freq } \text{TTF} = (\text{ESN} * \text{MFES} + \text{SBN} * \text{MFSB}) / \text{TWD}$$

The optimum coupling height for surface ducts is computed as follows, insuring that a surface-based duct is formed from the statistics.

$$\text{optimum height } \text{OHSB} = \text{THK} - \text{DM}/\text{TAG}$$

$$\text{if } \text{OHSB} < 0, \text{ then } \text{OHSB} = \text{THK} / 2$$

A surface-based duct M-unit deficit is computed as follows

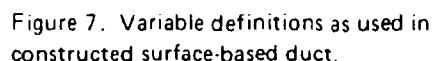
$$\text{surface M deficit } \text{SMD} = \text{OHSB} * (\text{GMSBD}/1000) + \text{DM}$$

If SMD is greater than zero, the weighted M deficit (DM) is recomputed such that the surface deficit is 4 M-units. Setting the surface deficit to 4 M-units is a purely subjective decision. A surface-based duct must be created

$$\text{weighted M deficit } \text{DM} = -(4 + \text{SMD} - \text{DM})$$

Figure 7 illustrates the relationships of the weighted and adjusted statistical information used to construct a TESS acceptable surface-based duct.

Table 2 illustrates the computed radiosonde database for World Meteorological Organization station 4YN, Fixed Ship, North Pacific Ocean.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
SELV	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC daytime	116	115	129	117	132	118	75	107	106	95	108	106	1324
ACC nighttime	120	112	127	107	133	120	81	108	100	95	107	97	1307
NS	343	337	337	336	341	348	351	356	359	353	341	343	345
GMSTD	107	109	112	111	109	105	105	98	102	104	108	107	107
GMSBD	85	89	92	71	97	97	94	72	85	89	84	100	90
OHSB	32	26	17	41	80	24	106	86	110	92	82	43	56
THK	89	89	88	83	133	114	144	129	137	121	125	58	98
DM	4	4	5	7	11	6	14	10	13	12	10	8	9
MFSB	730	960	746	577	575	1087	673	815	962	1014	692	3483	751
PSB daytime	19	27	18	29	11	9	16	30	25	22	12	9	19
PSB nighttime	5	3	7	9	2	1	1	3	1	3	3	0	3
GMEL	118	122	119	119	116	115	111	112	117	114	121	120	117
OHEL	1286	1522	1561	1552	1522	1185	1515	1551	1572	1544	1542	1401	1498
MTEL	180	173	172	172	168	203	210	220	171	181	215	177	186
MDEL	7	7	8	8	7	8	10	10	6	5	12	7	8
MFEL	206	186	201	205	197	151	133	119	212	216	121	194	175
PEL daytime	42	37	36	46	48	60	56	51	52	47	55	40	47
PEL nighttime	56	53	61	71	66	65	64	70	71	75	67	71	66
P2EL	466	264	234	134	264	714	705	512	874	632	279	443	445
PSBEL	339	264	195	848	226	294	641	791	388	368	186	99	376

Name	Description	data type
NHOD	number height observations, day	height, monthly
NHON	number height observations, night	height, monthly
TAOD	total accepted observations, ducts	monthly
MSWV	surface wind velocity	mean, monthly
NAOW	total accepted observations, wind	monthly

- b. The percent occurrence of evaporation ducts is given by

$$\text{POED (day)} = \text{NHOD} / \text{TAOD}$$

$$\text{POED (night)} = \text{NHON} / \text{TAOD}$$

- c. The mean surface wind velocity is transferred to the database without processing.

- d. If the total number of accepted observations is less than 10 for the evaporation duct height or the surface wind velocity, a -1. (indicating an error) is substituted for the calculated value.

Tables 3 and 4 illustrate the computed surface observation database (day and night respectively) for Marsden square 85.

Table 3. Computed values for variables within the HEPC surface observation database, Marsden square 85 (daytime).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00-02 meters	3.1	2.4	2.2	1.7	2.3	2.8	3.2	3.6	1.9	2.2	1.8	1.8
02-04 meters	1.8	1.8	1.8	.8	1.5	2.7	1.9	1.9	1.3	.7	1.2	1.6
04-06 meters	5.2	4.6	2.9	2.7	2.7	4.9	5.6	3.9	3.6	2.0	3.1	3.4
06-08 meters	7.6	7.6	6.3	4.7	5.9	7.6	7.6	7.2	5.7	5.4	4.3	7.0
08-10 meters	11.0	12.2	11.0	9.6	10.2	11.4	12.4	10.8	9.8	8.9	8.1	10.3
10-12 meters	14.5	15.6	14.9	12.8	17.6	16.8	19.2	15.3	13.3	12.7	12.6	13.7
12-14 meters	16.6	16.1	17.4	15.8	18.3	19.0	18.4	17.6	17.0	16.0	15.4	15.0
14-16 meters	13.7	13.4	13.8	15.1	15.8	13.6	14.7	16.6	16.4	16.3	16.1	14.5
16-18 meters	11.5	10.4	12.7	14.8	11.6	11.1	8.5	11.4	12.9	12.2	12.5	12.1
18-20 meters	7.2	6.9	7.8	10.6	7.4	5.5	4.4	5.6	7.8	10.3	10.9	8.9
20-22 meters	4.4	4.5	5.2	6.5	4.1	2.5	2.4	3.6	4.7	7.1	7.0	5.6
22-24 meters	1.9	2.5	2.3	2.9	1.7	1.2	1.1	1.6	3.1	3.0	3.8	3.4
24-26 meters	.8	1.0	1.3	.9	.6	.4	.3	.6	1.4	1.4	1.3	1.7
26-28 meters	.4	.5	.4	.5	.2	.2	.1	.1	.5	1.0	1.0	.8
28-30 meters	.2	.2	.2	.3	.2	.1	.1	.1	.3	.4	.5	.1
30-32 meters	.0	.2	.0	.2	.1	.0	.0	.0	.1	.1	.2	.1
32-34 meters	.0	.0	.0	.0	.0	.0	0	.0	.1	.1	.0	.1
34-36 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36-38 meters	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0
38-40 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
> 40 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
mean height	12.7	12.9	13.3	14.2	13.1	12.2	11.9	12.6	13.7	14.3	14.4	13.7
# of soundings	2278	2218	2397	2555	2480	2405	2355	2190	2074	2534	2391	2244
wind (m/sec)	6.8	6.7	6.7	7.2	6.8	6.6	6.6	6.2	6.1	6.1	6.6	7.0

Table 4. Computed values for variables within the HEPC surface observation database,
Marsden square 85 (nighttime).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
00-02 meters	2.1	1.9	1.1	.9	1.0	1.3	2.1	2.3	1.2	1.0	.6	1.2
02-04 meters	2.8	3.5	2.6	2.5	2.5	3.2	5.0	3.4	3.3	1.7	2.2	2.2
04-06 meters	6.0	6.2	6.2	4.6	5.0	7.3	6.4	6.3	7.4	4.9	4.8	4.5
06-08 meters	12.3	11.8	10.8	9.1	11.1	12.7	14.6	11.8	9.0	10.5	8.2	8.5
08-10 meters	15.2	17.4	15.3	14.1	17.4	19.3	21.0	19.2	16.0	12.6	11.6	15.5
10-12 meters	17.2	17.0	17.5	17.7	23.0	22.1	20.8	18.5	19.6	16.8	17.5	17.2
12-14 meters	15.5	14.5	16.7	18.4	17.0	16.8	16.4	18.3	14.8	17.5	17.5	16.6
14-16 meters	13.2	12.9	13.2	14.8	11.7	10.4	7.4	11.1	12.8	15.3	15.9	13.1
16-18 meters	7.2	7.1	9.0	10.2	6.3	3.8	4.0	5.1	8.4	10.2	11.0	9.2
18-20 meters	4.9	4.3	4.6	4.9	3.4	1.9	1.4	2.5	3.8	4.6	5.8	6.6
20-22 meters	2.0	2.1	1.8	1.9	.9	.9	.6	1.0	2.4	2.8	2.4	3.3
22-24 meters	.8	.7	.6	.7	.3	.2	.3	.2	.8	1.6	1.6	1.3
24-26 meters	.4	.5	.5	.2	.2	.1	.2	.2	.1	.4	.5	.5
26-28 meters	.2	.1	.1	.2	.0	.0	.0	.1	.5	.3	.3	.2
28-30 meters	.0	.1	.1	.0	.0	.0	.0	.0	.0	.1	.1	.1
30-32 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1
32-34 meters	.0	.0	.1	.0	.0	.0	.0	.1	.0	.0	.1	.0
34-36 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
36-38 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
38-40 meters	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
> 40 meters	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
mean height	11.4	11.3	11.7	12.0	11.3	10.5	10.1	10.7	11.5	12.3	12.6	12.3
# of soundings	1872	1750	1906	1970	2004	1927	1939	1789	1653	1998	1899	1770
wind (m/sec)	6.5	6.5	6.5	6.8	6.5	6.4	6.3	5.9	5.7	5.7	6.2	6.7

REFERENCES

1. Patterson, W.L., 31 December 1985. Historical Electromagnetic Propagation Condition Summary Function for the Tactical Environmental Support System, Computer Sciences Corporation Technical Report, Contract N66001-83-D-0043 Delivery Order 0103.
2. Ortenburger, L.N., 29 July 1977. Radiosonde Data Analysis II, GTE/Sylvania Incorporated, Contract MDA-904-76-C-0233.
3. Paulus, R.A., 29 June 1984. Practical Application of the IREPS Evaporation Duct Model, NOSC Technical Report 966.
4. Jeske, H., February 1971. "The State of Radar Range Prediction Over Sea," Tropospheric Radio Wave Propagation - Part II, NATO-AGARD.
5. Gorooh, A.K., May 1984. Rain Rate Climatologies Over Maritime Regions, Naval Environmental Research Prediction Facility Technical Report 84-04.
6. Cook, J., Private Communication.
7. Liebe, H.J., Nov-Dec 1981. Modeling Attenuation and Phase of Radio Waves in Air at Frequencies Below 1000 GHz, Radio Science, Vol 16, No 6.
8. Falcone, V.J., 15 October 1979. Atmospheric Attenuation of Millimeter and Sub-millimeter Waves: Models and Computer Code, AFGL-TR-79-0253.

APPENDIX A

Format	Layer	Variable	Type	Statistic	Time
2A4		Station Number			
11A4		Station Name and CI indicator			
I4		Record Sequence Number (1 or 2)			
I8		Latitude (hundredths of degrees)			
I8		Longitude (hundredths of degrees)			
I8		Elevation (meters)			
I8		Local time (hundredths of hours)			
I8		Local time (hundredths of hours)			
I8		Station elevation reliability			
I8		Most common instrument type			002
I8		Percent of time used			122
I8		2nd most common instrument type			
I8		Percent of time used			
78I8		Accepted soundings	monthly	###	all; 00; 12
78I8		Accepted soundings with surface	monthly	###	all; 00; 12
78I8		Accepted soundings with signal level	monthly	###	all; 00; 12
13I8		Accepted soundings with 100mb winds	monthly		
13I8		Accepted soundings with 850mb winds	monthly		
13I8		Average mandatory levels	monthly		
13I8		Average significant levels	monthly		
39I8		Pressure (millibars)	monthly	LCI; med; UCI	all
39I8		Temperature (Celsius)	monthly	LCI; med; UCI	all
39I8		Dew point (Celsius)	monthly	LCI; med; UCI	all
NS			monthly	LCI; med; UCI	all
NW			monthly	LCI; med; UCI	all
No			monthly	LCI; med; UCI	all
del N { 50 }		(N units km)	monthly	LCI; med; UCI	all
del N { 100 }		(N units km)	monthly	LCI; med; UCI	all
del N { 500 }		(N units km)	monthly	LCI; med; UCI	all
del N { 1000 }		(N units km)	monthly	LCI; med; UCI	all
Wind direction { 1000 mb }		(knots)	monthly	LCI; med; UCI	all
Wind direction { 850 mb }		(knots)	monthly	LCI; med; UCI	all
Wind speed { 1000 mb }		(knots)	monthly	LCI; med; UCI	all
Wind speed { 850 mb }		(knots)	monthly	LCI; med; UCI	all
Number of ducts { 5 years }			monthly	LCI; med; UCI	all
Number of ducts { 5 years }			monthly	LCI; med; UCI	all
Number of soundings with ducts			monthly	LCI; med; UCI	all
Number of soundings with ducts			monthly	LCI; med; UCI	all
Number of soundings with SPUR's			monthly	LCI; med; UCI	all
Number of soundings with SPUR's			monthly	LCI; med; UCI	all

Sylvania Long-A tape format Record 1

Format	Layer	Variable	Type	Statistic	Time
2A4		Station Number			
11A4		Record Name and CI indicator			
I4		Record Sequence Number (1 or 2)			
39I8	all	soundings with ducts	monthly	LCI; med; UCI	all
13I8	all	soundings with ducts	monthly	LCI; % % %	002
39I8	E	soundings with ducts	monthly	LCI; med; UCI	122
13I8	E	soundings with ducts	monthly	LCI; % % %	all
39I8	E	soundings with ducts	monthly	LCI; med; UCI	002
13I8	E	soundings with ducts	monthly	LCI; % % %	122
39I8	ES	soundings with ducts	monthly	LCI; med; UCI	all
13I8	ES	soundings with ducts	monthly	LCI; % % %	002
39I8	S	soundings with ducts	monthly	LCI; med; UCI	122
13I8	S	soundings with ducts	monthly	LCI; % % %	all
13I8	S	soundings with ducts	monthly	LCI; % % %	002
13I8	S	soundings with ducts	monthly	LCI; % % %	122
13I8	ES	Probability (≥ 2 elevated ducts)	monthly	LCI; % % %	all
13I8	E, ES	Probability (S and E ducts)	monthly	LCI; % % %	all
I8		Median maximum height	monthly		
3I8		Coupling factor (duct)	annual	med	
I8		Bottom height (ducts)	annual	LCI; med; UCI	
I8		Bottom height (ducts)	annual	med	
I8		Bottom height (ducts)	annual	x	
I8		Optimum coupling height (ducts)	annual	s	
I8		Optimum coupling height (ducts)	annual	med	
I8		Optimum coupling height (ducts)	annual	x	
I8		Top height (ducts)	annual	s	
I8		Top height (ducts)	annual	med	
I8		Top height (ducts)	annual	x	
I8		Top height (ducts)	annual	s	
I8		Thickness (ducts)	annual	x	
I8		Thickness (ducts)	annual	med	
I8		Thickness (ducts)	annual	x	
I8		Intensity (ducts)	annual	s	
I8		Intensity (ducts)	annual	x	
I8		Intensity (ducts)	annual	med	
I8		Intensity (ducts)	annual	x	
I8		Frequency (ducts)	annual	s	
I8		Frequency (ducts)	annual	med	all
I8		Frequency (ducts)	annual	x	all
I8		Frequency (ducts)	annual	s	all
I8		Average gradient (ducts)	annual	med	
I8		Average gradient (ducts)	annual	x	all
I8		Average gradient (ducts)	annual	s	all

Sylvania Long-A tape format Record 2

APPENDIX B

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
10035	SCHLESWIG, GERMANY	1	54.53	-9.55	216
10184	GREIFSWALD, GERMANY	0	54.10	-13.38	215
10202	EMDEN-WOLHUSEN, GERMANY	0	53.37	-7.22	216
10238	GERGEN/HOFNE, GERMANY	0	52.82	-9.93	216
10307	RHEINE/WALDHÜGEL, WEST GERMANY	0	52.27	-7.43	216
10338	HANNOVER, GERMANY	0	52.47	-9.70	216
10384	BERLIN/TEMPELHOF, GERMANY	0	52.47	-13.40	215
10393	LINDENBERG, GERMANY	0	52.22	-14.12	215
10404	COCH, WEST, GERMANY	0	51.68	-6.17	216
10410	ESSEN, GERMANY	0	51.40	-6.97	216
10486	WAHNSDORF, GERMANY	0	51.12	-13.68	215
10548	MEINTZEN, GERMANY	0	50.55	-10.37	215
10618	IDAR/OBERSTEIN, GERMANY	0	49.70	-7.33	180
10687	GRAFENWOHR, GERMANY	0	50.17	-12.58	215
10739	STUTTGART/CANNSTADT, GERMANY	0	48.83	-9.20	180
10771	CARMERSDORF, GERMANY	0	49.43	-11.90	179
10866	MÜNCHEN/RUEM, GERMANY	0	48.13	-11.72	179
11035	WIEN/HOHE-WARTE, AUSTRIA	0	48.25	-16.37	179
11518	PRAHA/RUZYNNE, CZECHOSLOVAKIA	0	50.10	-14.30	215
11520	LITUB, CZECHOSLOVAKIA	0	50.00	-14.45	215
11934	POBRAD/TATRY, CZECHOSLOVAKIA	0	49.07	-20.25	178
12105	KOSZALIN, POLAND	1	54.20	-16.20	215
12120	LEBA, POLAND	1	54.75	-17.53	215
12330	POZNAN, POLAND	0	52.42	-16.83	215
12374	LEGIONOWO, POLAND	0	52.40	-20.97	214
12425	WROCLAW I, POLAND	0	51.13	-16.98	215
12843	BUDAPEST-LORINC, HUNGARY	0	47.43	-19.18	179
12982	SZEBED, HUNGARY	0	46.25	-20.10	178
13130	ZAGREB/MAKSIMIR, YUGOSLAVIA	0	45.82	-16.03	179
13275	BELGRADE/ZELENO, YUGOSLAVIA	0	44.78	-20.53	178
13276	BEOGRAD/ZELENO BRDO, YUGOSLAVIA	0	44.80	-20.50	178
15120	CLUJ, ROMANIA	0	46.78	-23.57	178
15420	BUCURESTI/BANEASA, ROMANIA	0	44.50	-26.13	178
15480	CONSTANTA C, ROMANIA	1	44.22	-28.63	178
15614	SOFIA (OBSERV.), BULGARIA	0	42.82	-23.38	178
15730	KURDJALI, BULGARIA	0	41.63	-25.40	178
16044	UDINE/CAMPORMIDO, ITALY	0	46.03	-13.18	179
16080	MILANO/LINATE, ITALY	0	45.43	-9.28	180
16242	ROMA/FIUMICINO, ITALY	1	41.80	-12.23	179
16320	BRINDISI, ITALY	1	40.65	-17.95	179
16420	MESSINA, ITALY	1	38.20	-15.60	143
16560	CAGLIARI/ELMAS, ITALY	1	39.25	-9.05	144
16596	QRENDI, MALTA	1	35.83	-14.43	143
16622	THESSALONIKI/MIKRA, GREECE	1	40.52	-22.97	178
16716	ATHINAI/HELLINIKON, GREECE	1	37.90	-23.73	142
16754	HERAKLION CRETE, GREECE	1	35.33	-25.18	142
17030	SAMSUN, TURKEY	1	41.28	-36.33	177
17062	ISTANBUL/GOZTEPE, TURKEY	1	40.97	-29.08	178
17130	ANKARA/CENTRAL, TURKEY	0	39.95	-32.88	141

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
17220	IZMIR, TURKEY	1	38.43	-27.17	142
17240	ISPARTA, TURKEY	0	37.75	-30.55	141
17280	DIYARBAKIR, TURKEY	0	37.88	-40.20	140
17603	EPISKOFI, CYPRUS	1	34.68	-32.82	141
17606	NICOSIA AIRFIELD, CYPRUS	1	35.20	-33.30	141
20046	OSTROV HEJSA, U.S.S.R.	1	80.62	-58.05	931
20069	OSTROV VIZE, U.S.S.R.	1	79.50	-76.98	281
20107	BARENCHURG, U.S.S.R.	1	78.07	-14.22	287
20274	OSTROV UEDINENIJA, U.S.S.R.	1	77.50	-82.23	280
20292	MYS CELIUSKIN, U.S.S.R.	1	77.72	-104.28	278
20353	MYS ZEIANIJA, U.S.S.R.	1	76.95	-68.58	282
20667	OSTROV BELJ, U.S.S.R.	1	73.33	-70.03	281
20674	OSTROV DIKSON, U.S.S.R.	1	73.50	-80.23	280
20744	MALYE KARMANULY, U.S.S.R.	1	72.38	-52.73	283
20891	HATANGA, U.S.S.R.	0	71.98	-102.47	278
21358	OSTROV ZHOVA, U.S.S.R.	1	71.58	-128.92	276
21358	OSTROV KOTEL'NYJ, U.S.S.R.	1	76.15	-152.83	273
21432	OSTROV PREOBRAZENIJA, U.S.S.R.	1	76.00	-137.90	275
21504	MYS SALAUROVA, U.S.S.R.	1	74.67	-112.93	277
21647	BUHJA TIKSI, U.S.S.R.	1	73.18	-143.93	274
21824	OKURDAH, U.S.S.R.	0	71.58	-128.92	276
21946	OSTROV CETYREHSTOLBOVOJ, U.S.S.R.	1	70.62	-147.88	274
21965	OSTROV VRANGELJA, U.S.S.R.	1	70.63	-162.40	272
21982	MURMANSK, U.S.S.R.	1	70.97	-178.53	270
22113	KANDALAKSA, U.S.S.R.	0	68.97	-33.05	249
22217	SOJNA, U.S.S.R.	0	67.13	-32.43	249
22271	KEM'-PORT, U.S.S.R.	0	64.98	-44.13	248
22522	ARKHANGELSK, U.S.S.R.	0	64.58	-34.78	249
22550	SORTOVALA, U.S.S.R.	0	61.82	-40.50	248
22802	PEITROZAVODSK, U.S.S.R.	1	61.72	-30.72	249
22820	KARGOOL, U.S.S.R.	0	61.50	-34.27	249
22845	ANDERVA, U.S.S.R.	0	69.77	-38.93	249
23022	NORILSK, U.S.S.R.	1	69.02	-61.68	246
23077	MYS KAMENNYJ, U.S.S.R.	0	69.47	-86.12	244
23146	NAR'JAN-MAR, U.S.S.R.	1	67.65	-73.60	245
23205	ICARKA, U.S.S.R.	0	67.47	-53.02	247
23274	SALE-HARD, U.S.S.R.	0	66.53	-86.57	244
23330	PEORA, U.S.S.R.	0	65.12	-66.53	246
23418	TURUKANSK, U.S.S.R.	0	65.78	-57.10	247
23472	TARKO-SALE, U.S.S.R.	0	64.92	-87.95	244
23552	SVETLYKAR, U.S.S.R.	0	61.67	-77.82	245
23804	PODKAMENNAJA TUNGUSKA, U.S.S.R.	0	61.60	-50.85	247
23884	IVDEL, U.S.S.R.	0	60.68	-90.00	243
23921	HANTY-MANSIJSK, U.S.S.R.	0	60.97	-60.43	246
23933	ALEKSANDROVSKOE, U.S.S.R.	0	60.43	-69.07	246
23955	OLENEK, U.S.S.R.	0	68.50	-77.87	245
24125	VERHOJANSK, U.S.S.R.	0	67.55	-112.43	241
24266	ZIGANSK, U.S.S.R.	0	66.77	-133.38	239
24343	TURA, U.S.S.R.	0	64.17	-123.40	240
24507	VILJUSK, U.S.S.R.	0	63.77	-100.07	242
24641	OMTAKON, U.S.S.R.	0	63.27	-121.62	240
24688		0		-143.15	238

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
24726	MIRNY, U.S.S.R.	0	62.55	-114.00	241
24790	SUSMAN, U.S.S.R.	0	62.77	-148.17	238
24817	EROCACEN, U.S.S.R.	0	61.27	-108.02	242
24908	VANAVARA, U.S.S.R.	0	60.33	-102.27	242
24944	OLEKMSK, U.S.S.R.	0	60.40	-120.42	240
24959	JAKUTSK, U.S.S.R.	0	62.08	-129.75	240
25042	AYON, U.S.S.R.	0	69.93	-167.97	236
25123	CERSKIJ, U.S.S.R.	0	68.80	-161.28	236
25173	MYS SMIDTA, U.S.S.R.	1	68.92	179.48	234
25399	MYS UZLEN, U.S.S.R.	1	66.17	169.83	233
25400	ZVRJANKA, U.S.S.R.	0	65.73	-150.90	237
25428	SHERBAKOV, U.S.S.R.	0	65.22	-160.57	236
25551	MARKOVO, U.S.S.R.	0	64.68	-170.42	235
25563	ANADIR, U.S.S.R.	1	64.78	-177.57	235
25594	BUHTA PROVIDENIJA, U.S.S.R.	1	64.43	173.23	234
25677	BUHTA UGOINAJA, U.S.S.R.	1	63.05	179.32	235
25703	SEJMCAN, U.S.S.R.	0	62.92	-152.42	237
25822	EVENSK, U.S.S.R.	0	61.85	-160.57	236
25913	NAGAEVO, U.S.S.R.	1	59.58	-150.78	201
25954	KORF, U.S.S.R.	1	60.35	-166.00	236
26038	TALLIN, U.S.S.R.	1	59.42	-24.80	214
26063	LENINGRAD (TOWN), U.S.S.R.	1	59.97	-30.30	213
26258	PSKOV, U.S.S.R.	0	57.83	-28.35	214
26298	BOLGOE, U.S.S.R.	0	57.90	-34.05	213
26406	LIEPAJA, U.S.S.R.	1	56.55	-21.02	214
26422	RIGA, U.S.S.R.	1	56.97	-24.07	214
26477	VELIKIE LUKI, U.S.S.R.	0	56.38	-30.60	213
26629	KAINAS, U.S.S.R.	0	54.88	-23.88	214
26702	KALININGRAD, U.S.S.R.	1	54.70	-20.62	214
26781	SMOLENSK, U.S.S.R.	0	54.75	-32.07	213
26850	MINSK, U.S.S.R.	0	53.87	-27.53	214
27037	VOLOGDA, U.S.S.R.	0	59.28	-39.87	213
27196	KIROV, U.S.S.R.	0	58.65	-49.62	212
27553	GORKIJ, U.S.S.R.	0	56.22	-43.82	212
27595	KAZAN, U.S.S.R.	0	55.78	-49.18	212
27612	MOSKVA, U.S.S.R.	0	55.75	-37.57	213
27707	SHINGI, U.S.S.R.	0	54.12	-35.33	213
27731	RUZAN, U.S.S.R.	0	54.62	-39.72	213
27947	TAMBOV, U.S.S.R.	0	52.73	-41.47	212
27962	PENZA, U.S.S.R.	0	53.13	-45.02	212
28225	PERM, U.S.S.R.	0	58.02	-56.30	211
28275	TOBOLSK, U.S.S.R.	0	58.15	-68.18	210
28440	SVERDLOVSK, U.S.S.R.	0	56.80	-60.63	210
28661	KURGAN, U.S.S.R.	0	55.47	-65.40	210
28698	OMSK, U.S.S.R.	0	54.93	-73.40	209
28722	UFA, U.S.S.R.	0	54.75	-56.00	211
28900	KUBYSEV (BEZENOUK), U.S.S.R.	0	53.25	-50.45	211
28952	KUSTANAJ, U.S.S.R.	0	53.22	-63.62	210
29231	KOLPASEV, U.S.S.R.	0	58.30	-82.90	208
29263	ENISEJSK, U.S.S.R.	0	58.45	-92.15	207
29282	BOGUCANY, U.S.S.R.	0	58.42	-97.40	207

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
29574	KRASNOJARSK, U.S.S.R.	0	56.00	-92.88	207
29612	BARABINSK, U.S.S.R.	0	55.37	-78.40	209
29634	NOVOSIBIRSK, U.S.S.R.	0	55.03	-82.90	208
29698	NIZNE-UDINSK, U.S.S.R.	0	54.88	-99.03	207
29838	BARNAUL, U.S.S.R.	0	53.33	-83.70	208
29865	ABAKAN, U.S.S.R.	0	53.72	-91.40	207
30054	VITIM, U.S.S.R.	0	59.45	-112.58	205
30230	KIRENSK, U.S.S.R.	0	57.77	-108.12	206
30309	BRATSK, U.S.S.R.	0	56.07	-101.83	206
30372	CARA, U.S.S.R.	0	56.92	-118.37	205
30521	ZIGALOVO, U.S.S.R.	0	54.80	-105.17	206
30554	TRICKLE, PRIISK, U.S.S.R.	0	54.47	-113.58	205
30635	UST-BARGUZIN, U.S.S.R.	0	53.43	-108.98	206
30636	BARGUZIN, U.S.S.R.	0	53.60	-109.60	206
30673	MOGOC, U.S.S.R.	0	53.73	-119.78	205
30692	SKOVORODINO, U.S.S.R.	0	54.00	-123.97	204
30710	IRKUTSK, U.S.S.R.	0	52.27	-104.35	206
30758	CITA, U.S.S.R.	0	52.02	-113.33	205
30935	KRASNYJ CIKOI, U.S.S.R.	0	50.37	-108.75	206
30965	BORZJA, U.S.S.R.	0	50.38	-116.52	205
31004	ALDAN, U.S.S.R.	0	58.62	-125.37	204
31088	CHOTSK, U.S.S.R.	1	59.37	-143.20	202
31168	AJAN, U.S.S.R.	1	56.45	-138.15	203
31300	ZEJA, U.S.S.R.	0	53.75	-127.23	204
31329	EKIMCAN, U.S.S.R.	0	53.07	-132.93	203
31369	NIKOLAEVSK-NA-AMURE, U.S.S.R.	0	50.27	-140.70	202
31510	BLAGOVESHCHENSK, U.S.S.R.	0	50.17	-127.50	204
31538	SLUTSK, U.S.S.R.	0	50.07	-132.13	203
31561	KONSOVOL'SK-NA-AMUR', U.S.S.R.	0	50.60	-137.08	203
31707	EXATERINO-NIKOLSKOE, U.S.S.R.	0	47.73	-130.97	167
31735	HARBAROVSK, U.S.S.R.	0	48.52	-135.17	167
31770	SOVETSKAYA GAIAN, U.S.S.R.	1	49.00	-140.27	166
31873	TMAN, U.S.S.R.	0	45.87	-133.73	167
31909	TERNEJ, U.S.S.R.	1	45.03	-136.67	167
31960	VLADIVOSTOK, U.S.S.R.	1	43.12	-131.90	167
32061	ALEKSANDROVSK SAHALINSKI, U.S.S.R.	1	50.90	-142.17	202
32098	PORONAJSK, U.S.S.R.	1	49.22	-143.10	166
32099	N. TERPENIYA, U.S.S.R.	1	48.90	-144.60	166
32150	JUZNO-SAHALINSK, U.S.S.R.	1	46.92	-142.73	166
32165	JUZNO-KURILSK, U.S.S.R.	1	44.02	-145.82	166
32186	URUP, U.S.S.R.	1	46.20	-150.50	165
32217	MYS VASILEVA, U.S.S.R.	1	50.00	-155.38	201
32389	KLUJCI, U.S.S.R.	1	56.32	-160.83	200
32477	SOBOLEVO, U.S.S.R.	1	54.30	-155.97	201
32540	PETROPVLOVSK-KAMCATSKIJ, U.S.S.R.	1	52.97	-158.75	201
32618	OSTROV BERINGA, U.S.S.R.	1	55.20	-165.98	200
33008	BREST, U.S.S.R.	0	52.12	-23.68	214
33036	MOZVR, U.S.S.R.	0	52.00	-29.20	214
33041	GOMEL, U.S.S.R.	0	52.45	-31.00	213
33317	SEPETOVKA, U.S.S.R.	0	50.17	-27.05	214
33345	KIEV, U.S.S.R.	0	50.40	-30.45	213

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
33393	LMOV, U.S.S.R.	0	49.82	-23.95	178
33631	UZGOROD, U.S.S.R.	0	48.63	-22.27	178
33658	CERNOVCA, U.S.S.R.	0	48.27	-25.97	178
33791	KRIVOJ ROG, U.S.S.R.	0	47.93	-33.33	177
33815	KISINEV, U.S.S.R.	0	47.02	-28.87	178
33837	ODESSA, U.S.S.R.	1	46.48	-30.63	177
33946	SIMFEROPOL, U.S.S.R.	1	45.02	-33.98	177
34009	KURSK, U.S.S.R.	0	51.65	-36.18	213
34122	VORONEZ, U.S.S.R.	0	51.70	-39.17	213
34172	SARATOV, U.S.S.R.	0	51.57	-46.03	212
34247	KALAC, U.S.S.R.	0	50.42	-41.05	212
34300	PARKOV, U.S.S.R.	0	49.93	-36.28	177
34560	JOLOGRAD, U.S.S.R.	0	48.68	-44.35	176
34731	ROSTOV-NA-DONU, U.S.S.R.	1	47.25	-39.82	177
34858	DIVNOE, U.S.S.R.	0	45.92	-43.35	176
34880	ASTRAHAN, U.S.S.R.	1	46.27	-48.03	176
35108	URALSK, U.S.S.R.	0	51.25	-51.40	211
35121	ORENBURG, U.S.S.R.	0	51.75	-55.10	211
35229	AKTJUBINSK, U.S.S.R.	0	50.28	-57.15	211
35361	AMANGELDY, U.S.S.R.	0	50.13	-65.23	210
35394	KARAGANDA, U.S.S.R.	0	49.80	-73.13	173
35671	DZYZKAZGAN, U.S.S.R.	0	47.80	-67.72	174
35700	GUREV, U.S.S.R.	1	47.02	-51.85	175
35746	ARALSKOE MORE, U.S.S.R.	0	46.78	-61.67	174
35796	BALHAS, U.S.S.R.	0	46.90	-75.00	173
36003	PAVLODAR, U.S.S.R.	0	52.28	-76.95	209
36096	KIZYL, U.S.S.R.	0	51.67	-94.38	207
36177	SEMPALATINSK, U.S.S.R.	0	50.35	-80.25	208
36259	KOSH AGACHI, U.S.S.R.	0	50.00	-88.83	208
36859	PANFILOV, U.S.S.R.	0	44.17	-80.07	172
36870	ALMA-ATA, U.S.S.R.	0	43.23	-76.93	173
36974	NARYN, U.S.S.R.	0	41.43	-76.00	173
37018	TUAPSE, U.S.S.R.	1	44.10	-39.07	177
37054	MINERALNYE VODY, U.S.S.R.	0	44.22	-43.10	176
37260	BAUSERI (SUHMI), U.S.S.R.	1	42.87	-41.13	176
37472	MAHACKALA, U.S.S.R.	0	43.02	-47.43	176
37484	BATUMI, U.S.S.R.	1	41.65	-41.63	176
37549	TBILISI, U.S.S.R.	0	41.68	-44.95	176
37789	EREVAN, U.S.S.R.	0	40.13	-44.47	176
37860	BIAN/BAKU, U.S.S.R.	1	40.65	-49.98	176
37985	LENKORAN, U.S.S.R.	0	38.73	-48.83	140
38062	KZYL-ORDA ZAGORODATA, U.S.S.R.	0	44.77	-65.53	174
38341	DZAMBUL, U.S.S.R.	0	42.85	-71.38	173
38353	FRUNZE, U.S.S.R.	0	42.83	-74.58	173
38392	TASAUZ, U.S.S.R.	0	41.83	-59.98	175
38413	TAMDY, U.S.S.R.	0	41.73	-64.62	174
38457	TASKENT, U.S.S.R.	0	41.27	-69.27	174
38507	KRASNOVODSK, U.S.S.R.	1	40.03	-52.98	175
38613	DZALAL-ABAD, U.S.S.R.	0	40.92	-72.95	173
38687	CARDZOU, U.S.S.R.	0	39.08	-63.60	138
38750	GASAN-KULI, U.S.S.R.	1	37.47	-53.97	139

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
38836	DUSANBE, U.S.S.R.	0	38.58	-68.78	138
38880	ASHABAD, U.S.S.R.	0	37.97	-58.33	139
38927	TERMEZ, U.S.S.R.	0	37.23	-67.32	138
38954	HOKG, U.S.S.R.	0	37.50	-71.50	137
38989	TAKHTA-BAZAR, U.S.S.R.	0	35.95	-62.90	138
40007	ALFTFO, SYRIA	0	36.12	-37.22	141
40100	BEYROUTH (AEROPORT), LEBANON	1	33.82	-35.48	141
40179	BET LACAN, ISRAEL	1	32.00	-34.82	141
40265	MAFRAQ, JORDAN	0	32.37	-36.27	141
40372	KUWAIT INTERNATIONAL AIRPORT, KUWAIT	1	29.22	-47.98	104
40427	BAHRAIN/MUHARRAQ, PERSIAN GULF	1	26.30	-50.60	103
40438	RIYADH, SAUDI ARABIA	0	24.70	-46.73	104
40477	JEDDAH, SAUDI ARABIA	1	21.50	-39.20	105
40564	MASIRAH, OTHER TERRITORIES IN ARABIA	1	20.67	-58.90	103
40597	ADEN/KHORMAKSAR, ARABIA-RED SEA	1	13.38	-45.05	68
40608	MOSUL, IRAQ	0	36.30	-43.20	140
40650	BAGHDAD, IRAQ	0	33.23	-44.23	140
40689	PASRAH, IRAQ	0	30.57	-47.78	140
40706	TABRIZ, IRAN	0	38.13	-46.25	140
40745	MASHAD, IRAN	0	36.27	-59.63	139
40754	TEHRAN/MEHRABAD, IRAN	0	35.68	-51.32	139
40800	ESFAHAN, IRAN	0	32.62	-51.67	139
40841	KEHRAN, IRAN	0	30.25	-56.97	139
40848	SHIRAZ, IRAN	0	29.60	-52.53	103
40948	KABUL AIRPORT, AFGHANISTAN	0	34.55	-69.22	138
41350	GAN, MALDIVE ISLANDS, INDIAN OCEAN	1	-68	-73.17	328
41530	PESHAWAR, PAKISTAN	0	34.02	-71.58	137
41780	KARACHI AIRPORT, PAKISTAN	1	24.90	-67.13	102
41917	DACCA/TEJGAON, PAKISTAN	0	23.80	-90.40	99
42027	SRINAGAR, INDIA	0	34.08	-74.83	137
42182	NEW DELHI/SAFDARJUNG, INDIA	0	28.58	-77.20	101
42339	JOHNPUR, INDIA	0	26.30	-73.02	101
42369	LUCKNOW/AMALSI, INDIA	0	26.75	-80.88	100
42410	GAUHATI, INDIA	0	26.10	-91.58	99
42647	AMERABAD, INDIA	0	23.07	-72.63	101
42809	CALCUTTA/CUM DUM, INDIA	0	22.65	-88.45	100
42867	NAGPUR/SONEGAN, INDIA	0	21.10	-79.05	101
42971	BHUBANESWAR, INDIA	0	20.25	-85.83	100
43003	BOMBAY/SANTACRUZ AERODROME, INDIA	1	19.12	-72.85	65
43128	HYDERABAD/BERGAMOT, INDIA	0	17.45	-78.47	65
43149	VISHAKHAPATNAM, INDIA	1	17.72	-83.27	64
43192	COA/PANJIM, INDIA	1	15.48	-73.82	65
43279	MADRAS/MINAMBARKAM, INDIA	1	13.00	-80.18	64
43295	BANGALORE, INDIA	0	12.97	-77.58	65
43333	FORT BLAIR, INDIA	1	11.67	-92.72	63
43353	COCHIN/WILLINGDON, INDIA	1	9.93	-76.23	29
43369	MINICOY, INDIA	0	8.30	-73.00	29
43371	TRIVANDRUM, INDIA	1	8.48	-76.95	29
43466	COLOMBO, CEYLON	1	6.90	-79.87	29
44292	ULAN-BATOR, MONGOLIA	0	47.93	-106.98	170
44354	SAINSHAND, MONGOLIA	0	44.90	-110.12	169

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
44373	DALANZADGAD, MONGOLIA	0	43.58	-104.42	170
45004	KINGS PARK, HONG KONG	1	22.32	-114.17	97
46692	TAIPEI, CHINA (TAIWAN)	1	25.03	-121.52	96
46697	TAOYUAN, CHINA (TAIWAN)	1	25.05	-121.22	96
46734	MAKUNG, CHINA (TAIWAN)	1	23.52	-119.57	97
46747	TUNG KONG, CHINA (TAIWAN)	1	22.47	-120.43	96
46810	PRATAS IS, CHINA (TAIWAN)	1	20.67	-116.72	97
47058	PYONGYANG, KOREA	0	39.02	-125.82	132
47122	OSAN AB, KOREA	0	37.10	-127.03	132
47138	POHANG, KOREA	1	36.03	-129.38	132
47187	MOSULPO AB, KOREA	1	33.20	-126.22	132
47401	WAGKANAI, JAPAN	1	45.42	-141.68	166
47412	SAFFORO, JAPAN	0	43.05	-141.33	166
47420	NEMURO, JAPAN	1	43.33	-145.58	166
47580	MISAWA AB, JAPAN	1	40.68	-141.38	166
47582	AKITA, JAPAN	1	39.72	-140.10	130
47590	SENDAI, JAPAN	1	38.27	-140.90	130
47600	WJIMA, JAPAN	1	37.38	-136.90	131
47646	TATENO, JAPAN	0	36.05	-140.13	130
47678	HACHIJUJIMA, JAPAN	1	33.12	-139.78	131
47681	HAMAMATSU AB, JAPAN	1	34.73	-137.67	131
47744	YONAGO, JAPAN	1	35.43	-133.35	131
47778	SHIONOMISAKI, JAPAN	1	33.45	-135.77	131
47807	FUKUOKA, JAPAN	1	33.58	-130.38	131
47827	KAGOSHIMA, JAPAN	1	31.63	-130.58	131
47881	TOKUSHIMA AB, JAPAN	1	34.13	-134.60	131
47909	NAZE, JAPAN	1	28.38	-129.55	96
47918	ISHIGAKIJIMA, JAPAN	1	24.33	-124.17	96
47931	KADENA AB, JAPAN	1	26.40	-127.80	96
47936	NAHA/KAGAMIZU, JAPAN	1	26.20	-127.67	96
47945	MINAMIDAITOJIMA, JAPAN	1	25.83	-131.23	95
47971	CHI CHI JIMA, JAPAN	0	27.08	-142.18	94
47991	MINAMITORISHIMA, JAPAN	0	24.30	-153.97	93
48327	CHIANG MAI, THAILAND	0	18.78	-98.98	63
48354	UDORN THANI, THAILAND	0	17.37	-102.80	62
48407	UBON RATCHATHANI (UU), THAILAND	0	15.25	-104.87	62
48455	BANGKOK, THAILAND	1	13.73	-100.50	62
48568	SONGKHA, MALAYSIA	1	7.20	-100.60	26
48601	PENANG/BAYAN LEPAS, MALAYSIA	1	5.30	-100.27	26
48615	KOTA BHARU/PENGLAN, MALAYSIA	1	6.17	-102.28	26
48647	KUALA LUMPUR/SUBANG, MALAYSIA	0	3.12	-101.55	26
48657	KUALAN/RESERAH, MALAYSIA	0	3.78	-103.22	26
48694	SINGAPORE AIRPORT, SINGAPORE	1	1.37	-103.92	26
48849	DONG HA, VIET NAM	0	16.80	-107.10	62
48855	DA-NANG/TOURANE (SD), CENTRAL VIET NAM	1	16.03	-108.18	62
48896	BIEN-HOA, CENTRAL VIET NAM	0	11.90	-106.80	62
48900	SAIGON/TANSONNHUT (VS), SOUTH VIET NAM	0	10.82	-106.67	62
50527	HUILUN/HAILAR, CHINA	0	49.22	-119.75	169
50557	NAUKIANG, CHINA	0	49.17	-125.22	168
50774	YICHUN, CHINA	0	47.72	-128.90	168
50953	HARBIN, CHINA	0	45.68	-126.62	168

WD number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
51076	ALFETTAI, CHINA	0	47.73	-88.08	172
51133	T'A-CH'ENG, CHINA	0	46.73	-83.00	172
51243	ANGIRIA, CHINA	0	45.60	-84.85	172
51238	PEI TA HSHAN, CHINA	0	45.37	-90.53	171
51431	INING, CHINA	0	43.95	-81.33	172
51463	WULUMUCHI, CHINA	0	43.90	-87.47	172
51614	KUCHE, CHINA	0	41.72	-82.95	172
51656	K'U-ERH-IC, CHINA	0	41.75	-86.13	172
51709	SU LO/SHU LEH, CHINA	0	39.47	-75.98	137
51777	NOCHDANG, CHINA (MAINLAND)	0	39.03	-88.17	136
51828	HOTIEN, CHINA	0	37.13	-79.93	137
51866	MANG-YAI-CHEN, CHINA	0	38.37	-90.15	135
52203	HAMI, CHINA	0	42.82	-93.52	171
52267	SOH KUO NOR, CHINA	0	41.98	-101.07	170
52323	YEMAJTE, CHINA	0	41.63	-96.88	171
52391	PANG-TING-TO-TO-KAI, CHINA	0	41.70	-104.00	170
52418	TUNHWANG, CHINA	0	40.13	-94.78	171
52495	RAYAN NOO, CHINA	0	40.75	-104.50	170
52533	CHUICHUAN, CHINA	0	39.77	-98.52	135
52602	ANGIR TOLGOI, CHINA	0	38.83	-93.38	135
52652	CHIANG YEN, CHINA	0	38.93	-100.58	134
52681	MINCHIN, CHINA	0	38.72	-103.10	134
52818	KARU, CHINA	0	36.20	-94.63	135
52836	CHAHAMUSU, CHINA	0	36.33	-98.03	135
52866	SINING, CHINA	0	36.75	-101.60	134
52889	LANCHOW, CHINA	0	36.05	-103.88	134
53068	ERHLIEN, CHINA	0	43.65	-112.00	169
53336	HAJUT, CHINA	0	41.67	-108.80	170
53463	HUFEROT, CHINA	0	40.82	-111.68	169
53513	TENGKOW, CHINA	0	40.77	-107.40	170
53543	TUNG SHENG, CHINA	0	39.83	-109.98	134
53614	YINCHUAN, CHINA	0	38.48	-106.22	134
53772	TAIYUAN, CHINA	0	37.78	-112.55	133
53798	NEI CHIU, CHINA	0	37.07	-114.50	133
53845	YENAN, CHINA	0	36.60	-109.50	134
53915	PINGLIANG, CHINA	0	35.55	-106.67	134
54102	HSILINDET, CHINA	0	43.95	-116.07	169
54135	TUNGILIAO, CHINA	0	43.60	-122.27	168
54161	CHANGCHUN, CHINA	0	43.90	-125.22	168
54218	CHIFENG, CHINA	0	42.27	-118.97	169
54292	YENCHI, CHINA	0	42.88	-129.47	168
54337	CHINCHOW, CHINA	0	41.13	-121.12	168
54342	SHENYANG, CHINA	0	41.82	-123.55	168
54374	LINCHANG, CHINA	0	41.72	-126.92	168
54401	ZHANGJIAKOU, CHINA	0	40.78	-114.88	169
54497	ANTUNG, CHINA	0	40.05	-124.33	168
54511	PEKING, CHINA	0	39.80	-116.47	133
54662	TALIAN, CHINA	0	38.98	-121.63	132
54823	CHINAN, CHINA	1	36.68	-116.98	133
54857	TSINGTAO, CHINA	1	36.07	-120.33	132
55299	HEIHO, CHINA	0	31.48	-92.05	135

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
55591	LASA, CHINA	0	29.70	-91.13	99
56004	TO TU HO YEN, CHINA	0	33.95	-92.62	135
56029	YUSHU (P), CHINA	0	33.10	-96.75	135
56046	CHINAI, CHINA	0	33.80	-99.80	135
56080	HA TUNG, CHINA	0	34.92	-103.07	134
56096	WUTOU, CHINA	0	33.38	-104.68	134
56137	CHANGTU, CHINA	0	31.18	-96.98	135
56146	KANTZE, CHINA	0	31.63	-99.98	135
56294	CHENGITU, CHINA	0	30.67	-104.02	134
56444	DECHIN, CHINA	0	28.65	-99.17	99
56492	I PIN/YEHPIN, CHINA	0	28.82	-104.53	98
56571	HSIHCANG, CHINA	0	27.88	-102.30	98
56551	LICHANG, CHINA	0	26.87	-100.43	98
56691	WEI NING, CHINA	0	26.87	-104.28	98
56739	TENG CHUNG, CHINA	0	25.12	-98.48	99
56778	KUNMING, CHINA	0	25.02	-102.68	98
56964	SZEMOA, CHINA	0	22.67	-101.40	98
56989	HOKOW, CHINA	0	22.50	-103.95	98
57036	SIAN, CHINA	0	34.30	-108.93	134
57083	CHENG CHOW, CHINA	0	34.72	-113.65	133
57127	HANCHUNG, CHINA	0	33.07	-107.03	134
57178	NANYANG, CHINA	0	30.03	-112.58	133
57245	ANKANG, CHINA	0	32.72	-109.03	134
57290	HSIN YANG, CHINA	0	32.97	-114.05	133
57328	DAHSIEN, CHINA	0	31.27	-107.47	134
57447	ENSHIH, CHINA	0	30.27	-109.37	134
57461	YEHKANG, CHINA	0	30.70	-111.08	133
57494	HANKOW, CHINA	0	30.63	-114.07	133
57515	SAPINPA, CHINA	0	29.52	-106.48	98
57679	CHANGSHA, CHINA	0	28.20	-113.07	97
57745	CHUKIANG, CHINA	0	27.45	-109.63	98
57816	KWEIYANG, CHINA	0	26.58	-106.72	98
57957	KWEILIN, CHINA	0	25.33	-110.30	97
57972	CHENGHSIEN, CHINA	0	25.75	-112.98	97
57993	KANCHOW, CHINA	0	25.83	-114.83	97
58027	HSUCHOW, CHINA	0	34.28	-117.30	133
58150	NAN-YANG-AN/YEN-CH, CHINA	0	33.77	-120.25	132
58203	FOU YANG/FUYANG YINGCHOW, CHINA	0	32.93	-115.83	133
58238	NANCHING, CHINA	0	32.00	-118.80	133
58367	SHANGHAI, CHINA	0	31.17	-121.43	132
58424	ANCHING, CHINA	0	30.52	-117.03	133
58457	HANGCHOW, CHINA	0	30.23	-120.17	132
58506	NANCHANG, CHINA	0	28.67	-115.97	97
58633	CHUNCHOW, CHINA	0	28.97	-118.87	97
58666	TA CHEN 'TAO, CHINA	1	28.45	-121.88	96
58725	SHAO WU, CHINA	0	27.33	-117.47	97
58847	FUCHOW, CHINA	0	26.08	-119.28	97
59023	HECHI, CHINA	0	24.70	-108.05	98
59096	LIEN PING, CHINA	0	24.37	-114.48	97
59134	SHAMEN, CHINA	1	24.45	-118.07	97
59211	FOSEH, CHINA	0	23.92	-105.53	98

WHO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
59265	WUCHOW, CHINA	0	23.48	-111.30	97
59287	KUANGCHOW, CHINA	0	23.13	-113.32	97
59316	SHANTOU, CHINA	0	23.40	-116.68	97
59431	NANNING, CHINA	0	22.82	-108.35	98
59553	TUNG KONG, CHINA	0	24.15	-120.68	96
59663	HONGKONG, CHINA	0	21.87	-111.97	97
59758	YANGCHANG, CHINA	1	26.03	-110.35	97
59981	HAIKOW, CHINA	1	20.03	-112.33	61
60020	HSI SHÁ CHOU/PARACEL ISLAND, CHINA	1	16.83	16.25	74
60119	SANTA CRUZ DE TENERIFE, CANARY ISLANDS	1	28.47	6.60	109
60155	KENTIRA II (EX PORT-L'AUTÉY), MOROCCO	1	34.30	7.67	109
60250	CASABLANCA, MOROCCO	1	33.57	7.67	109
60390	AGADIR/INEZGANE, MOROCCO	1	30.38	9.57	109
60571	ALGER/DAR EL BEIDA, ALGERIA	1	36.72	-3.25	144
60580	BECHAR, ALGERIA	0	31.63	2.25	109
60630	OUARGLA, ALGERIA	0	31.90	-5.40	144
60680	IN SALAH, ALGERIA	0	27.20	-2.47	108
60715	TAMENRASET, ALGERIA	0	22.78	-5.52	108
60760	TUNIS CARHAGE, TUNISIA	1	36.83	-10.23	143
61052	TOZEUR, TUNISIA	0	33.92	-8.17	144
61223	NIAMEY-AERO, NIGER	0	13.48	-2.17	72
61290	TOMBOUCTOU, MALI	0	16.72	3.00	37
61415	BAKAKO, MALI	0	12.63	8.03	37
61641	PORT-ETIENNE, MAURITANIA	0	20.93	17.50	74
61902	DAKAR/YOFF, SENEGAL	1	14.73	17.50	38
61967	WIDE AWAKE FLD-ASCENSION IS., OCEAN ISLANDS	1	-7.97	14.40	301
61995	DIEGO GARCIA, OCEAN ISLANDS	1	-7.35	-72.48	328
61996	VACACS (MAURITIUS), OCEAN ISLANDS	1	-20.30	-57.50	402
61998	ILE NOUVELLE-AMSTERDAM, OCEAN ISLANDS	1	-37.80	-77.53	436
62010	PORT-AUX-FRANCAIS (ILES KERGUELEN), OCEAN IS	1	-49.33	-70.22	472
62011	IDRIS, LIBYA	0	32.68	-13.17	143
62053	WHEELUS FIELD, LIBYA	1	32.90	-13.30	143
62062	BENGHAZI/BENINA, LIBYA	1	32.08	-20.27	142
62306	TOBRUK, LIBYA	1	32.10	-20.27	142
62378	METSA MATROH, UNITED ARAB REPUBLIC (EGYPT)	1	31.32	-27.22	142
62414	HELMAN, UNITED ARAB REPUBLIC (EGYPT)	0	29.87	-31.33	105
62641	AGWAN, UNITED ARAB REPUBLIC (EGYPT)	0	23.97	-32.82	105
62721	PORT SUDAN, SUDAN	1	19.58	-37.22	69
63450	KHARTOUM, SUDAN	0	15.60	-32.55	69
63705	ADDIS ABABA, ETHIOPIA	0	8.98	-38.80	33
63741	ENTEBE AIRPORT, UGANDA	0	0.05	-32.45	33
63994	NAIROBI/DAGORETTI, KENYA	0	-1.30	-36.75	332
64650	DAR ES SALAAM AIRPORT, TANZANIA	0	-6.88	-39.20	332
64700	BANGUI CENTRAL AFRICAN REPUBLIC	1	4.40	-18.52	35
64910	PORT-LAMY, CHAD	0	12.13	-15.03	71
65046	LOUALA, CAMEROON	1	4.02	-9.70	36
65202	KANO, NIGERIA	0	12.05	-8.53	72
65578	LAGOS OSHODI, NIGERIA	1	6.55	-3.35	36
66160	ABIDJAN, IVORY COAST	1	5.25	3.93	1
66285	LUANDA, ANGOLA	1	-8.85	-13.23	334
66390	ILUSO, ANGOLA	0	-11.78	-19.92	370
	SA DA BANDERIA, ANGOIA	0	-14.93	-13.58	370

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
67083	TANANARIVE/IVATO, MALAGASY REPUBLIC	0	-18.80	-47.48	367
67085	TANANARIVE, MALAGASY REPUBLIC	0	-18.90	-47.50	367
67197	FT DAUTHIN, MALAGASY REPUBLIC	1	-25.03	-46.95	403
67237	NAMFULA, MOZAMBIQUE	0	-15.10	-39.28	368
67341	LOURENGO MARQUES/GAGO COUTINHO, MOZAMBIQUE	1	-25.92	-32.57	404
67663	BROKEN HILL, ZAMBIA	0	-14.45	-28.47	369
68014	GROUTFONTEIN, SOUTH AFRICA	0	-19.60	-18.13	370
58112	J. G. SIRLIDOM, SOUTH WEST AFRICA	0	-22.48	-17.47	406
68262	PRETORIA, SOUTH AFRICA	0	-25.57	-28.22	405
68263	PRETORIA/IRENE, SOUTH AFRICA	0	-25.92	-28.22	405
68406	ALEXANDER BAY, SOUTH WEST AFRICA	1	-28.57	-16.53	406
68442	BLOEMFONTEIN (J.B.M.HERTZOG), SOUTH AFRICA	0	-29.10	-26.30	405
68588	DURBAN (LOUIS BOTHA), SOUTH AFRICA	1	-29.97	-30.95	404
68816	CAPE TOWN (D.F. MALAN), SOUTH AFRICA	0	-33.97	-18.60	442
68842	PORT ELIZABETH, SOUTH AFRICA	1	-33.98	-25.60	441
68906	GOUCH ISLAND, SOUTH ATLANTIC OCEAN	1	-40.35	9.88	444
68994	MARION ISLAND, SOUTH AFRICA	1	-46.88	-37.87	476
70026	BARROW, ALASKA	1	71.30	156.78	268
70086	BARTER ISLAND, ALASKA	1	70.13	143.63	267
70133	KOTZEBUE, ALASKA	1	66.87	162.63	233
70200	NOME, ALASKA	1	64.50	165.43	233
70219	BETHEL, ALASKA	0	60.78	161.80	233
70231	MOGRATH, ALASKA	0	62.97	155.62	232
70261	FAIRBANKS/INT., ALASKA	0	64.82	147.87	231
70273	ANCHORAGE/INT., ALASKA	0	61.17	150.02	232
70308	ST. PAUL IS., ALASKA	0	57.15	170.22	198
70316	COLD BAY, ALASKA	1	55.20	162.72	197
70326	KING SALMON, ALASKA	1	58.68	156.65	196
70350	KODIAK/NAS, ALASKA	1	57.75	152.52	196
70361	YAKUTAT, ALASKA	1	59.52	139.67	194
70398	ANNETTE ISLAND, ALASKA	1	55.03	131.57	194
70414	SIEMVA, ALASKA	1	57.72	-174.10	199
70454	ADAK, ALASKA	1	51.88	176.65	198
72201	KEY WEST/INT., FLA., USA	1	24.58	81.70	81
72202	MIAMI/INT., FLA., USA	1	25.80	80.27	81
72206	JACKSONVILLE/IMESON, FLA., USA	1	30.40	81.70	117
72208	CHARLESTON/M.N., S.C., USA	1	32.90	80.03	117
72211	TAMPA/INT., FLA., USA	1	27.97	82.53	81
72213	WAYCROSS/WARE CO., GEORGIA, U.S.A.	0	31.25	82.40	117
72220	APALACHICOLA, FLORIDA, U.S.A.	1	29.73	84.98	91
72221	EGLIN AFB, FLA., USA	1	30.48	86.52	117
72225	LAWSON AAF, GEORGIA, USA	0	32.20	84.50	117
72226	MONTGOMERY/DANNELLY, ALA., USA	0	32.30	86.40	117
72228	BIRMINGHAM, ALABAMA, U.S.A.	0	33.57	86.75	117
72232	BOOTHVILLE, LA., USA	1	29.33	89.40	81
72235	JACKSON/THOMPSON, MISS., USA	0	32.32	90.08	118
72240	LAKE CHARLES/M.N., LA., USA	0	30.12	93.22	118
72243	HOUSTON INT/VTL, TEXAS, U.S.A.	0	29.97	95.35	82
72248	SHREVEPORT/M.N., LA., USA	0	32.47	93.62	118
72250	BROWNSVILLE/R.G.V. INT., TEX., USA	1	28.85	97.43	82
72255	VICTORIA/FOSTER, TEX., USA	0	28.85	96.92	82

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72257	FT. HOOD AAF, TEXAS, UNITED STATES	C	31.10	97.33	118
72259	FT. WORTH/GREATER FT. WORTH INT., TEX., USA	0	32.77	97.42	118
72260	STIEHEVILLE, TEXAS, U.S.A.	0	32.22	98.18	118
72261	DEL RIO/INT., TEX., USA	0	29.37	100.92	83
72265	MIDLAND/AIR TERM., TEX., USA	0	31.95	102.18	119
72266	ABILENE/MUN., TEX., USA	0	32.43	99.68	118
72270	EL PASO/INT., TEX., USA	0	31.80	106.40	119
72274	TUCSON/INT., ARIZ., USA	0	32.12	110.93	120
72280	YUMA/YUMA INT., ARIZ., USA	0	32.67	114.60	120
72290	SAN DIEGO/LINDBERG, CALIF., USA	1	32.82	117.13	120
72291	SAN NICOLAS IS./NF, CALIF., USA	1	33.25	119.45	120
72295	LOS ANGELES/INT., CALIF., USA	1	33.93	118.40	120
72304	CAPE HATTERAS, N.C., USA	1	35.27	75.55	116
72311	ATHENS/BEN EPS FIELD, GA., USA	0	33.95	83.32	117
72317	GREENSBORO/G. - HIGH POINT, N.C., USA	0	36.08	79.95	116
72327	NASHVILLE/METROPOLITAN, TENN., USA	0	36.25	86.57	117
72340	LITTLE ROCK/ADAMS, ARK., USA	0	34.73	92.23	118
72349	MONETT, MISSOURI, U.S.A.	0	36.88	93.90	118
72353	OKLAHOMA CITY/W. ROGERS WORLD, OKLA., USA	0	35.40	97.60	118
72354	TINKER AFB, OKLA., USA	0	35.42	97.38	118
72355	FT. STILL, OKLAHOMA, USA	0	34.60	98.40	118
72357	NORMAN/MAX WESTHEIM, OKLAHOMA, U.S.A.	0	35.23	97.47	118
72363	AMARILLO/AIR TERM., TEX., USA	0	35.23	101.70	119
72365	ALBUQUERQUE/SUNPORT-KIRTLAND AFB, N.MEX., USA	0	35.05	106.62	119
72374	WINSLOW/MUN., ARIZ., USA	0	35.02	110.73	120
72381	EDWARDS AFB, CALIF., USA	0	34.92	117.90	120
72385	YUCCA FLAT, NEV., USA	0	36.95	116.05	120
72386	LAS VEGAS/MCCARRAN, NEVADA, U.S.A.	0	36.10	115.20	120
72389	FRESNO/AIR TERM., CALIF., USA	0	36.77	119.72	120
72391	POINT MUGU/NAS, CALIFORNIA, U.S.A.	1	34.12	119.12	120
72393	VANDENBERG AFB, CALIF., USA	1	34.75	120.57	121
72402	WALLOPS ISLAND, VA., USA	1	37.85	75.48	116
72403	WASHINGTON/DULLES INT., VA., USA	0	38.98	77.47	116
72406	PHILADELPHIA INTL, PENNSYLVANIA, U.S.A.	0	39.88	75.25	116
72414	CHARLESTON/KANAWHA, WEST VIRGINIA, U.S.A.	0	38.37	81.60	117
72425	HUNTINGTON/TRI-STATE, W.VA., USA	0	38.37	82.55	117
72429	DAYTON/COX-DAYTON MUN., OHIO, USA	0	39.87	84.12	117
72433	SALEM-LECKONE, ILLINOIS, U.S.A.	0	38.65	88.97	117
72445	COLUMBIA, MO., USA	0	39.00	92.40	118
72451	DOGE CITY/MUN., KANS., USA	0	37.77	99.97	118
72456	TOPEKA/MUN., KANS., USA	0	39.07	95.63	118
72468	BUTTS AAF, GEORGIA, USA	0	38.70	104.77	119
72469	DENVER/STAPLETON, COLO., USA	0	39.75	104.87	119
72476	GRAND JUNCTION/WALKER, COLO., USA	0	39.12	108.53	119
72486	ELY/VELLAND, NEV., USA	0	39.28	114.85	120
72493	OAKLAND/OAL, CALIF., USA	1	37.73	122.20	121
72506	NANTUCKET/MEMORIAL, MASS., USA	1	41.30	70.10	152
72518	ALBANY/ALBANY CO., N.Y., USA	0	42.75	73.80	152
72520	PITTSBURGH/GREATER PITTSBURGH, PA., USA	0	40.53	80.23	153
72528	BUFFALO/GREATER BUFFALO INT., N.Y., USA	1	42.93	78.73	152
72532	PEORIA/GREATER PEORIA, ILL., USA	0	40.67	89.68	153

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
72534	CHICAGO-MIDWAY, ILLINOIS, U.S.A.	1	41.78	87.75	153
72553	CHAMPA/NOTH OMAHA, NEBR., USA	0	41.37	96.02	154
72562	NORTH PLATTE/LEE BIRD, NEBR., USA	0	41.13	100.68	155
72572	SALT LAKE CITY/MUN., UTAH, USA	0	40.77	111.97	156
72576	LANDER/HUNT, WYO., USA	0	42.82	108.73	155
72583	WINNEMCCA/MUN., NEV., USA	0	40.90	117.80	156
72597	MEDFORD/MEDFORD-JACKSON COUNTY, OREG., USA	0	42.37	122.87	157
72600	SABLE ISLAND, N.S., CANADA	1	43.93	60.02	151
72606	PORTLAND/MUN., MAINE, USA	1	43.65	70.32	152
72637	FLINT/BISHOP, MICH., USA	0	42.97	83.73	153
72645	GREEN BAY/A. STRAUDEL, WIS., USA	0	44.48	88.13	153
72654	HURON/HOMES MUN., S. DAK., USA	0	44.38	98.22	154
72655	ST. CLOUD/WHITNEY, MINN., USA	0	45.58	94.07	154
72662	RAPID CITY/MUN., S. DAK., USA	0	44.05	103.07	155
72681	BOISE/MUN., IDAHO, USA	0	43.57	116.22	156
72694	SALEM/MCNARY, OREG., USA	0	44.92	123.02	157
72701	GAGETOWN, CANADA	0	45.83	66.43	151
72712	CARIBOU/MUN., MAINE, USA	0	46.87	68.02	151
72722	MANITWAKI, QUE., CANADA	0	46.37	75.98	152
72734	SAULT STE. MARIE, MICH., USA	1	46.47	84.37	153
72747	INTERNATIONAL FALLS, MINN., USA	0	48.57	93.38	154
72764	BUSWICK/MUN., N. DAK., USA	0	46.77	100.75	155
72768	GLASGOW/INT., MONT., USA	0	48.22	106.62	155
72775	GREAT FALLS/INT., MONT., USA	0	47.48	111.37	156
72785	SPOKANE/INT., WASH., USA	0	47.63	117.53	156
72793	SEATTLE/TACOMA INTL., WASH., U.S.A.	1	47.45	122.30	157
72797	QUILLAYUTE, WASH., USA	0	47.95	124.55	157
72798	TATLOOSH ISLAND, WASHINGTON, U.S.A.	1	48.40	124.70	157
72801	ST. JOHN'S/TORBAY, CANADA	1	47.07	52.75	150
72807	ARGENTIA, NFID., CANADA	1	47.30	54.00	150
72811	SEPT-ILES (SEVEN ISLANDS) QUE., CANADA	1	50.22	66.27	187
72815	STEPHENVILLE, NFID., CANADA	1	48.53	58.55	150
72816	GOOSE, NFID., CANADA	1	53.32	60.42	187
72826	NITCHELON, QUE., CANADA	0	53.20	70.90	188
72836	MOOSONEE, ONT., CANADA	1	51.27	80.65	189
72848	TROUT LAKE, ONT., CANADA	0	53.83	89.87	189
72853	CAMP SHILO, MAN., CANADA	0	49.82	99.65	154
72867	THE PAS, MAN., CANADA	0	53.97	101.10	191
72896	PRINCE GEORGE, B.C., CANADA	0	53.88	122.68	193
72906	FORT CHIMO, QUE., CANADA	1	58.10	68.42	187
72907	INCOUDJOUAC, QUE., CANADA	1	58.45	78.12	188
72909	FROBISHER BAY, N.W.T., CANADA	0	63.75	68.55	223
72913	CHURCHILL, MAN., CANADA	1	58.75	94.07	190
72915	CORAL HARBOUR, N.W.T., CANADA	1	64.20	83.37	225
72917	EUREKA, N.W.T., CANADA	1	80.90	85.93	297
72924	RESOLUTE, N.W.T., CANADA	1	74.72	94.98	262
72925	CAMBRIDGE BAY, N.W.T., CANADA	1	69.10	105.12	227
72926	BAKER LAKE, N.W.T., CANADA	0	64.30	96.00	226
72928	ROCKY MOUNTAIN HOUSE, CANADA	0	52.38	114.92	192
72934	FORT SMITH, N.W.T., CANADA	0	60.02	111.97	228
72938	COPPERMINE, N.W.T., CANADA	1	67.80	115.10	228

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
72945	FORT NELSON, B.C., CANADA	0	58.83	122.58	193
72957	INUVIK, N.W.T., CANADA	0	68.30	133.48	230
72964	WHITEHORSE, Y.T., CANADA	0	60.72	135.07	230
74043	NORMAN WELLS, N.W.T., CANADA	0	65.28	126.80	229
74051	SACHS HARBOR, N.W.T., CANADA	1	71.98	126.28	265
74072	MOULD BAY, N.W.T., CANADA	1	76.23	119.33	264
74074	ISACHSEN, N.W.T., CANADA	1	78.78	103.53	263
74081	HALL BEACH, N.W.T., CANADA	1	81.25	81.25	225
74082	ALEUT, N.W.T., CANADA	1	82.50	62.33	907
74090	CLYDE, N.W.T., CANADA	1	70.50	68.60	259
74109	FORT HARDY, B.C., CANADA	1	50.68	127.37	193
74115	VERNON BRIDGE, CANADA	0	53.23	119.28	192
74119	EDMONTON (STONY PLAIN), ALTA., CANADA	0	53.55	114.10	192
74399	SHELburne, CANADA	1	43.72	65.25	151
74486	NEW YORK/JOHN F. KENNEDY INT., N.Y., USA	1	40.65	73.78	152
74494	CHATHAM, MASS., U.S.A.	1	41.67	69.97	151
74704	EL MONTE EMSU, CALIFORNIA, U.S.A.	1	34.08	118.03	120
74794	CAPE KENNEDY, FLORIDA, USA	1	28.47	80.55	81
76151	ISLA GUADALUPE, MEXICO	1	29.17	118.32	84
76225	CHIHUAHUA, CHIH., MEXICO	0	28.70	106.07	83
76256	FRACCIONAMIENTO LIB. MEXICO	0	27.95	110.80	84
76394	MONTERREY, N.L., MEXICO	0	25.87	100.23	83
76458	MAZATLAN, SIN., MEXICO	1	23.18	105.42	83
76644	MERIDA, YUC., MEXICO	0	20.95	89.67	81
76679	MEXICO CITY, D.F., MEXICO	0	19.43	99.07	46
76692	VERACRUZ, VER., MEXICO	1	19.15	96.12	46
76723	ISLAND SOCORRA, MEXICO	1	18.72	110.95	48
78016	KINDLEY FIELD AFB, ST. GEORGE'S, BERMUDA	1	32.37	64.68	115
78063	GOLD ROCK CREEK, GRAND BAHAMA IS., BAHAMAS	1	26.60	78.30	80
78076	COFFIN HILLS, ELEUTHERA ISLAND, BAHAMAS	1	25.30	76.30	80
78118	TURKS ISLAND (AUX. AFB), TURKS ISLANDS	1	21.45	71.15	80
78325	CASA BLANCA, CUBA	1	23.15	82.35	81
78355	CANAGUEY, CANAGUEY, CUBA	0	21.40	77.90	80
78367	QUANTANARO, ORIENTE, CUBA	1	19.90	75.15	44
78384	ROBERTS FIELD, GRAND CAYMAN, CAYMAN ISLANDS	1	19.32	81.35	45
78397	KINGSTON/PALLISADES, JAMAICA	1	18.07	76.85	44
78486	SANTO DOMINGO, DOMINICAN REPUBLIC	1	18.47	69.88	43
78501	SWAN ISLAND, SWAN ISLAND	1	17.40	83.93	45
78526	SAN JUAN/INT., PUERTO RICO	1	18.43	66.00	43
78641	GUATEMALA/LA AURORA, GUATEMALA	0	14.58	90.52	46
78724	CHOLUTECA, HONDURAS	0	13.30	87.20	45
78762	SAN JOSE/SANTAMARIA, COSTA RICA	0	9.98	84.22	9
78806	HOWARD AIR FORCE BASE, CANAL ZONE	1	8.97	79.60	8
78861	COOLIDGE FIELD, ANTIGUA, BRITISH ISLANDS	1	17.12	61.78	43
78866	JULIANA AIRPORT, ST. MARTIN	1	18.05	63.12	43
78897	RAIZET, GUADELOUPE, LA GUADELOUPE	1	16.27	61.52	43
78954	SEAMELL AIRPORT, BARBADOS	1	13.07	59.48	42
78967	CHAGUARAMAS, TRINIDAD	1	10.70	61.60	43
78970	PIARCO/PORT OF SPAIN, TRINIDAD + TOBAGO	1	10.62	61.35	43
78988	DR. A. PLESMAN AIRPORT, CURACAO	1	12.20	68.97	43
80001	SAN ANDRES, COLOMBIA	1	12.58	81.70	45

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80222	BOGOTA/ELDORADO, COLOMBIA	0	4.70	74.13	8
80415	MARACAY-E.A. SUAREZ, VENEZUELA	0	10.25	67.65	43
80447	SAN ANTONIO, VENEZUELA	0	7.85	72.45	8
81403	KOURON, FRENCH GUIANA	1	5.20	52.70	6
81405	CAVENE/ROCHAMBEAU, FRENCH GUIANA	1	4.83	52.37	6
82193	BELEM (VAL DE CAS), BRAZIL	1	-1.38	48.48	304
82280	SAO LUIZ, BRAZIL	1	-2.53	44.28	304
82332	MANAUS (LONTA PELADA), BRAZIL	0	-3.15	59.98	305
82397	FORTALEZA, BRAZIL	1	-3.72	38.55	303
82400	FERNANDO NORONHA, BRAZIL	1	-3.85	32.42	303
82599	NATAL (AUGUSTO SEVERO), BRAZIL	1	-5.92	35.25	303
82678	FLORIANO/CANGAPARA, BRAZIL	0	-6.77	43.02	304
82765	CAROLINA, BRAZIL	0	-7.03	47.47	304
82900	RECIFE CURADO, BRAZIL	1	-8.07	34.92	303
82983	PETROLINA, BRAZIL	0	-9.38	40.50	304
83208	VILHENA (AEVOFORITO), BRAZIL	1	-12.73	60.13	342
83229	SALVADOR (ONDINA), BRAZIL	1	-13.00	38.52	339
83288	BOM JESUS DA LAPA, BRAZIL	0	-13.27	43.42	340
83378	BRASILIA (AIRPORT), BRAZIL	0	-15.87	47.93	340
83612	CAMPO GRANDE (AIRPORT), BRAZIL	0	-20.47	54.67	377
83650	TRINDADE (ISLAND), BRAZIL	1	-20.50	29.32	374
83746	RIO JANEIRO/AEROPORTO GALEAO, BRAZIL	1	-22.82	43.25	376
83780	SAO PAULO/CONGONHAS, BRAZIL	0	-23.62	46.65	376
83840	CURITIBA (ALFONSO PENA), BRAZIL	0	-25.52	49.17	376
83971	PORTO ALEGRE (SALGADO FILHO), BRAZIL	1	-30.00	51.18	413
84008	SAN CRISTOBAL (GALAPAGOS), ECUADOR	1	-90	89.62	308
84129	GUAYAQUIL/SIMON BOLIVAR, ECUADOR	1	-2.20	79.88	307
84628	LIMA-CALLAO (INT. AIRPORT), PERU	0	-12.00	77.12	343
84631	LIMATAMBO, PERU	1	-12.10	77.00	343
85442	ANTOFAGASTA/CERRO MORENO, CHILE	1	-23.43	70.47	379
85469	ISLA DE PASCUA, CHILE	1	-27.17	109.43	382
85543	QUINERO, CHILE	1	-32.78	71.53	415
85799	FUERTE MONTE/EL TEP, CHILE	1	-41.47	72.93	451
85801	FUERTE MONTE/LA CHAMIZA, CHILE	1	-41.50	72.90	451
87047	SALTA, ARGENTINA	0	-24.85	65.48	378
87155	RESISTENCIA AEROP. INT., ARGENTINA	0	-27.45	59.05	377
87344	CORDOBA, ARGENTINA	0	-31.32	64.22	414
87418	MENDOZA/EL PILMERIL, ARGENTINA	0	-32.83	68.78	414
87420	OBSERVATORIO MENDOZA, ARGENTINA	0	-32.88	68.85	414
87576	EZEIZA, ARGENTINA	1	-34.82	58.53	413
87623	SANTA ROSA AERO, ARGENTINA	0	-36.57	64.27	414
87715	NEUQUEN, ARGENTINA	0	-38.95	68.13	414
87748	BASE AERONAVAL COMANDANTE ESPORA, ARGENTINA	1	-38.73	62.17	414
87860	COMODORO RIVADAVIA, ARGENTINA	1	-45.78	67.45	450
87926	STACION AERONAVAL DE RIO GALLEGOS, ARGENTINA	1	-51.63	69.22	486
87938	ESTACION AERONAVAL USHUAIA, ARGENTINA	1	-54.80	68.30	486
88952	ARGENTINE ISLANDS	1	-65.25	64.27	522
88968	ISLAS ORCADAS ISLANDS	1	-60.75	44.72	520
89001	S.A.N.A.E. STATION, ANTARCTICA	1	-70.32	2.37	552
89009	AMUNDSEN-SCOTT, ANTARCTICA	0	-90.00	.00	588
89022	HALLEY BAY, ANTARCTICA	1	-75.52	26.60	554

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89050	BELLINGHAUSEN, ANTARCTICA	1	-62.20	58.93	521
89125	BYRD STATION, ANTARCTICA	0	-80.02	119.53	599
89512	NOVOLAZAREVSKAJA, ANTARCTICA	0	-70.77	-111.83	576
89532	SYOWA, ANTARCTICA	1	-69.00	-39.58	548
89542	MOLODEZARAJA, ANTARCTICA	1	-67.67	-45.85	547
89571	DAVIS, ANTARCTICA	1	-68.58	-77.98	544
89592	MERNYJ, ANTARCTICA	1	-66.55	-93.02	542
89606	VOSTOK, ANTARCTICA	0	-78.45	-106.87	577
89611	WILKES, ANTARCTICA	1	-66.25	-110.53	540
89664	MC MURDO, ANTARCTICA	1	-77.85	-166.67	571
91030	CHICHI JIMA ISLAND, PACIFIC OCEAN	1	27.10	-142.30	94
91066	MIDWAY ISLAND, PACIFIC OCEAN	1	28.22	-177.37	90
91115	CENTRAL AIRFIELD, IWO JIMA	1	24.80	-141.30	94
91131	MARCUS ISLAND, PACIFIC OCEAN	1	24.30	-154.00	93
91165	LIHUE, KAUAI, HAWAII	1	21.98	-159.35	88
91217	GUAM, TAGUAC, MARIANA IS.	1	13.55	-144.83	58
91245	WAKE ISLAND	1	19.28	-166.65	56
91250	ENIWETOK ATOLL, MARSHALL IS.	1	11.40	-162.40	56
91275	JOHNSTON ISLAND	1	16.73	-169.52	53
91285	HILO/GEN. LYMAN, HAWAII	1	19.72	-155.07	52
91334	TRUK, CAROLINE IS.	1	7.47	-151.85	21
91348	RONAPE, EASTERN CAROLINE IS.	1	6.97	-158.22	21
91366	KWAJALEIN MARSHALL IS.	1	8.72	-167.73	20
91376	MAJURO, MARSHALL IS.	1	7.33	-171.38	19
91408	KOROR, PALAU IS.	1	7.08	-134.48	23
91413	YAP, CAROLINE IS.	1	9.48	-138.08	23
91517	HONTARA, BRITISH SOLOMON ISLANDS	1	-9.42	-159.97	320
91558	VILA, NEW HEBRIDES	1	-17.75	-168.30	355
91592	NOUMEA (NILE-CALEDONIE), NEW CALEDONIA	1	-22.27	-166.45	391
91610	TARAWA, GILBERT ISLANDS	1	1.35	-172.92	19
91643	FUNAFUTI, ELLICE IS.	1	-8.52	-179.22	318
91680	NANDI, FIJI ISLANDS	1	-17.75	-177.45	354
91700	CANTON ISLAND, TOKELAU ISLANDS	1	-2.77	171.72	317
91755	PAGO PAGO/TINT AIRPORT, AMERICAN SAMOA	1	-14.33	170.72	353
91843	RAROTONGA, COOK ISLANDS	1	-21.20	159.82	387
91925	ATUONA, FRENCH OCEANIA	1	-9.82	139.03	313
91938	TAHITI-FAAA, FRENCH OCEANIA	1	-17.55	149.62	350
91944	HAA, FRENCH OCEANIA	1	-18.07	140.95	350
91948	RIKITEA, FRENCH OCEANIA	1	-23.10	134.87	385
91958	RAPA, FRENCH OCEANIA	1	-27.62	144.33	386
93119	AUCKLAND AIRPORT, NEW ZEALAND	1	-37.02	-174.80	426
93337	WAIOURU, NEW ZEALAND	0	-39.47	-175.68	426
93780	CHRISTCHURCH AIRPORT, NEW ZEALAND	1	-43.48	-172.55	462
93844	INVERCARGILL AERODROME, NEW ZEALAND	1	-46.40	-168.33	463
93944	CAMPBELL ISLAND, NEW ZEALAND	1	-52.55	-169.15	499
93986	CHATHAM ISLAND, NEW ZEALAND	1	-43.95	175.57	461
93997	RAOUL IS. KERMADEC IS., NEW ZEALAND	1	-29.25	177.92	389
94027	LAE, AUSTRALIAN NEW GUINEA	1	-6.73	-147.00	321
94120	DARWIN AERO, AUSTRALIA	1	-12.43	-130.87	358
94203	BROOME, AUSTRALIA	1	-17.95	-122.22	359
94294	TOWNSVILLE, AUSTRALIA	1	-19.25	-146.77	357

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94299	WILLIS ISLAND, AUSTRALIAN NEW GUINEA	1	-16.30	-149.98	357
94300	CARVAVON, AUSTRALIA	1	-24.88	-113.65	396
94312	FORT HEDLAND, AUSTRALIA	1	-20.38	-118.62	396
94326	ALICE SPRINGS, AUSTRALIA	0	-23.80	-133.90	394
94335	CLONCURRY, AUSTRALIA	0	-20.67	-140.50	393
94380	GLADSTONE, M.O., AUSTRALIA	1	-23.85	-151.27	392
94461	GILES, AUSTRALIA	0	-25.03	-128.30	395
94510	CHARLEVILLE, AUSTRALIA	0	-26.42	-146.28	393
94527	MOREE, AUSTRALIA	0	-29.47	-149.85	393
94578	PERSEUS AIRPORT, AUSTRALIA	1	-27.43	-153.08	392
94610	FERI AIRPORT, AUSTRALIA	1	-31.92	-115.97	432
94637	KALGOORLIE, AUSTRALIA	0	-30.77	-121.45	431
94638	ESPERANCE, M.O., AUSTRALIA	1	-33.82	-121.88	431
94646	FORREST, AUSTRALIA	0	-30.83	-128.10	431
94659	WOOMERA, AUSTRALIA	0	-31.15	-136.80	430
94672	ADELAIDE AIRPORT, AUSTRALIA	1	-34.95	-138.53	430
94711	COBAR M.O., AUSTRALIA	0	-31.53	-145.82	429
94750	NOMRA, AUSTRALIA	1	-34.95	-150.53	428
94776	WILLIAMTOWN, AUSTRALIA	1	-32.82	-151.83	428
94802	ALBANY N.O., AUSTRALIA	1	-34.95	-117.80	432
94821	MT. GAMBIER M.O., AUSTRALIA	0	-37.75	-140.78	429
94865	LAVERTON (AERO), AUSTRALIA	1	-37.87	-144.75	429
94910	WAGGA, AUSTRALIA	0	-35.17	-147.47	429
94975	HOBART AIRPORT, AUSTRALIA	1	-42.83	-147.50	465
94986	MASON (AUST.), ANTARCTICA	1	-67.60	-62.88	545
94995	LORD HOWE ISLAND, AUSTRALIA	1	-31.53	-159.08	428
94996	NORFOLK ISLAND, AUSTRALIA	1	-29.05	-167.93	391
94998	MACQUARIE ISLAND, AUSTRALIA	1	-54.50	-158.95	500
95502	DUMONT D'URVILLE, ANTARCTICA	1	-66.67	-140.02	537
96471	JESSELTON, NORTH BORNEO, INDONESIA	1	5.95	-116.05	25
96743	DIKARPA/KEMAJORAN, INDONESIA	1	-6.15	-106.85	325
96996	COCOS ISLAND, INDONESIA	1	-12.18	-96.83	362
98223	LAOAG, PHILIPPINES	1	18.18	-120.53	60
98327	CLARK AFB, PHILIPPINES	1	15.17	-120.57	60
98646	MACTAN INTL, PHILIPPINES	0	10.30	-123.97	60
98836	ZAMBOANGA, PHILIPPINES	1	7.50	-122.12	24
1001	JAN MAYEN, NORWAY	1	70.93	8.67	253
1028	BJORNØYA, NORWAY	1	74.52	-19.02	287
1152	BODO, NORWAY	1	67.25	-14.40	251
1241	ORLAND, NORWAY	1	63.70	-9.43	252
1384	OGLO/GARDMOEN, NORWAY	0	60.20	-11.10	251
1415	STAVANGER/SOLA, NORWAY	1	58.87	-5.67	216
2057	LULEÅ/KALLAX, SWEDEN	1	65.55	-22.13	250
2062	ÖSTERSUND/FRÖSON, SWEDEN	0	63.18	-14.50	251
2066	SUNDSVALL/HARNÖSAND, SWEDEN	1	62.53	-17.45	251
2077	STOCKHOLM/BROMMA, SWEDEN	1	59.35	-17.95	215
2084	BJERTEGÖR/TORSLANDA, SWEDEN	0	57.72	-11.78	215
2160	TINGSSTADE, SWEDEN	1	57.65	-18.35	215
2836	SODANKYLÄ, FINLAND	0	67.37	-26.65	250
2935	JYVASKYLÄ/LUONETJARVI, FINLAND	0	62.40	-25.67	250
2963	JOKIOINEN, FINLAND	0	60.82	-23.50	250

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
3005	LERWICK, UNITED KINGDOM	1	60.13	1.18	217
3026	STORNOWAY, UNITED KINGDOM	1	58.22	6.32	181
3170	SHANWELL, UNITED KINGDOM	1	56.43	2.87	181
3322	AUGHIN, UNITED KINGDOM	0	53.55	2.92	181
3496	HEMSBY, UNITED KINGDOM	1	52.68	-1.68	216
3502	AHERFORTH, UNITED KINGDOM	1	52.13	4.57	181
3693	SHOEBURNESS, UNITED KINGDOM	0	51.55	-8.3	216
3743	LARKHILL, UNITED KINGDOM	0	51.20	1.80	181
3774	CRAWLEY, UNITED KINGDOM	1	51.08	2.22	181
3808	CAMBORNE, UNITED KINGDOM	1	50.22	5.32	181
3920	LONG KESH, UNITED KINGDOM	1	54.48	6.10	181
3953	VALENITIA OBSERVATORY, IRELAND	1	51.93	10.25	182
4018	KEFLAVIK (2ND STATION), ICELAND	1	63.97	22.60	219
4202	THULE A.B., GREENLAND	1	76.52	68.83	259
4220	EGEDSMINDE, GREENLAND	1	68.70	52.75	222
4270	NARSARSUAQ, GREENLAND	1	61.18	45.43	221
4310	NORD, GREENLAND	1	81.60	16.70	902
4320	DANMARKSHAVN, GREENLAND	1	76.77	18.77	254
4340	KAP TOBIN, GREENLAND	1	70.42	21.97	255
4360	ANGMAGSSALIK, GREENLAND	1	65.60	37.63	220
6011	THORSHAVN, DENMARK	1	62.02	6.77	217
6030	ALBORG, DENMARK	0	57.10	-9.87	216
6181	KOBENHAVEN/GARDERHOLJ, DENMARK	1	55.77	-12.52	215
6260	DE BILT, NETHERLANDS	0	52.10	-3.18	216
6447	UCCLE, BELGIUM	0	50.80	-4.35	216
6476	ST. HUBERT, BELGIUM	0	50.03	-5.40	216
6510	PAVERNE (ST.AEROL.), SWITZERLAND	0	46.82	-6.95	180
7110	BREST/GUIPAVAS, FRANCE	0	48.45	4.42	145
7145	TRAPES, FRANCE	0	48.77	-2.02	180
7180	NANCY/ESSEY, FRANCE	0	48.68	-6.22	180
7480	LYON/BRON, FRANCE	0	45.72	-4.95	180
7510	BORDEAUX/MERIGNAC, FRANCE	0	44.83	.70	145
7645	NIMES/COUBESSAC, FRANCE	0	43.87	-4.40	180
7761	ATACCO/CAMPO DEL ORO, FRANCE	1	41.92	-8.80	180
8001	LA CORUNA, SPAIN	1	43.37	8.42	145
8221	MAURID/BARAJAS, SPAIN	0	40.47	3.57	145
8302	PALMA/SON BONET, BALEARIC ISLANDS	1	39.60	-2.70	144
8495	NORTH FRONT, GIBRALTAR	1	36.15	5.33	109
8509	LATES (ACORES), PORTUGAL	1	38.73	27.08	111
8521	FUNCHAL (MADEIRA), PORTUGAL	1	32.68	16.77	110
8536	LISBOA/PORTELA, PORTUGAL	1	38.77	9.13	109
8594	SAL (CABO VERDE), PORTUGAL	1	16.73	22.95	39
4YA	FIXED SHIP, NORTH ATLANTIC OCEAN	1	61.80	29.20	219
4YB	FIXED SHIP, NORTH ATLANTIC OCEAN	1	56.50	51.00	186
4YC	FIXED SHIP, NORTH ATLANTIC OCEAN	1	52.70	35.50	184
4YD	FIXED SHIP, NORTH ATLANTIC OCEAN	1	44.00	41.00	149
4YE	FIXED SHIP, NORTH ATLANTIC OCEAN	1	35.00	48.00	113
4YH	FIXED SHIP, ATLANTIC OCEAN	1	38.00	71.00	116
4YI	FIXED SHIP, NORTH ATLANTIC OCEAN	1	57.90	15.80	182
4YJ	FIXED SHIP, NORTH ATLANTIC OCEAN	1	52.30	20.20	183
4YK	FIXED SHIP, NORTH ATLANTIC OCEAN	1	45.00	16.00	146

WMO number	Station name and country	Land/coast	Latitude	Longitude	Marsden square
4VM	FIXED SHIP, NORWEGIAN SEA	1	65.70	-2.20	252
4VN	FIXED SHIP, NORTH PACIFIC OCEAN	1	30.00	140.00	123
4VP	FIXED SHIP, NORTH PACIFIC OCEAN	1	50.00	145.00	195
4VT	FIXED SHIP, PHILIPPINE SEA	1	28.80	-134.70	95
4VV	FIXED SHIP, NORTH PACIFIC OCEAN	1	34.00	-164.00	128

APPENDIX C

4YNFIXED SHIP, NORTH PACIFIC OCEAN	1	2	3000	14000	12
1467	267	0	236	79	227
82	256	86	238	80	156
54	215	71	215	73	203
68	2631	75	129	86	117
82	132	89	107	70	106
72	95	63	1324	75	120
81	112	80	133	88	120
80	81	54	95	66	107
74	97	66	171	75	220
86	192	86	134	86	159
74	141	68	151	74	2074
79	90	78	100	85	124
94	95	81	72	85	78
82	75	69	94	78	87
78	110	87	85	71	70
86	73	68	70	65	72
74	1017	78	251	98	221
99	263	99	212	99	200
97	187	98	2587	98	114
98	108	94	131	99	115
97	74	99	93	98	108
100	106	100	109	97	124
98	105	98	80	99	106
98	97	97	96	99	1286
98	62	39	24	48	35
11	60	55	96	125	90
66	83	58	9	9	9
8	10	10	10	9	9
6	6	5	6	6	6
5	5	6	1023	1023	1022
1020	1019	1019	1018	1023	1025
1023	1024	1022	1020	1022	1019
1019	1023	1025	1020	1022	1021
1021	1022	182	198	205	222
228	222	200	168	170	183
198	205	222	185	170	172
168	170	185	225	202	192
192	142	120	162	175	185
172	142	138	118	138	156
165	178	188	145	125	122
122	140	158	145	145	148
342	336	336	355	358	352
340	342	344	341	348	351
356	359	353	337	337	337
342	350	351	344	345	71
62	61	61	91	83	70

Raw radiosonde observation data as it appears GTE Sylvania Long A tape.
Station 4YN Fixed ship, North Pacific Ocean (Record one)

69	73	72	63	62	69	78	81	88
92	84	71	71	72	64	63	62	70
78	81	89	93	72	72	74	343	337
337	322	342	349	356	359	353	341	343
345	344	338	338	342	349	352	357	360
354	342	344	346	338	338	338	343	351
352	358	360	354	345	346	-72	-75	-64
-89	-60	-59	-62	-72	-69	-73	-56	-67
-71	-67	-64	-85	-59	-62	-84	-71	-56
-72	-56	-66	-53	-48	-53	-51	-50	-56
-63	-60	-59	-58	-54	-49	-47	-44	-45
-47	-51	-51	-58	-52	-48	-49	-49	120
140	70	60	70	50	60	30	110	290
80	60	157	209	77	93	63	68	65
50	133	22	121	210	230	220	100	140
190	80	100	100	60	180	170	110	240
240	20	350	10	70	20	80	290	120
40	206	279	281	68	52	66	130	95
134	30	174	115	330	360	130	150	110
140	210	160	210	250	210	19	19	19
17	14	12	12	11	12	16	16	16
21	19	19	17	12	14	14	12	14
17	16	16	21	20	18	15	12	14
15	14	15	18	16	17	18	14	11
10	14	8	9	10	12	12	12	18
19	15	12	11	9	10	9	11	12
13	12	19	19	12	11	10	10	10
10	12	13	14	129	108	130	133	159
168	105	145	145	137	120	1607	0	1
0	0	1	1	0	2	0	0	0
8	22	26	28	16	10	11	2	19
19	11	7	234	1482	651	1851	28	

Raw radiocorde observation data as it appears GTE Sylvania Long A tape.
 Station 4YN Fixed ship, North Pacific Ocean (Record one continued)

-68	-65	-69	-73	-55	-76	-80	-68
-85	-50	-44	-53	-55	-70	-81	-95
121	119	-72	-61	-67	-19	-85	-42
114	117	118	117	122	119	118	120
117	114	115	114	112	116	116	123
120	117	112	116	115	114	117	116
121	119	117	117	116	115	113	119
116	111	120	116	115	124	115	119
114	114	111	112	120	115	116	112
120	117	117	117	117	117	116	124
122	118	117	120	120	118	124	116
117	118	112	117	116	116	115	116
116	121	114	112	113	119	117	113
121	0	114	117	117	117	122	120
0	0	0	0	0	0	0	196
0	0	0	0	0	0	492	0
209	0	0	205	0	0	243	175
0	193	171	0	216	210	196	0
0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0
1	4	3	2	0	0	0	0
1	84	103	89	76	4	2	83
88	127	110	84	83	83	93	76
85	155	129	103	179	137	94	156
104	51	121	112	76	146	121	92
93	3	2	6	4	3	94	5
1	4	4	3	9	7	4	12
1	1	4	3	2	5	3	1
2	1	1	6	3	2	3	1
693	397	545	547	663	832	583	499
680	577	990	730	704	1517	630	1194
694	927	3483	760	1014	1006	815	876
0	1006	1463	1255	1648	2732	603	799
213	0	0	0	0	0	0	0
0	479	0	74	0	213	583	620
0	0	483	0	357	0	0	0
0	0	0	680	0	0	0	176
173	501	111	134	180	185	184	176
180	194	205	201	186	206	171	103
212	151	220	175	194	121	216	119
166	223	129	242	251	155	148	217

Raw radiosonde observation data as it appears GTE Sylvania Long A tape.
Station 4VN Fixed ship, North Pacific Ocean (Record two continued)

APPENDIX D

85	2	51	100	222	348	460	630047
85	21	235	126	69	19	7	630048
85	341	1	0	0	0	0	630049
85	4	21	0	0	18		630050
85	11.3	8.6	11.1	13.8	2004	404	630051
85	68	64	119	183	273	29	630052
85	456	328	268	133	61	0	630053
85	9	6	3	0	0	18	630054
85	0	1	0	0	0		630055
85	0	2	0	0	2405	426	630056
85	24	9.2	12.4	15.4	372	4	630057
85	2	62	141	245	17	0	630058
85	324	201	73	36	0	18	630059
85	1	0	0	0	0		630060
85	0	0	0	0	1927	452	630061
85	10.5	8.0	10.6	13.1	292	26	630062
85	76	45	131	178	56	0	630063
85	434	347	200	104	0	18	630064
85	8	3	2	1	0		630065
85	0	0	0	0	2355	404	630066
85	0	21	0	14.9	407	5	630067
85	11.9	9.1	12.0	283	11	0	630068
85	40	96	124	27	0	18	630069
85	318	144	77	0	0		630070
85	3	0	0	0	1939	336	630071
85	0	0	0	0	236	35	630072
85	10.1	7.6	10.1	12.6	79	1	630073
85	24	42	85	158	0		630074
85	386	363	249	123	0	18	630075
85	13	3	3	0	2190	331	630076
85	0	0	0	0	343	4	630077
85	12.6	9.6	12.8	15.8	18	0	630078
85	42	60	112	211	1	18	630079
85	327	198	92	45	0		630080
85	3	2	0	0	0	276	630081
85	0	0	0	0	1789	65	630082
85	10.7	8.1	10.8	13.5	204	1	630083
85	24	26	75	118	98		630084
85	40	341	267	161	3	18	630085
85	352	10	6	0	0		630086
85	29	0	0	0	2074	324	630087
85	0	0	0	0	265	13	630088
85	13.7	10.4	13.7	16.9	39	0	630089
85	24	55	122	148	0		630090
85	2	211	139	62	0	18	630091
85	8	9	0	0	0		630092
85	14	9	0	0	1653	6	
85	245	21	0	14.6	225		
85	1	0	0	137	5		
85	0	8.5	11.3	0			
85	20	5	26	5			
85	24	19	4	5			
85	2	3		5			

Raw surface data as it appears on the DUC63 tape. Marsden square 85.

8510	1	1	1	7	405	8	413	9	309	10	260	11	181	12	76	630093
8510	1	1	1	13	36	14	25	15	11	16	0	17	3	18	1	630094
8510	1	1	1	19	1	20	2	21	0	22	0	27	2534	6		630095
8510	1	1	1	23	14	3	10	9	14	3	17	8	252	12	336	630096
8510	2	1	1	7	20	2	34	3	97	4	209	5	55	12	31	630097
8510	2	1	1	13	350	8	305	9	203	10	92	11	0	18	0	630098
8510	2	1	1	19	7	14	5	15	1	16	1	17	0			630099
8510	2	1	1	23	0	20	0	21	0	22	0	27	1998			630100
8510	2	1	1	7	12	3	9	1	12	3	15	3	194	6	302	630101
8511	1	1	1	1	42	2	29	3	75	4	103	5	167	12	92	630102
8511	1	1	1	7	368	8	386	9	299	10	260	11	0	18	1	630103
8511	1	1	1	13	31	14	24	15	13	16	5	17				630104
8511	1	1	1	19	0	20	0	21	0	22	0	27	2391			630105
8511	1	1	1	23	14	4	11	0	14	4	18	0	220	6	333	630106
8511	2	1	1	7	11	2	42	3	91	4	155	5	45	12	31	630107
8511	2	1	1	13	333	8	302	9	208	10	110	11	1	18	0	630108
8511	2	1	1	19	10	14	5	15	1	16	1	17				630109
8511	2	1	1	23	0	20	0	21	0	22	0	27	1899			630110
8511	2	1	1	7	12	6	9	6	12	6	15	6	232	6	307	630111
8512	1	1	1	7	40	2	35	3	76	4	156	5	126	12	76	630112
8512	1	1	1	13	337	8	326	9	271	10	199	11	2	18	0	630113
8512	1	1	1	19	39	14	18	15	2	16	0	17				630114
8512	1	1	1	23	0	20	0	21	0	22	0	27	2244			630115
8512	1	1	1	7	13	7	10	1	13	6	17	3	274	6	305	630116
8512	2	1	1	1	22	2	39	3	26	4	150	5	59	12	23	630117
8512	2	1	1	7	293	8	232	9	163	10	116	11	0	18	0	630118
8512	2	1	1	13	9	14	3	15	1	16	1	17				630119
8512	2	1	1	19	0	20	0	21	1	22	0	27	1770			630120
8512	2	1	1	23	12	3	9	1	12	1	15	4	0			630121
8512	2	1	1	7	678	0	0	0	0	0	0	0	0	0	0	630122
8512	2	1	1	13	0	0	0	0	0	0	0	0	0	0	0	630123
8512	2	1	1	19	0	0	0	0	0	0	0	0	0	0	0	630124
8512	2	1	1	23	363	1	6	4	1	1	3	4	5	0	5	630125
8512	2	1	1	7	1	653	1	1	1	1	1	3	22	0	7	630126
8512	2	1	1	13	14	5	63	3	8	6	6	3	8	0	0	630127
8512	2	1	1	19	4	5	3	3	4	4	3	6	176	16	15	630128
8512	2	1	1	23	18	8	1156	94	39	26	17	18	243	0	23	630129
8512	2	1	1	7	3	17	39	1715	229	96	55	59	37	0	0	630130
8512	2	1	1	13	10	10	24	15	11	407	12	480	88	51	0	630131
8512	2	1	1	19	22	31	9	14	2366	9	150	102	0	38	0	630132
8512	2	1	1	23	14	10	24	40	9	15	5	730	0	65	0	630133
8512	2	1	1	7	13	25	10	14	2735	423	166	116	91	0	0	630134
8512	2	1	1	13	28	32	21	25	40	27	16	780	144	100	0	630135
8512	2	1	1	19	32	14	38	17	27	15	2131	450	207	0	0	630136
8512	2	1	1	23	33	32	12	12	17	28	19	761	0	0	0	630137
8512	2	1	1	7	63	6	43	0	23	2	14	1547	370	204	131	630138
8512	2	1	1	13	73	1	0	0	2	2	12	14				

Raw surface data as it appears on the DUCT63 tape. Marsden square 85.

85 9	1D12	93	68	63	53	28	24	23	22	652	0	.0	28121	630139
8510	1D12	2	1	0	3	4	1	1	4	6	1054	214	117	630140
8511	1D12	97	68	47	40	27	20	27	21	442	0	.0	28121	630141
8512	1D12	0	0	0	1	0	0	1	0	2	2	618	114	630142
8513	1D12	71	66	34	23	19	26	18	13	350	0	.0	28121	630143
8514	1D12	0	0	1	0	0	0	0	0	0	0	1	281	630144
8515	1D12	51	29	26	23	23	12	9	6	206	0	.0	28121	630145
8516	1D12	0	0	0	0	0	0	0	0	0	2	0	0	630146
8517	1D12	106	21	9	8	4	8	5	2	110	0	.0	28121	630147
8518	1D12	0	0	9	0	0	0	0	0	0	0	0	0	630148
8519	1D12	0	67	9	3	9	2	2	9	39	0	.0	28121	630149
8520	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630150
8521	1D12	0	0	17	0	1	2	1	2	41	0	.0	28121	630151
8522	1D12	0	0	0	1	0	0	0	0	0	0	.0	28121	630152
8523	1D12	0	0	0	8	1	0	2	0	14	0	.0	28121	630153
8524	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630154
8525	1D12	0	0	0	0	2	0	1	0	7	0	.0	28121	630155
8526	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630156
8527	1D12	0	0	0	0	0	1	0	0	5	0	.0	28121	630157
8528	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630158
8529	1D12	0	0	0	0	0	0	0	1	2	0	.0	28121	630159
8530	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630160
8531	1D12	0	0	0	0	0	0	0	0	3	0	.0	28121	630161
8532	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630162
8533	1D12	0	0	0	0	0	0	0	0	0	0	.0	28121	630163
8534	1D12	0	0	0	0	0	0	0	0	0	0	0	0	630164
8535	1D12	0	0	0	0	0	0	0	0	0	0	.0	28121	630165
8536	1D12	307	2	2	0	0	0	1	0	1	0	.0	28121	630166
8537	1D12	0	0	0	0	0	0	0	0	0	0	.0	22477	630167
8538	1D12	5	543	22	13	3	5	8	1	1	1	0	1	630168
8539	1D12	4	1	3	3	2	2	2	1	31	0	.0	22477	630169
8540	1D12	20	4	1032	92	14	10	5	6	8	4	9	5	630170
8541	1D12	3	8	6	0	0	1	1	1	68	0	.0	22477	630171
8542	1D12	12	4	9	2058	132	34	34	13	9	12	3	3	630172
8543	1D12	7	4	1	5	0	0	0	0	94	0	.0	22477	630173
8544	1D12	8	2	11	13	3019	205	86	43	30	21	18	10	630174
8545	1D12	12	8	6	4	16	0	3	3	132	0	.0	22477	630175
8546	1D12	5	3	3	4	3	3477	300	97	47	60	28	22	630176
8547	1D12	17	6	4	2	3	0	4	4	119	0	.0	22477	630177
8548	1D12	3	0	0	1	4	6	3144	208	96	56	39	19	630178
8549	1D12	8	10	8	9	7	2	4	2	129	0	.0	22477	630179
8550	1D12	1	0	1	1	1	0	7	2311	205	105	38	22	630180
8551	1D12	26	15	11	8	4	4	1	0	84	0	.0	22477	630181
8552	1D12	0	0	11	0	0	0	1	1	1343	137	67	27	630182
8553	1D12	34	18	10	7	7	2	2	0	54	0	.0	22477	630183
8554	1D12	0	0	0	0	0	0	0	0	0	737	60	30	630184

Raw surface data as it appears on the DUC63 tape. Marsden square 85.

8510	2D12	19	10	4	8	0	4	0	154	267	0	0	253	297	0	0	182	171	303	.0	22477	630185
8511	2D12	14	0	0	17	13	162	0	12	135	0	0	232	218	199	0	145	132	0	.0	22477	630186
8512	2D12	11	0	0	61	135	13	0	134	204	2	2	232	218	175	6	145	132	0	.0	22477	630187
8513	2D12	49	0	10	27	145	145	0	180	235	1	0	251	270	192	1	196	157	0	.0	22477	630188
8514	2D12	0	0	4	27	9	137	0	133	222	0	0	218	218	147	4	131	117	0	.0	22477	630189
8515	2D12	0	0	0	40	9	11	0	9	205	6	1	218	218	147	0	131	117	0	.0	22477	630190
8516	2D12	0	0	0	17	11	172	0	205	232	0	0	310	274	211	0	186	161	0	.0	22477	630191
8517	2D12	0	0	0	23	17	147	0	16	237	0	2	213	246	158	4	6.7	2397	0	.0	22477	630192
8518	2D12	0	0	0	57	147	147	0	133	220	271	1	213	246	158	1	120	126	0	.0	22477	630193
8519	2D12	0	0	0	23	14	112	0	169	222	307	308	349	285	285	1	254	201	0	.0	22477	630194
8520	2D12	0	0	0	58	23	125	0	16	222	307	308	349	285	285	1	254	201	0	.0	22477	630195
8521	2D12	0	0	0	23	44	128	0	121	183	289	0	235	278	184	0	152	154	0	.0	22477	630196
8522	2D12	0	0	0	24	48	6	0	9	5	357	339	374	255	255	0	208	175	0	.0	22477	630197
8523	2D12	0	0	0	24	48	134	0	9	253	357	339	374	255	255	0	208	175	0	.0	22477	630198
8524	2D12	0	0	0	11	48	134	0	9	253	357	339	374	255	255	0	208	175	0	.0	22477	630199
8525	2D12	0	0	0	11	48	134	0	9	253	357	339	374	255	255	0	208	175	0	.0	22477	630200
8526	2D12	0	0	0	45	11	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630201
8527	2D12	0	0	0	15	2	159	0	22	238	329	298	304	239	239	0	205	174	0	.0	22477	630202
8528	2D12	0	0	0	91	159	159	0	22	238	329	298	304	239	239	0	205	174	0	.0	22477	630203
8529	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630204
8530	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630205
8531	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630206
8532	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630207
8533	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630208
8534	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630209
8535	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630210
8536	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630211
8537	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630212
8538	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630213
8539	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630214
8540	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630215
8541	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630216
8542	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630217
8543	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630218
8544	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630219
8545	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630220
8546	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630221
8547	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630222
8548	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630223
8549	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630224
8550	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630225
8551	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630226
8552	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630227
8553	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630228
8554	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630229
8555	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630230
8556	2D12	0	0	0	44	15	107	0	152	220	305	262	294	176	176	3	149	140	0	.0	22477	630231

Raw surface data as it appears on the DUCT63 tape. Marsden square 85.

Raw surface data as it appears on the DUCT63 tape. Marsden square 85.

855	3	1	5	1	0	5	2	1	0	699	3	1	6	163.3	2394	630507
855	3	2	0	0	0	0	0	59	0	699	838	236	38	4	8	630508
855	3	0	0	0	0	0	0	90	0	949	1073	313	4	159.3	1903	630509
855	4	1	0	1	1	1	1	0	0	1	785	168	4	160.0	2552	630510
855	4	0	0	0	0	0	0	98	0	854	0	0	27	3	7	630511
855	4	0	0	0	0	0	0	0	0	737	1261	371	6	156.4	1967	630512
855	5	1	0	0	0	0	0	17	0	737	1261	371	11	1	1	630513
855	5	0	0	0	0	0	0	0	0	681	1033	208	2	163.0	2478	630514
855	5	0	0	0	0	0	0	26	1	681	1033	208	22	2	8	630515
855	5	0	0	0	0	0	0	1	8	293	1304	657	5	160.7	2002	630516
855	5	0	0	0	0	0	0	0	0	293	1304	657	104	17	2	630517
855	5	0	0	0	0	0	0	0	0	289	1153	417	9	173.8	2403	630518
855	5	0	0	0	0	0	0	4	0	289	1153	417	19	2	3	630519
855	5	0	0	0	0	0	0	0	0	45	890	999	43	6	3	630520
855	5	0	0	0	0	0	0	1	1	45	890	999	2	168.8	1926	630521
855	5	0	0	0	0	0	0	1	1	0	0	0	294	69	15	630522
855	5	0	0	0	0	0	0	1	1	1	0	0	9	187.7	2348	630523
855	5	0	0	0	0	0	0	0	0	38	876	768	163	29	19	630524
855	5	0	0	0	0	0	0	0	0	4	0	0	10	186.2	1936	630525
855	5	0	0	0	0	0	0	2	0	17	591	988	408	129	27	630526
855	5	0	0	0	0	0	0	5	2	30	562	824	6	194.1	2186	630527
855	5	0	0	0	0	0	0	2	1	0	0	0	264	61	12	630528
855	5	0	0	0	0	0	0	2	1	0	0	1	9	189.7	1786	630529
855	5	0	0	0	0	0	0	2	2	48	565	898	398	100	25	630530
855	5	0	0	0	0	0	0	2	4	55	503	762	15	197.3	2070	630531
855	5	0	0	0	0	0	0	2	2	163	911	935	253	41	8	630532
855	5	0	0	0	0	0	0	2	2	163	911	935	9	190.9	1648	630533
855	5	0	0	0	0	0	0	4	4	135	800	745	378	79	21	630534
855	5	0	0	0	0	0	0	3	3	324	971	746	11	187.7	2530	630535
855	5	0	0	0	0	0	0	6	3	324	971	746	246	25	6	630536
855	5	0	0	0	0	0	0	15	7	324	971	746	5	184.4	1994	630537
855	5	0	0	0	0	0	0	0	0	286	828	590	207	60	8	630538
855	5	0	0	0	0	0	0	16	0	286	828	590	22	182.6	2388	630539
855	5	0	0	0	0	0	0	0	0	432	1010	541	137	11	1	630540
855	5	0	0	0	0	0	0	34	0	432	1010	541	20	179.9	1898	630541
855	5	0	0	0	0	0	0	8	3	425	784	388	120	33	3	630542
855	5	0	0	0	0	0	0	35	8	425	784	388	32	182.5	2243	630543
855	5	0	0	0	0	0	0	5	6	1	0	0	71	7	0	630544
855	5	0	0	0	0	0	0	6	2	1	0	0	30	178.2	1766	630545
855	5	0	0	0	0	0	0	62	3	1	0	10	8	6	2	630546
855	5	0	0	0	0	0	0	3	4	2	0	0	2	78.3	2276	630547
855	5	0	0	0	0	0	0	24	3	0	0	5	8	2	2	630548
855	5	0	0	0	0	0	0	1	0	0	0	0	4	76.2	1869	630549
855	5	0	0	0	0	0	0	49	1	4	0	17	6	4	4	630550
855	5	0	0	0	0	0	0	0	0	1	0	0	2	76.8	2215	630551
855	5	0	0	0	0	0	0	14	0	0	15	8	1	2	3	630552

Raw surface data as it appears on the DUCT63 tape. Marsden square 85.

Raw surface data as it appears on the DUCT63 tape. Marsden square 85.

85 3	1M11	11	18	5	5	3	1	0	1	0	2	57	0	28121	630599
85 4	1M11	17	47	286	333	250	222	190	110	89	85	53	0	28121	630600
85 5	1M11	17	29	7	4	7	2	0	3	0	1	104	0	28121	630601
85 5	1M11	37	1	232	529	441	497	411	243	175	116	85	0	28121	630602
85 5	1M11	0	32	18	4	8	2	1	2	1	0	151	0	28121	630603
85 6	1M11	43	0	75	495	612	737	741	555	340	216	129	0	28121	630604
85 6	1M11	0	46	13	9	9	1	0	6	1	4	291	0	28121	630605
85 7	1M11	67	58	19	199	402	761	896	743	644	416	212	0	28121	630606
85 7	1M11	0	0	0	9	7	4	1	5	2	3	381	0	28121	630607
85 8	1M11	86	75	0	45	203	497	742	719	686	469	266	0	28121	630608
85 9	1M11	0	0	0	12	10	6	1	4	0	3	380	0	28121	630609
85 9	1M11	111	105	34	16	57	172	430	582	667	458	282	0	28121	630610
85 10	1M11	128	93	0	2	11	53	172	267	426	353	304	0	28121	630611
85 10	1M11	0	0	0	30	16	8	1	1	2	4	229	0	28121	630612
85 11	1M11	87	85	20	18	13	16	84	132	269	200	195	0	28121	630613
85 12	1M11	0	0	0	0	0	6	30	54	116	82	116	0	28121	630614
85 12	1M11	51	47	16	13	8	5	1	1	2	0	45	0	28121	630615
85 13	1M11	0	0	0	5	0	2	2	25	39	45	47	0	28121	630616
85 13	1M11	31	17	5	0	0	2	0	4	0	1	20	0	28121	630617
85 14	1M11	0	0	0	0	0	0	3	9	16	12	18	0	28121	630618
85 14	1M11	16	22	7	5	3	0	1	2	1	2	14	0	28121	630619
85 15	1M11	4	4	2	0	3	2	0	3	7	9	3	0	28121	630620
85 15	1M11	0	0	0	1	3	0	0	1	1	2	14	0	28121	630621
85 16	1M11	3	0	0	0	0	0	1	4	3	1	3	0	28121	630622
85 16	1M11	0	2	0	2	1	0	1	1	1	1	2	0	28121	630623
85 17	1M11	0	0	0	0	0	0	1	1	0	1	3	0	28121	630624
85 17	1M11	3	0	0	0	0	0	0	1	1	1	2	0	28121	630625
85 18	1M11	0	0	0	0	0	0	0	0	0	0	2	0	28121	630626
85 18	1M11	1	0	0	0	0	0	0	0	1	1	1	0	28121	630627
85 18	1M11	0	0	0	0	0	0	0	0	0	0	0	0	28121	630628
85 19	1M11	1	0	1	1	0	0	0	0	1	1	0	0	28121	630629
85 19	1M11	0	0	0	0	0	0	0	0	1	1	0	0	28121	630630
85 20	1M11	1	0	0	0	0	0	0	0	0	0	0	0	28121	630631
85 20	1M11	0	2	0	0	0	0	0	0	0	0	1	0	28121	630632
85 21	1M11	0	0	0	0	0	0	0	0	0	0	0	0	28121	630633
85 21	1M11	0	0	0	0	0	0	0	0	0	0	0	0	28121	630634
85 22	1M11	0	0	0	0	0	0	0	0	0	0	0	0	28121	630635
85 22	1M11	0	0	0	0	0	0	0	0	0	0	0	0	28121	630636
85 22	1M11	0	23	8	17	21	38	46	35	34	24	13	0	28121	630637
85 22	1M11	10	7	4	1	0	0	0	0	0	1	31	0	28121	630638
85 22	1M11	0	286	77	49	27	26	41	28	43	21	20	0	28121	630639
85 22	1M11	8	5	1	0	2	0	0	0	0	0	18	0	28121	630640
85 23	1M11	0	224	232	231	135	92	113	66	59	48	35	0	28121	630641
85 3	2M11	8	15	3	2	3	1	0	0	0	1	29	0	28121	630642
85 4	2M11	0	12	253	493	372	384	340	190	143	82	77	0	28121	630643
85 4	2M11	0	0	0	0	0	0	0	0	0	0	51	0	28121	630644

Kaw surface data as it appears on the DUCT63 tape. Marsden square 85.

Raw surface data as it appears on the DUCT63 tape. Marsden square 85.