Miscellaneous Paper CERC-95-6
June 1995

US Army Corps of Engineers
Waterways Experiment Station

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by Charles E. Long

Prepared for U.S. Army Corps of Engineers
Washington, DC 20314-1000

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Final report

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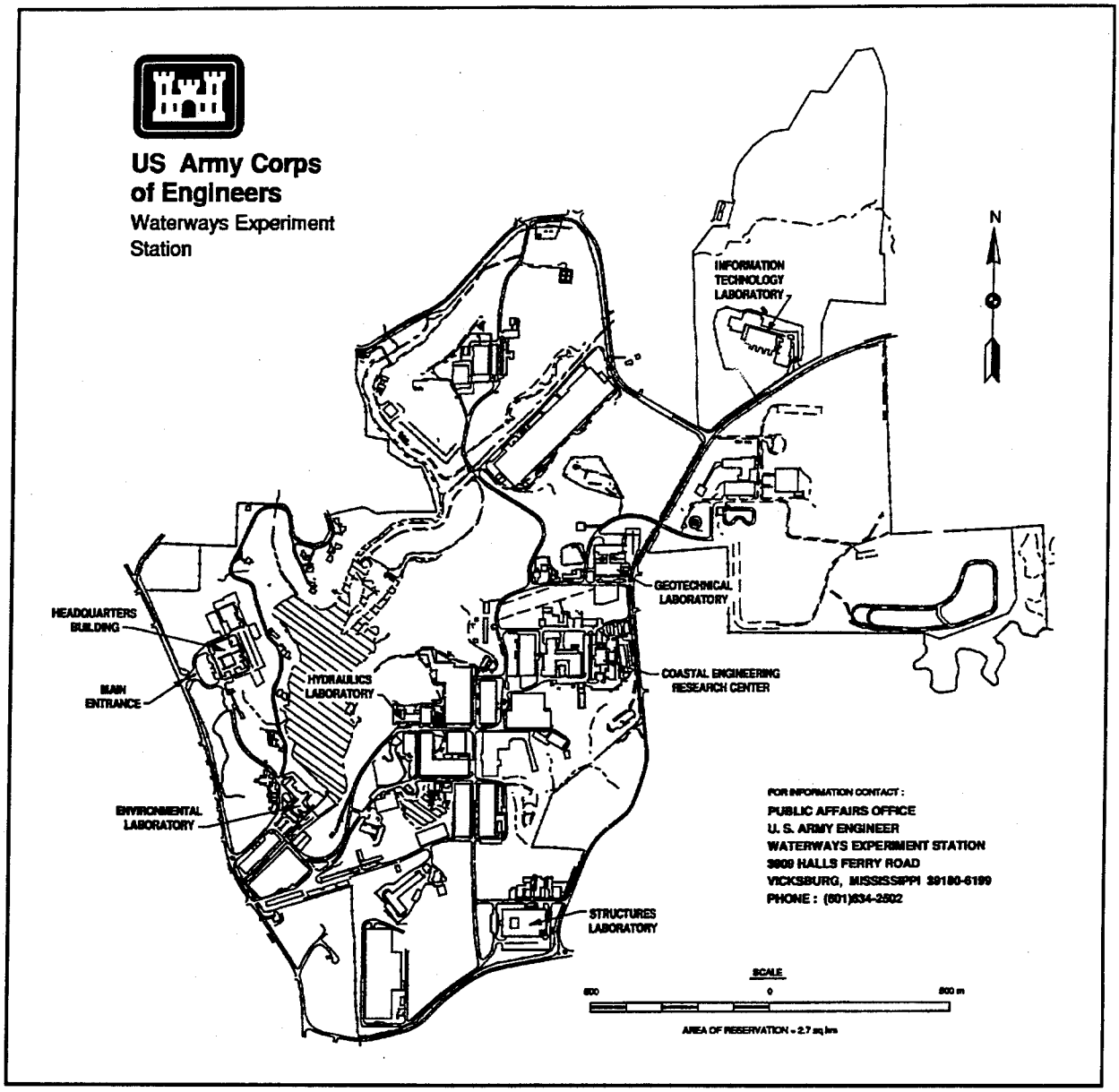

Waterways Experiment Station Cataloging-in-Publication Data

Long, Charles E.
1993 annual index of wind wave directional spectra measured at Harvest Platform / by Charles E. Long ; prepared for U.S. Army Corps of Engineers.
110 p. : ill. ; 28 cm. — (Miscellaneous paper ; CERC-95-6)
Includes bibliographic references.
1. Water waves — California — Statistics. 2. Wind waves — California — Statistics. 3. Ocean waves — California — Statistics. 4. Frequency spectra. I. United States. Army. Corps of Engineer. II. U.S. Army Engineer Waterways Experiment Station. III. Coastal Engineering Research Center (U.S. Army Engineer Waterways Experiment Station) IV. Title. V. Series: Miscellaneous paper (U.S. Army Engineer Waterways Experiment Station) ; CERC-95-6.
TA7 W34m no.CERC-95-6

Contents

Preface

This report indexes parameters of and describes a means of access to a series of frequency-direction spectral estimates made with a six-element, high-resolution directional wave gauge at Texaco Oil Company's Harvest Platform. The work was motivated by a need to publicize these results so they can be used by all investigators interested in natural wind wave energy distributions at a deepwater site near the exposed California coast. This effort was authorized by Headquarters, U.S. Army Corps of Engineers (HQUSACE), under Civil Works Coastal Flooding and Storm Protection Program Research Work Unit 32484, "Directionality of Waves in Shallow Water." Funds were provided through the Coastal Engineering Research Center (CERC), U.S. Army Engineer Waterways Experiment Station (WES), under the program management of Ms. Carolyn M. Holmes, CERC. Messrs. John H. Lockhart, Jr., Charles Chesnutt, Barry W. Holliday, and John F. C. Sanda were HQUSACE Technical Monitors.

This report was prepared by Dr. Charles E. Long at WES's Field Research Facility (FRF) in Duck, NC, under the direct supervision of Mr. William A. Birkemeier, Chief, FRF, and Mr. Thomas W. Richardson, Chief, Engineering Development Division (EDD), CERC. General supervision was provided by Dr. James R. Houston and Mr. Charles C. Calhoun, Jr., Director and Assistant Director, CERC, respectively.

Mr. David D. McGehee, Prototype Measurement and Analysis Branch, EDD, CERC, was instrumental in coordinating the efforts of CERC and the State of California in data archiving and gauge maintenance by the Coastal Data Information Program (CDIP) at Scripps Institution of Oceanography (SIO). Data transfer between SIO and the FRF was coordinated under the direction of Dr. Richard J. Seymour, CDIP, with particularly helpful assistance from Ms. Julianna Thomas, CDIP. Ms. Judy H. Roughton, FRF, produced Figure 1 of this report. The contributions of all of these individuals are gratefully acknowledged.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

1 Introduction

In late December 1992, a high-resolution directional wave measuring system became fully operational on Texaco Oil Company's Harvest Platform to make long-term observations of the deep-ocean wind wave climate in the vicinity of the Southern California Bight (Figure 1). Such observations are necessary to provide ground truth for interpreting satellite imagery of the ocean surface, test evolution and propagation models of open-ocean wind waves, and establish seaward boundary conditions for models of wave propagation and transformation from deep water to coastal regions. The purpose of this report is to encourage broad use of these observations by parametrically describing 2,339 wind wave frequency-direction spectral estimates obtained in calendar year 1993, and identifying a means whereby an investigator can access these spectra.

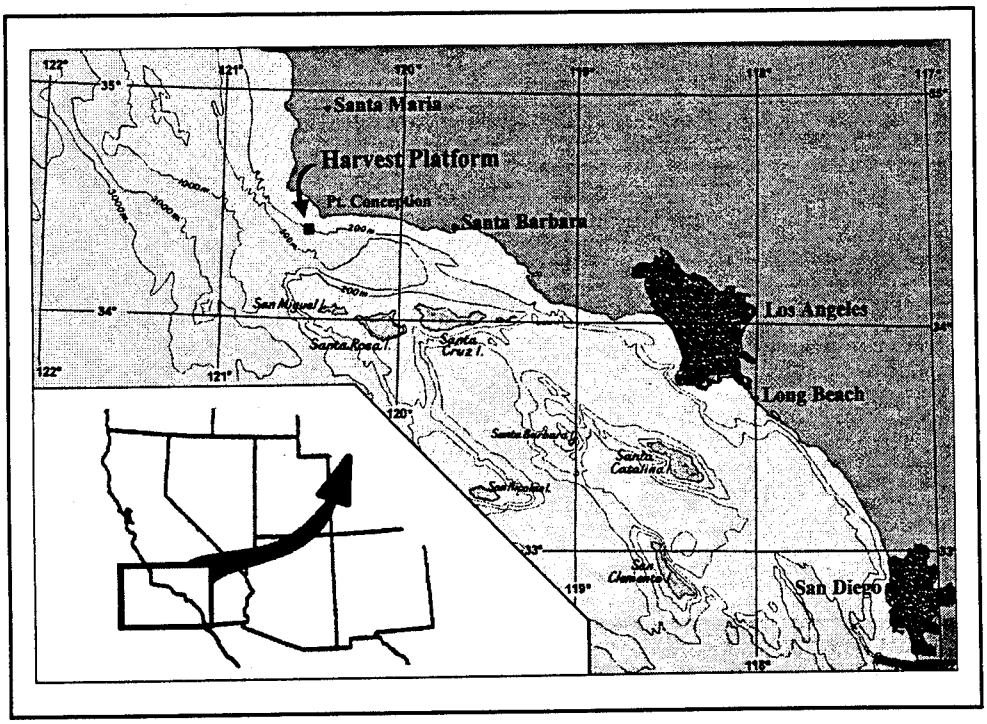

Figure 1. Southern California Bight and location of Harvest Platform

For completeness, this report briefly describes the directional gauge geometry and data collection scheme (Chapter 2), error checking procedures and basic directional estimation algorithm (Chapter 3), and definitions of parameters used to characterize the observations (Chapter 4). Appendix A contains a table of these characterizing parameters, and acts as an index for the 1993 database. Time series graphs of these parameters are presented in Appendix B. Chapter 5 describes how data can be obtained as well as the data format and file-naming scheme.

2 Directional Gauge

Gauge Location and Array Geometry

As indicated in Figure 1, Harvest Platform is located about 20 km (10.8 n.m.) west of Point Conception, California, in water with a mean depth of 202 m (663 ft). Waves originating in the greater Pacific Ocean can reach the platform via relatively unobstructed paths from the north, west, and south. The mean water depth ensures deepwater wave conditions for waves with lengths shorter than about 400 m (1,312 ft), or frequencies higher than about 0.06 Hz. Spectra reported herein are processed at frequencies between 0.04 and 0.16 Hz, so it is likely that directional spectra for frequencies between 0.04 and 0.06 Hz are affected somewhat by refraction.

Directional wave detection is achieved with a spatial array of six subsurface pressure gauges mounted on the Harvest Platform framework. Figure 2 shows a plan view of relative gauge positions, and the array orientation in a geophysical reference frame. Gauge spacing takes advantage of the maximum horizontal dimensions of Harvest Platform, and allows directional estimation for waves in the frequency band noted in the previous paragraph. All gauges are mounted at a depth of 15.72 m (51.57 ft) below mean sea level, which ensures they will not protrude through the sea surface under extreme wave conditions that have been observed at this site.[1] To avoid aliasing in directional estimation, the lower resolution wavelength limit is two times the shortest lag spacing of the array. In the Harvest Platform array, this limit is 45.4 m (149.0 ft), which corresponds to a wave frequency of about 0.18 Hz. Signal analysis used in this report was limited further to 0.16 Hz to be conservatively clear of aliasing effects.

Pressure Gauges and Data Path

Individual sensors were Model TJE absolute pressure sensors manufactured by Sensotec Transducer Company with operating ranges of 0 to 100 psia (0 to

[1] Personal communication, 1991, Dr. R. J. Seymour, Coastal Data Information Program (CDIP), Scripps Institution of Oceanography (SIO).

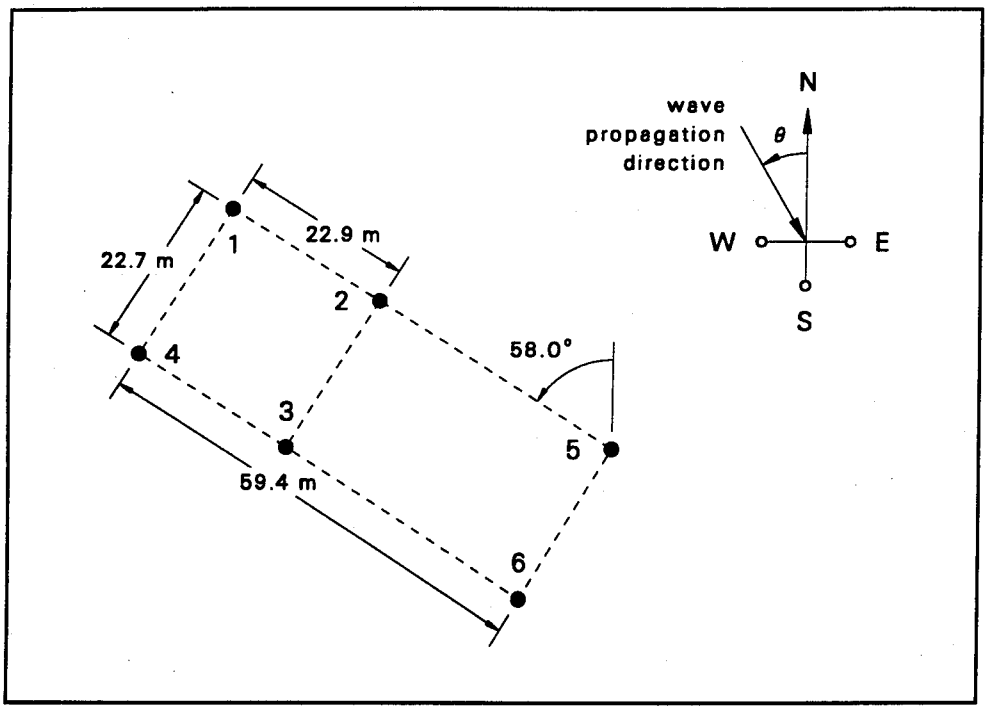

Figure 2. Dimensions and orientation of the Harvest Platform array

689.5 kPa), and a manufacturer's stated accuracy of ± 0.1 percent of full scale. The six gauges on Harvest Platform were sampled simultaneously at 1 Hz, digitized, and then fed to a concentrator where the set of samples was buffered. Buffered signals were periodically transmitted to shore through a telephone connection, and ultimately stored as collection files on the main computer of the CDIP, Ocean Engineering Research Group, SIO, La Jolla, CA. Each collection time series is 8,192 sec (2 hr 16 min 32 sec) in length.

Data processing for results presented in this report was not performed at the CDIP site, and so is independent of the processing done and published by that group (*Monthly reports*, Coastal Data Information Program). Data collections were transferred to the Field Research Facility (FRF) of the U.S. Army Engineer Waterways Experiment Station's Coastal Engineering Research Center for processing by high-resolution techniques that are different from those used by CDIP. Initially, data transfer was achieved by way of magnetic tape, but later was accomplished over an electronic network.

Collection Schedule and Data Set Size

Collections were made eight times daily, at approximately 3-hr intervals. From 1 January to 2 July 1993, nominal collection start times were 0100, 0400, 0700, 1000, 1300, 1600, 1900, and 2200 Greenwich Mean Time (GMT). From 3 July to 31 December 1993, nominal collection start times were 0200, 0500, 0800, 1100, 1400, 1700, 2000, and 2300 GMT. Actual collection start times varied by several minutes on either side of a given

nominal start time because the amount of time required to establish a phone link varied from collection to collection.

Of the maximum possible 2,920 collections during calendar year 1993, a total of 2,339 collections were acquired and processed. A number of collections were lost because of the inability to establish or maintain electrically clean phone links to the concentrator on Harvest Platform. An additional number of collections were not processed because data did not satisfy error-checking constraints described in Chapter 3 of this report.

3 Primary Data Analysis

Primary data processing was done by checking data quality through a series of spectral intercomparisons, and, for data of sufficient quality, computing frequency-direction spectra. All steps rely on Fourier analysis of pressure gauge time series data, and subsequent computation of cross-spectral densities. A discussion of error-checking procedures then leads logically to the subsequent steps involved in frequency-direction spectral computation.

Error Checking

The first step in data processing is computation of discrete estimates of frequency autospectra of pressure signals, and surface-corrected cross-spectral densities of signals from all pairs of gauges. Cross spectra are denoted $C_{ij}(f_n) - iQ_{ij}(f_n)$, where $C_{ij}(f_n)$ is the coincident spectrum, $Q_{ij}(f_n)$ is the quadrature spectrum, i and j are indices ranging in value from 1 to 6 that refer to the gauge numbers shown in Figure 2, and f_n is the n^{th} of a set of N discrete frequencies.[1] Frequency autospectra are denoted $S(f_n)$, and, if surface corrected with the linear wave pressure response function (Dean and Dalrymple 1984), are identically equal to $C_{ii}(f_n)$. All spectra are computed using Welch's method (Welch 1967) with standard Fourier analysis techniques (Bendat and Piersol 1971).

In a collection, the 8,192-sec time series from each gauge is analyzed in 15 half-lapped segments of 1,024 sec duration. Each segment is demeaned, tapered with a variance-preserving window, and converted to the frequency domain with a discrete Fourier transform. At this point, the analysis is split into two parts: estimates of pressure autospectra from each gauge at depth, and estimates of surface-corrected cross spectra of sea surface displacement. Raw cross-spectral estimates are formed for all gauge pairs using temporally corresponding transformed segments of pressure data corrected to represent sea surface displacement. Raw autospectral estimates are formed for each of the 15 transform segments for each individual gauge. At the error-checking stage, autospectral estimates are not surface corrected.

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[1] For convenience, symbols and abbreviations are listed in the notation (Appendix E).

For both autospectra and cross spectra, smooth estimates are formed by averaging raw estimates over all 15 segments, and averaging results over 10 adjacent frequency bands. Final resolution frequency bandwidth is $df = 0.00977$ Hz, and the pass band of frequencies ranges from 0.044 to 0.162 Hz, which corresponds to ($N =$) 13 discrete frequency bands. Degrees of freedom for spectral estimates range from 160 to about 200, depending on the extent to which the second halves of time series segments are correlated with the first halves (Welch 1967).

Autospectral intercomparisons

One part of error checking is a graphic intercomparison of signal means and autospectra, an example of which is shown in the lower left graph of Figure 3. Frequency autospectral estimates of data from all six pressure gauges are plotted on the same set of axes from the first resolvable frequency band out to the temporal Nyquist frequency. If a pressure gauge is malfunctioning, its autospectrum will deviate obviously from the main group of curves.

The small inset graph in the lower left graph of Figure 3 is an analysis of signal means. The closely packed group of symbols of nearly constant value represents the deviations of the segment means from the median of the set of segment means for each of the 15 segments. If a gauge develops signal drift problems, it will be obvious as a symbol that deviates from the main group of symbols. Triangle symbols in the small inset graph show the deviation of the indicated water surface from mean sea level (gauge height off the bottom plus median of gauge mean depths for each segment minus the total long-term mean ocean depth of 202 m), and is therefore an indication of tide stage at Harvest Platform for each of the 15 segments in a collection.

Coherence and phase comparisons

The next step in error checking is computation of a dimensionless cross spectrum $M_{ij}(f_n)$, defined by

$$M_{ij}(f_n) = \frac{C_{ij}(f_n) - iQ_{ij}(f_n)}{\sqrt{C_{ii}(f_n)}\sqrt{C_{jj}(f_n)}} \qquad (1)$$

Equation 1 is used in error checking in the form of coherence and phase estimates. Coherence of signals from gauges i and j at discrete frequency f_n is

$$\Gamma_{ij}^2(f_n) = |M_{ij}(f_n)|^2 \qquad (2)$$

Signal phase difference of gauge i relative to gauge j at frequency f_n is

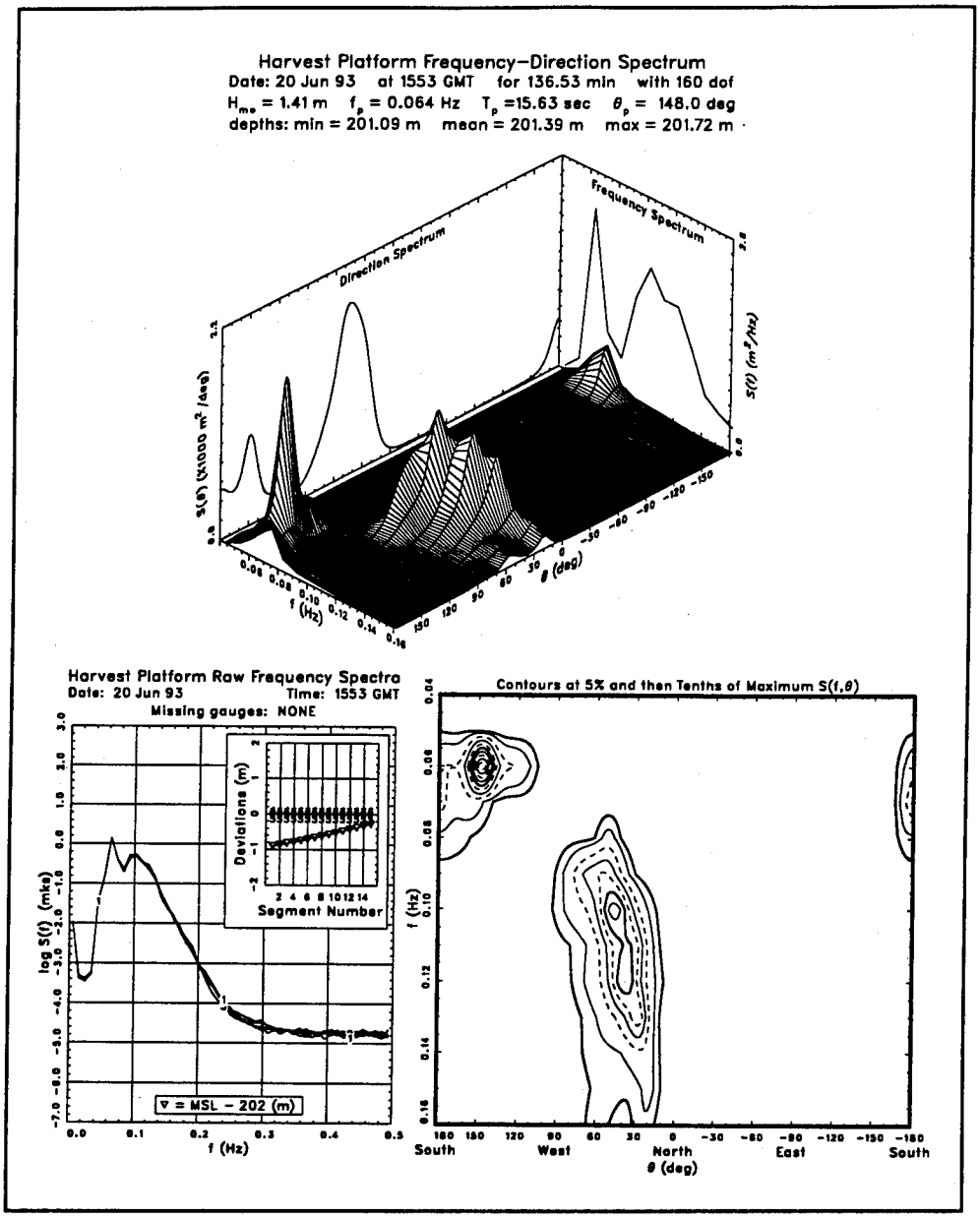

Figure 3. Autospectral intercomparison and frequency-direction spectral estimate

$$\phi_{ij}(f_n) = \tan^{-1}\left[\frac{\mathrm{Im}[M_{ij}(f_n)]}{\mathrm{Re}[M_{ij}(f_n)]}\right] \tag{3}$$

where Re[ ] and Im[ ] are the real and imaginary parts, respectively, of the entity contained in square brackets.

Signals from multiple pairs of gauges having redundant lag (or separation) vectors in a uniform wave field are expected to have identical cross spectra. In the Harvest Platform array there are several such sets of pairs as can be seen in Figure 2. In terms of coherences and phases, one would expect

$$\Gamma_{14}(f_n) = \Gamma_{23}(f_n) = \Gamma_{56}(f_n) \qquad \phi_{14}(f_n) = \phi_{23}(f_n) = \phi_{56}(f_n) \tag{4}$$

as well as

$$\Gamma_{12}(f_n) = \Gamma_{43}(f_n) \qquad \phi_{12}(f_n) = \phi_{43}(f_n) \tag{5}$$

and

$$\Gamma_{15}(f_n) = \Gamma_{46}(f_n) \qquad \phi_{15}(f_n) = \phi_{46}(f_n) \tag{6}$$

Figure 4 is an example of coherence and phase comparisons, showing graphs of the functions named in Equations 4, 5, and 6 (upper, middle, and lower sets of graphs in Figure 4, respectively). This type of error checking is useful for isolating cases where a data point is dropped during telephone transmission from the data buffer, resulting in an apparent temporal shift of data from one gauge relative to data from the other gauges. Such a shift causes a significant phase error in cross spectra, and is readily apparent in a graphic display like Figure 4.

The combined effects of intercomparing frequency autospectra and coherence and phase functions for the pressure gauge array on Harvest Platform provide clear indications of faulty or suspect data. When such conditions are detected in a collection, frequency-direction spectra are not computed. Such rigorous examination of the data ensures that only high-quality time series are used in directional estimation.

Frequency-Direction Spectra

Estimates of frequency-direction spectra are made using the iterative maximum likelihood estimator (IMLE) developed by Pawka (1983). Estimates are made by iterative approximations of directional distribution functions $D(f_n, \theta_m)$, which are related to corresponding frequency-direction spectra $S(f_n, \theta_m)$ by

$$D(f_n, \theta_m) = \frac{S(f_n, \theta_m)}{S(f_n)} \tag{7}$$

where θ_m is a discrete angle indicating the direction from which wave energy arrives, measured counterclockwise from true north (Figure 2), and $S(f_n)$ is the (surface-corrected) frequency spectrum. The direction index m ranges from $m = 1$ to $m = M = 181$, while direction ranges from $\theta_1 = -180$ deg to $\theta_{181} = 180$ deg in steps of $d\theta = 2$ deg. The directional distribution function has the property

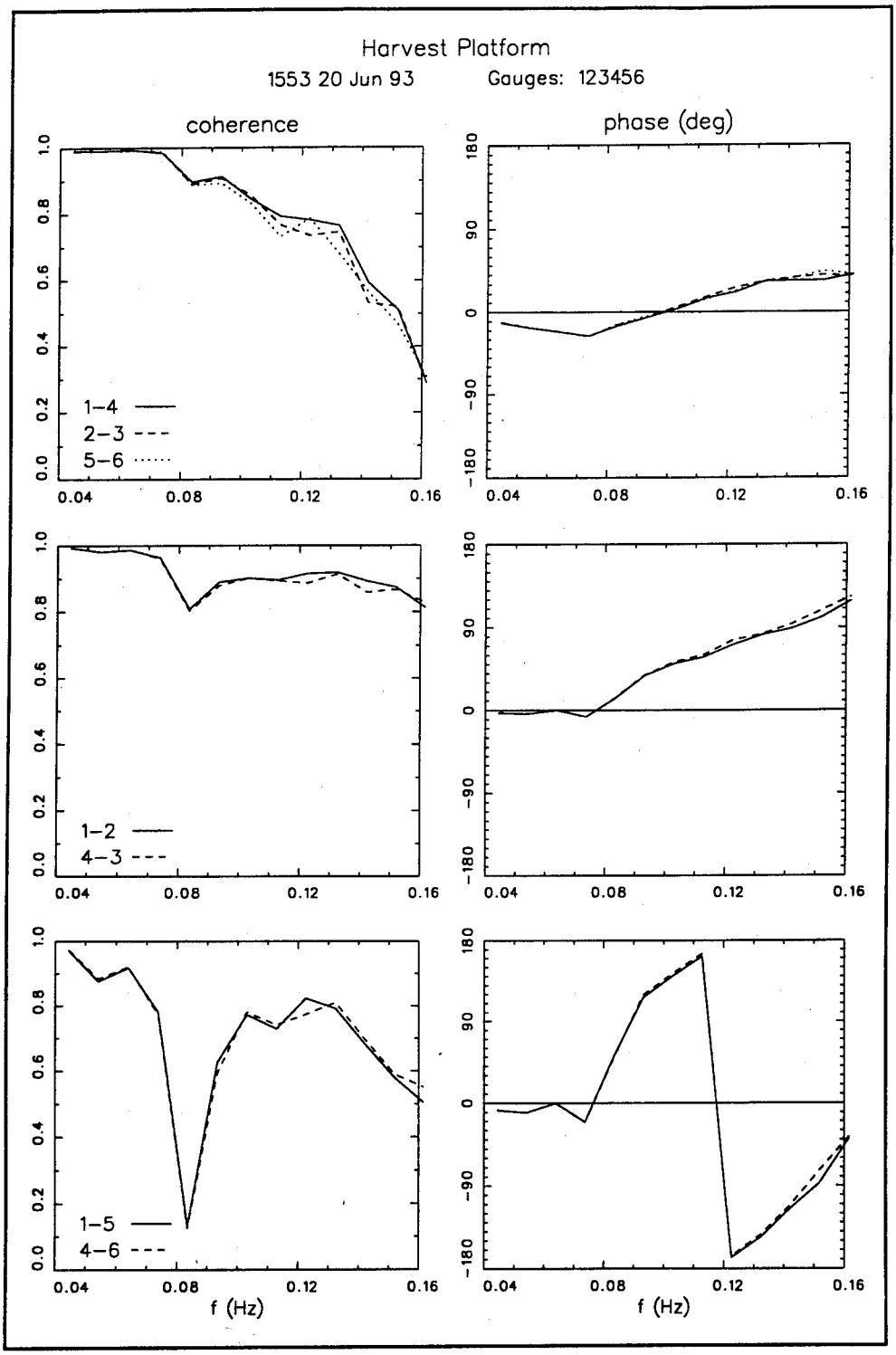

Figure 4. Sample coherence and phase function comparisons

$$\sum_{m=1}^{M} D(f_n, \theta_m)\, d\theta = 1 \qquad (8)$$

which must be satisfied in all estimates.

The lowest order estimate is the maximum likelihood estimate described by Davis and Regier (1977), which takes the form

$$D_0(f_n,\theta_m) = \frac{a_0}{d\theta \sum_{i=1}^{I}\sum_{j=1}^{I} M_{ij}^{-1}(f_n)\, e^{i\vec{k}_n(\theta_m)\cdot(\vec{x}_i-\vec{x}_j)}} \tag{9}$$

where a_0 is a factor of order 1 that is used to satisfy Equation 8, I is the number of gauges, the $M_{ij}^{-1}(f_n)$ are elements of the inverse of the dimensionless cross-spectral matrix defined by Equation 1, $\vec{k}_n(\theta_m)$ is the wave number vector, and $\vec{x}_i$ and $\vec{x}_j$ are coordinate position vectors of gauges i and j, respectively. The wave number vector $\vec{k}_n(\theta_m)$ is

$$\vec{k}_n(\theta_m) = k_n \cos\theta_m \hat{e}_x + k_n \sin\theta_m \hat{e}_y \tag{10}$$

where $\hat{e}_x$ and $\hat{e}_y$ are spatial coordinate unit vectors in the x- and y-directions, respectively, and k_n is wave number vector magnitude, which is related with gravitational acceleration g to frequency f_n and water depth d through the linear wave dispersion relation

$$4\pi^2 f_n^2 = g k_n \tanh k_n d \tag{11}$$

As used in this report, horizontal coordinates are such that x increases to the north, and y increases to the west.

An IMLE result is achieved by iterating through several computational steps. At the r^{th} iteration, an estimate ${}^{r}M_{ij}(f_n)$ of the observed cross-spectral matrix $M_{ij}(f_n)$ is computed from the previous directional distribution function estimate $D_{r-1}(f_n,\theta_m)$ by

$${}^{r}M_{ij}(f_n) = \sum_{m=1}^{M} D_{r-1}(f_n,\theta_m)\, e^{i\vec{k}_n(\theta_m)\cdot(\vec{x}_i-\vec{x}_j)}\, d\theta \tag{12}$$

A new intermediate directional distribution function estimate $D_r'(f_n,\theta_m)$ is computed using the cross-spectral matrix of Equation 12 in the expression

$$D_r'(f_n,\theta_m) = \frac{a_r}{d\theta \sum_{i=1}^{I}\sum_{j=1}^{I} {}^{r}M_{ij}^{-1}(f_n)\, e^{i\vec{k}_n(\theta_m)\cdot(\vec{x}_i-\vec{x}_j)}} \tag{13}$$

where a_r is adjusted so that Equation 8 is satisfied for $D_r'(f_n, \theta_m)$. A correction is found for $D_r'(f_n, \theta_m)$ by first computing

$$\lambda_r(f_n, \theta_m) = 1 - \frac{D_r'(f_n, \theta_m)}{D_0(f_n, \theta_m)} \tag{14}$$

and then finding a new directional distribution function estimate $D_r(f_n, \theta_m)$ from

$$D_r(f_n, \theta_m) = D_r'(f_n, \theta_m) \left[1 + \frac{|\lambda_r(f_n, \theta_m)|^{\beta+1}}{\gamma \lambda_r(f_n, \theta_m)} \right] \tag{15}$$

The parameters β and γ in Equation 15 control the rate of convergence of the estimator. As used by Pawka (1983), the values $\beta = 1$ and $\gamma = 5$ were used for all estimates discussed in this report.

In each iterative loop, a convergence check ϵ_r is computed as the sum of the squares of the magnitudes of the differences of elements of the estimated cross spectrum of Equation 12 and the measured cross spectrum of Equation 1. This takes the form

$$\epsilon_r = \sum_{i=1}^{I} \sum_{j=1}^{I} |{}^{r}M_{ij}(f_n) - M_{ij}(f_n)|^2 \tag{16}$$

Iteration continues as long as ϵ_r decreases between successive iterations, or until an upper limit R of iterations has been completed. In computations reported herein, $R = 30$.

Equations 9 to 16 form the basis of the IMLE technique. For the iteration r that satisfies the convergence check, the frequency-direction spectrum at f_n is formed from

$$S(f_n, \theta_m) = S(f_n) D_r(f_n, \theta_m) \tag{17}$$

The complete frequency-direction spectrum is formed when Equations 9 through 17 are evaluated for all frequencies.

An example of such a spectrum is illustrated in Figure 3. The upper graph is a three-dimensional plot of $S(f_n, \theta_m)$, and the lower right graph is a contour plot of the spectrum. The right panel in the three-dimensional plot is a linear graph of the discrete frequency spectrum $S(f_n)$, which is related to the frequency-direction spectrum through Equations 7 and 8 by

$$S(f_n) = \sum_{m=1}^{M} S(f_n, \theta_m)\, d\theta \tag{18}$$

The left panel in the three-dimensional plot is a linear graph of the direction spectrum $S(\theta_m)$, which is the directional analog of the frequency spectrum. The direction spectrum is defined by

$$S(\theta_m) = \sum_{n=1}^{N} S(f_n, \theta_m)\, df \tag{19}$$

Because $S(\theta_m)$ represents total wave energy in each direction bin, it is a particularly useful function from which to derive direction-sensitive characterizing parameters for a given frequency-direction spectrum as a whole. A set of such characterizing parameters is defined in Chapter 4.

4 Characterizing Parameters

To effect a summary description of the Harvest Platform database, frequency-direction spectra are characterized with a set of parameters. These descriptors are called bulk parameters because they are derived from extremal or integral properties of spectra, and so represent only part of the frequently more detailed directional structure of the wind wave field. A more exhaustive treatment of directional spectral structure for the 1993 collection year is given by Long (in preparation). In this report, nine parameters are used. These parameters are: characteristic wave height, peak frequency, two measures of characteristic direction, two measures of directional spread, two measures of asymmetry of directionally distributed wave energy, and a measure of kurtosis of directional distributions. This chapter contains the mathematical definitions of these parameters.

Wave Height, Peak Frequency, and Peak Direction

Characteristic wave height H_{mo} is defined using the conventional definition of 4 times sea surface displacement variance. H_{mo} can be defined in terms of the full frequency-direction spectrum, the frequency spectrum defined by Equation 18, or the direction spectrum defined by Equation 19. A definition that relates all of these entities is

$$\frac{H_{mo}^2}{16} = \sum_{m=1}^{M} \sum_{n=1}^{N} S(f_n, \theta_m)\, df\, d\theta = \sum_{n=1}^{N} S(f_n)\, df = \sum_{m=1}^{M} S(\theta_m)\, d\theta \qquad (20)$$

It should be noted that H_{mo} reported herein is lower than what would be found in conventional analysis because directional computations were truncated at 0.16 Hz instead of the nominal 0.3-Hz limit for wind waves. Consequently, contributions to H_{mo} from high-frequency parts of wind wave spectra are not represented.

Peak frequency f_p is defined as the discrete frequency at which the frequency spectrum $S(f_n)$ is maximum. This definition is conventional, in that it is the usual characteristic frequency defined for nondirectional gauges. For convenience, Appendix A lists both f_p and its inverse, peak period T_p (= $1/f_p$).

Peak direction θ_p is defined as the direction of maximum variance density in the directional distribution associated with the peak frequency. In symbols, θ_p is the discrete direction at which $S(f_p, \theta_m)$ is a maximum. It is interpreted as the direction of the most energetic waves at the frequency containing the greatest overall energy.

Circular Moment Parameters

Kuik, van Vledder, and Holthuijsen (1988) proposed a useful set of parameters that define mean wave direction, directional spread, skewness, and kurtosis based on circular moments of directional distribution functions. Though derived for directional distributions at individual frequencies, the definitions can be applied to any directional distribution function. For the purposes of characterizing a frequency-direction spectrum as a whole, the direction spectrum $S(\theta_m)$, as defined by Equation 19, is used herein because it represents total wave energy in any given direction arc.

To define a directional distribution function (one that integrates to unit area) from the direction spectrum, $S(\theta_m)$ must be normalized by its own area. By Equation 20, this area is identically $\frac{1}{16} H_{mo}^2$, so the appropriate directional distribution function is

$$D(\theta_m) = \frac{16}{H_{mo}^2} S(\theta_m) \qquad m = 1, 2, \ldots, M \tag{21}$$

Circular moments in terms of $D(\theta_m)$ adapted from definitions by Kuik, van Vledder, and Holthuijsen (1988) are

$$m_1 = \sum_{m=1}^{M} \cos(\theta_m - \theta_0) D(\theta_m) d\theta \tag{22}$$

$$n_1 = \sum_{m=1}^{M} \sin(\theta_m - \theta_0) D(\theta_m) d\theta \tag{23}$$

$$m_2 = \sum_{m=1}^{M} \cos(2\theta_m - 2\theta_0) D(\theta_m) d\theta \tag{24}$$

$$n_2 = \sum_{m=1}^{M} \sin(2\theta_m - 2\theta_0) D(\theta_m) d\theta \tag{25}$$

where θ_0 is the mean direction defined by requiring $n_1 = 0$. With this constraint, Equation 23 can be solved to find

$$\theta_0 = \tan^{-1}\left[\frac{\sum_{m=1}^{M} D(\theta_m)\sin\theta_m\, d\theta}{\sum_{m=1}^{M} D(\theta_m)\cos\theta_m\, d\theta}\right] \tag{26}$$

With θ_0 determined by Equation 26, moments m_1, m_2, and n_2 can be computed from Equations 22, 24, and 25, respectively.

Kuik, van Vledder, and Holthuijsen (1988) define a measure of directional spread (herein called *circular width*) σ as

$$\sigma = \left(2 - 2m_1\right)^{1/2} \tag{27}$$

a measure of asymmetry of a directional distribution (*circular skewness*) γ as

$$\gamma = \frac{-n_2}{\left(\frac{1}{2} - \frac{1}{2}m_2\right)^{3/2}} \tag{28}$$

and a measure of the flatness of a directional distribution (*circular kurtosis*) δ, as

$$\delta = \frac{6 - 8m_1 + 2m_2}{\left(2 - 2m_1\right)^2} \tag{29}$$

Quartile Parameters

Two parameters that are modestly more intuitive than the corresponding circular parameters, and are also useful for characterizing spread and asymmetry in directional distribution functions are the *quartile spread* $\Delta\theta$ and *quartile asymmetry* A used by Long and Oltman-Shay (1991). The concept is based on the fact that any directional distribution function integrates to unity such that an integral from the direction of minimum energy $\theta_{m_{min}}$ (where m_{min} is the discrete direction index at which minimum energy occurs) to any arbitrary angle creates a function $I(\theta_m - \theta_{m_{min}})$ that increases monotonically from zero to an upper limit of unity. The directions at which this integral (interpolated as necessary from discrete data) has the values $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ are the first quartile, median, and third quartile directions of the directional distribution, respectively. Differences among these directions then provide information about the spread and asymmetry of the distribution.

Using $D(\theta_m)$ as a representative directional distribution function, the integral function is

$$I(\theta_m - \theta_{m_{min}}) = \sum_{l=m_{min}}^{m} D(\theta_l)\, d\theta \tag{30}$$

where the cyclic nature of the distribution function is employed if necessary. Quartile directions satisfy

$$I(\theta_{25\%} - \theta_{m_{min}}) = 0.25 \tag{31}$$

$$I(\theta_{50\%} - \theta_{m_{min}}) = 0.50 \tag{32}$$

and

$$I(\theta_{75\%} - \theta_{m_{min}}) = 0.75 \tag{33}$$

A measure of directional spread $\Delta\theta$ is the span of the two middle quartiles

$$\Delta\theta = \theta_{75\%} - \theta_{25\%} \tag{34}$$

and has the specific interpretation that it is the arc subtending the central 50 percent of the energy distribution.

A measure of asymmetry of a distribution is the ratio of the directional width of the third quartile to that of the second quartile. By taking the natural logarithm of this ratio, a symmetric distribution has an asymmetry parameter A near zero, and that for a skewed distribution acquires a positive or negative sign if the skewness is toward larger or smaller angles, respectively. The asymmetry parameter is thus defined as

$$A = \ln\left[\frac{\theta_{75\%} - \theta_{50\%}}{\theta_{50\%} - \theta_{25\%}}\right] \tag{35}$$

Summary of Parameters

The nine bulk parameters (H_{mo}, f_p, θ_p, θ_0, σ, γ, δ, $\Delta\theta$, A) defined here are useful for classifying general wind wave energy distributions. For reference as an index of processed data from the 1993 collection year, these parameters are listed in Appendix A, and plotted as time series in Appendix B. Graphs in Appendix B provide an overview of the directional wave climate at

Harvest Platform, and specific parametric values can be determined from the listing in Appendix A. An evaluation of the accuracy of these parameters, relationships among these parameters, and examples of frequency-direction spectra classified by ranges of these parameters are given by Long (in preparation).

5 Accessing Spectra

Frequency-direction spectra computed from Harvest Platform data are currently stored on electro-optical media in binary, unformatted form, and so are not "on-line" in the sense of common data networks. Nonetheless, an individual interested in obtaining these spectra can readily do so by communicating with the FRF via:

Surface mail	Chief, Field Research Facility 1261 Duck Road Kitty Hawk, NC 27949-4472
Telephone	(919) 261-3511
FAX	(919) 251-4432

or any of the following internet addresses:

long@duck.wes.army.mil
baron@duck.wes.army.mil
bill@duck.wes.army.mil

On request, all or part of the spectral database can be converted to 80-column ASCII format and copied either to portable magnetic tape media or to an anonymous file transfer protocol (ftp) account that is accessible through common computer networks. Data will be in the form of a set of files with one spectral estimate per file. Files will be named HP*yymmddhhmm*.ASC, where *yymmdd* represents year, month, and day, and *hhmm* represents hour and minute (GMT) of a collection start time from which a spectrum is estimated. For convenience, dates and times of parameter listings in Appendix A are in the *yymmdd* and *hhmm* mnemonic forms.

On receipt by a user, spectral data files can be read using the format statements shown in the sample FORTRAN program listed in Appendix C. The header of the FORTRAN program listing identifies all the variables contained in a data file. For reference, Appendix D is a listing of a sample data file, and shows locations of variables within the file.

6 Summary

This is one of a series of reports describing results from a high-resolution directional wave gauge installed on the Texaco Oil Company Harvest Platform. The purpose of this gauge is long-term monitoring of the directional wind wave climate at a deepwater site that can be used to represent open ocean conditions for waves approaching the coast of southern California. This report indexes parameters of and describes a means of access to 2,339 frequency-direction spectral observations made during calendar year 1993, the first full year of operation.

The primary intent of this report is to publicize these observations so that they can be used by researchers interested in seaward boundary conditions in coastal wave propagation models, studies of ocean wave evolution, comparison studies with locally deployed low-resolution directional wave gauges, and ground truth in remote sensing research and tests. Improved knowledge resulting from such studies will enhance abilities to model the physics of open ocean wave processes, and the consequent nearshore wave climate required in coastal engineering computations as such waves propagate landward.

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Appendix A
Table of Collection Times and Bulk Parameters

Table A1
Collection Times and Bulk Parameters

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930101	0100	1.79	0.083	12.0	80	75	0.77	0.83	3.25	52	-0.18
930101	0734	1.61	0.093	10.7	62	74	0.63	1.62	4.46	36	0.53
930101	1000	1.57	0.093	10.7	54	71	0.62	1.63	4.49	35	0.69
930101	1302	1.75	0.093	10.7	58	67	0.56	1.97	5.48	23	0.56
930101	1600	1.85	0.093	10.7	54	67	0.59	2.02	5.43	29	0.79
930101	2200	1.58	0.093	10.7	54	73	0.58	1.52	4.84	35	0.49
930102	0108	1.68	0.093	10.7	56	74	0.57	1.57	5.22	35	0.53
930102	0400	1.80	0.103	9.7	60	73	0.51	1.49	6.07	31	0.57
930102	0700	1.51	0.103	9.7	60	77	0.59	1.19	4.73	36	0.11
930102	2200	1.88	0.132	7.6	60	69	0.53	0.77	5.45	33	0.10
930103	2200	1.31	0.132	7.6	54	57	0.54	1.39	5.95	30	0.11
930107	0657	1.42	0.083	12.0	172	136	0.94	-0.34	1.93	97	-0.65
930107	1557	1.60	0.132	7.6	150	132	0.79	-0.33	2.32	71	-0.22
930107	2211	2.02	0.123	8.2	122	119	0.74	0.07	2.31	68	0.04
930108	0100	2.02	0.132	7.6	68	111	0.76	0.14	2.20	74	-0.08
930108	0357	1.96	0.123	8.2	52	109	0.78	0.03	2.11	75	-0.30
930108	0700	1.93	0.123	8.2	124	103	0.74	0.16	2.33	66	-0.11
930108	0951	2.00	0.113	8.9	60	96	0.72	0.36	2.46	62	0.03
930108	1712	2.26	0.113	8.9	70	95	0.65	0.09	2.78	56	0.09
930108	1900	2.39	0.093	10.7	68	93	0.64	0.14	2.87	55	0.21
930109	0059	2.58	0.103	9.7	74	86	0.59	0.31	3.26	44	0.50
930109	0400	2.60	0.103	9.7	72	86	0.59	0.41	3.28	47	0.50
930109	1000	2.31	0.093	10.7	68	79	0.58	0.87	3.94	41	0.42
930109	1257	2.28	0.093	10.7	60	79	0.60	0.86	3.90	43	0.36
930109	1857	2.28	0.093	10.7	46	67	0.63	0.91	3.73	44	0.47
930109	2158	2.35	0.093	10.7	70	68	0.58	1.01	4.28	37	-0.08
930110	0058	2.13	0.093	10.7	70	67	0.65	0.87	3.45	48	0.08
930110	0358	2.04	0.054	18.5	72	69	0.65	1.00	3.56	47	-0.07
930110	0658	2.17	0.083	12.0	46	69	0.64	1.20	3.71	43	0.54
930110	1259	2.13	0.083	12.0	48	64	0.59	1.31	4.32	37	0.67
930110	1558	2.07	0.083	12.0	56	67	0.62	1.23	4.05	39	0.40
930110	2158	1.85	0.083	12.0	58	68	0.61	1.18	4.17	36	0.59

(Sheet 1 of 44)

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930112	0352	1.69	0.103	9.7	32	78	0.75	0.41	2.27	72	0.24
930112	0649	1.69	0.113	8.9	58	81	0.74	0.17	2.24	69	0.31
930112	0952	1.58	0.103	9.7	60	78	0.73	0.35	2.28	70	0.29
930113	0652	2.35	0.123	8.2	176	-163	0.85	0.09	2.35	82	1.24
930113	0952	1.64	0.123	8.2	180	170	0.86	-0.44	2.57	63	-0.30
930113	1252	1.42	0.123	8.2	180	148	0.88	-0.54	2.26	82	-0.68
930113	1552	1.39	0.132	7.6	176	132	0.87	-0.14	2.02	92	-0.34
930113	1914	1.84	0.113	8.9	140	123	0.76	-0.22	2.88	61	-0.47
930113	2205	2.35	0.123	8.2	128	114	0.63	0.17	2.90	51	-0.14
930114	0353	2.56	0.103	9.7	86	101	0.60	0.62	3.44	45	0.49
930114	0652	2.45	0.103	9.7	122	112	0.62	0.16	3.16	47	-0.10
930114	0952	3.51	0.103	9.7	116	108	0.53	0.24	4.15	37	-0.10
930114	1252	4.71	0.083	12.0	90	99	0.44	0.29	5.86	28	0.30
930114	1552	4.53	0.083	12.0	96	100	0.47	0.01	5.38	28	0.18
930114	1852	4.42	0.074	13.6	96	99	0.47	-0.05	5.04	28	0.19
930114	2159	3.85	0.083	12.0	100	99	0.52	-0.21	4.16	35	-0.07
930115	0055	3.53	0.083	12.0	118	97	0.55	-0.20	3.75	43	-0.26
930115	0352	3.30	0.083	12.0	92	96	0.72	-0.05	3.09	56	0.23
930115	0652	2.94	0.083	12.0	90	94	0.56	-0.03	3.74	42	0.08
930115	0953	2.47	0.093	10.7	86	94	0.58	0.08	3.63	45	0.13
930115	1901	2.28	0.162	6.2	-100	165	1.19	0.41	1.38	144	1.21
930115	2154	1.93	0.074	13.6	124	112	0.92	1.39	3.01	65	-0.27
930116	0052	1.77	0.074	13.6	62	98	0.73	0.49	3.30	62	-0.07
930116	0351	1.73	0.074	13.6	76	97	0.64	0.37	3.22	53	0.18
930116	0652	1.73	0.074	13.6	66	95	0.63	0.43	3.03	54	0.42
930116	0952	1.68	0.074	13.6	66	97	0.62	0.40	2.94	55	0.38
930116	1252	1.62	0.103	9.7	124	102	0.64	0.06	3.07	53	-0.06
930116	1552	1.83	0.074	13.6	120	103	0.60	-0.24	3.18	49	-0.83
930116	1852	1.87	0.074	13.6	124	107	0.60	-0.26	3.19	48	-0.86
930116	2151	1.77	0.103	9.7	124	101	0.63	-0.07	2.84	55	-0.51
930117	0052	1.74	0.083	12.0	112	93	0.61	0.25	3.30	51	-0.19
930117	0345	1.61	0.103	9.7	64	92	0.65	0.41	3.31	53	0.18
930117	0652	1.44	0.113	8.9	62	95	0.68	0.34	3.00	57	0.13
930117	0952	1.35	0.074	13.6	72	98	0.68	0.27	2.76	59	0.30
930117	1252	1.28	0.064	15.6	62	96	0.72	0.24	2.56	67	0.29
930117	1551	1.19	0.064	15.6	70	89	0.74	0.67	2.74	64	0.97
930117	1852	1.22	0.064	15.6	60	94	0.76	0.63	2.47	70	0.73
930117	2152	1.20	0.064	15.6	78	95	0.74	0.68	2.59	67	0.86
930118	0051	1.29	0.064	15.6	78	119	0.79	-0.03	2.13	78	-0.20
930118	0352	1.68	0.132	7.6	146	134	0.68	-0.81	3.07	53	-0.65
930118	0652	2.06	0.132	7.6	134	130	0.58	-0.62	4.01	38	-0.13
930118	0951	2.83	0.103	9.7	130	124	0.49	-0.58	5.29	28	-0.42
930118	1252	3.12	0.093	10.7	126	119	0.51	-0.45	5.12	30	-0.36
930118	1552	3.75	0.083	12.0	126	115	0.45	-0.33	6.28	28	-0.45
930118	1852	3.57	0.083	12.0	122	118	0.46	-0.16	6.61	25	-0.20
930118	2151	3.30	0.083	12.0	124	117	0.44	-0.01	6.63	27	-0.19
930119	0051	3.44	0.083	12.0	124	113	0.46	0.10	5.99	29	-0.21
930119	0352	3.69	0.083	12.0	92	104	0.46	0.11	5.72	31	0.16
930119	0651	3.82	0.083	12.0	90	95	0.45	-0.10	5.48	30	0.20
930119	0952	3.32	0.093	10.7	110	87	0.54	-0.13	3.72	43	-0.04
930119	1252	2.77	0.093	10.7	100	80	0.62	0.08	3.13	51	-0.05
930119	1901	2.24	0.123	8.2	94	71	0.66	0.29	3.08	54	0.01
930119	2152	1.97	0.113	8.9	58	71	0.68	0.35	2.85	57	0.00
930120	0352	1.52	0.132	7.6	92	76	0.80	0.35	2.51	70	-0.27
930120	0653	1.35	0.123	8.2	96	77	0.80	0.54	2.51	65	-0.15

(Sheet 2 of 44)

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930120	0953	1.22	0.132	7.6	54	84	0.85	0.60	2.34	70	0.11
930120	1554	1.02	0.074	13.6	64	105	0.89	0.35	1.99	92	0.58
930120	1859	1.19	0.074	13.6	56	92	0.84	0.95	2.43	79	0.88
930120	2156	1.80	0.074	13.6	62	74	0.66	2.19	4.48	28	0.55
930121	0129	2.69	0.074	13.6	58	66	0.59	2.49	6.03	25	0.54
930121	0352	3.03	0.064	15.6	58	64	0.52	2.42	7.51	20	0.54
930121	0652	3.42	0.074	13.6	62	65	0.44	2.47	9.96	16	0.33
930121	0952	3.33	0.074	13.6	54	68	0.53	1.88	6.59	29	0.38
930121	1252	3.29	0.074	13.6	58	70	0.50	1.36	6.70	29	0.20
930121	1555	3.30	0.074	13.6	56	67	0.50	1.03	6.35	30	0.41
930121	1928	2.96	0.074	13.6	54	69	0.53	0.91	5.48	36	0.43
930121	2201	2.95	0.074	13.6	56	69	0.50	0.87	6.04	31	0.24
930122	0050	2.75	0.074	13.6	60	72	0.53	0.81	5.24	33	0.35
930122	0352	2.62	0.083	12.0	54	72	0.55	0.57	4.09	42	0.16
930122	0651	2.70	0.083	12.0	64	71	0.50	0.46	4.78	33	0.29
930122	0951	2.59	0.083	12.0	58	69	0.52	0.69	4.58	37	0.52
930122	1251	2.32	0.083	12.0	54	69	0.56	0.79	4.20	40	0.63
930122	1551	2.25	0.083	12.0	58	74	0.54	0.51	4.47	38	0.19
930122	1851	2.23	0.083	12.0	64	77	0.54	0.22	4.00	41	0.38
930122	2131	2.39	0.083	12.0	72	71	0.53	0.18	3.87	40	0.06
930123	0049	3.20	0.083	12.0	54	63	0.49	0.45	3.95	35	0.52
930123	0350	3.40	0.083	12.0	54	60	0.50	0.46	4.12	36	0.29
930123	0650	3.22	0.083	12.0	54	59	0.51	0.48	4.27	33	0.23
930123	0947	3.39	0.083	12.0	52	56	0.49	0.53	4.27	35	0.24
930123	1250	3.23	0.083	12.0	52	57	0.46	0.52	4.94	32	0.22
930123	1552	2.87	0.083	12.0	52	56	0.50	0.77	4.66	34	0.22
930123	1850	2.90	0.083	12.0	50	55	0.48	0.55	4.55	36	0.14
930123	2150	3.21	0.083	12.0	56	57	0.44	0.50	6.07	27	0.01
930124	0350	2.24	0.083	12.0	48	55	0.51	0.88	5.26	33	0.28
930124	0651	2.03	0.074	13.6	42	59	0.53	0.64	4.94	38	0.09
930124	0949	2.01	0.083	12.0	50	58	0.48	0.91	5.63	31	0.28
930124	1251	1.99	0.083	12.0	46	58	0.45	0.97	6.72	28	0.21
930124	1551	1.88	0.083	12.0	46	59	0.50	0.98	5.45	32	0.39
930125	2253	1.62	0.074	13.6	60	66	0.50	1.35	6.92	23	0.61
930126	0047	1.63	0.074	13.6	60	65	0.48	1.29	7.29	19	0.45
930126	0347	1.60	0.083	12.0	58	65	0.53	1.12	5.67	27	0.71
930126	0648	1.54	0.083	12.0	58	62	0.54	1.08	5.67	30	0.20
930126	0949	1.49	0.083	12.0	48	61	0.52	1.13	5.67	32	0.39
930126	1246	1.25	0.083	12.0	50	61	0.58	1.13	5.22	35	0.16
930126	1549	1.14	0.083	12.0	58	66	0.59	1.14	4.78	35	0.44
930126	1849	1.09	0.083	12.0	62	68	0.61	1.03	4.36	38	0.26
930126	2153	1.12	0.083	12.0	62	69	0.61	0.82	4.42	39	0.62
930127	0056	1.17	0.093	10.7	66	65	0.62	0.65	3.73	45	-0.14
930127	0354	1.23	0.083	12.0	58	64	0.57	0.99	4.46	36	0.23
930127	0655	1.33	0.103	9.7	56	63	0.53	1.31	5.34	30	0.43
930127	0957	1.17	0.093	10.7	58	67	0.58	1.22	4.97	33	0.32
930127	1257	1.06	0.093	10.7	60	67	0.64	1.02	4.05	41	0.43
930127	1557	1.06	0.093	10.7	64	68	0.63	0.84	3.75	44	0.16
930127	1912	1.06	0.093	10.7	62	68	0.62	0.96	4.00	43	0.23
930128	0055	1.25	0.103	9.7	54	67	0.61	1.01	4.11	42	0.42
930128	0351	1.23	0.064	15.6	60	72	0.64	1.14	3.94	41	0.53
930128	0655	1.37	0.064	15.6	70	73	0.53	1.10	5.26	29	0.26
930128	0954	1.52	0.064	15.6	76	73	0.53	1.13	5.70	27	-0.03
930128	1254	1.65	0.064	15.6	70	73	0.52	1.33	6.02	25	0.24
930128	1555	1.60	0.064	15.6	68	74	0.52	1.42	6.12	23	0.33

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930128	1855	1.66	0.064	15.6	72	76	0.52	1.07	5.96	24	0.20
930128	2155	1.63	0.064	15.6	70	76	0.55	1.09	5.72	30	0.30
930129	0055	1.96	0.064	15.6	70	74	0.45	1.04	7.21	22	0.24
930129	0355	1.85	0.064	15.6	68	69	0.53	0.87	5.04	32	0.13
930129	0655	2.06	0.064	15.6	70	68	0.50	0.75	5.62	28	-0.01
930129	0955	2.07	0.074	13.6	56	69	0.54	0.66	4.55	37	0.35
930129	1254	1.99	0.064	15.6	74	69	0.54	0.67	4.89	34	0.02
930129	1555	1.88	0.064	15.6	74	71	0.52	0.63	4.84	33	-0.06
930129	1855	1.83	0.074	13.6	52	71	0.62	0.96	3.98	44	0.49
930129	2154	2.02	0.074	13.6	62	71	0.53	0.59	4.25	36	0.26
930130	0055	2.13	0.074	13.6	58	67	0.52	0.83	4.73	33	0.56
930130	0347	1.96	0.074	13.6	56	67	0.55	0.71	4.41	38	0.25
930130	0655	2.12	0.064	15.6	54	69	0.56	0.77	4.22	39	0.28
930130	0955	1.97	0.074	13.6	56	71	0.56	0.81	4.17	40	0.50
930130	1255	1.95	0.074	13.6	54	71	0.54	0.71	4.09	41	0.59
930130	1555	1.83	0.074	13.6	54	73	0.58	0.66	3.78	47	0.52
930131	1851	1.84	0.074	13.6	64	79	0.56	0.57	4.16	40	0.38
930131	2156	1.88	0.074	13.6	64	79	0.51	0.77	5.16	33	0.15
930201	0057	1.84	0.074	13.6	60	83	0.60	0.50	3.93	47	0.17
930201	0357	1.63	0.074	13.6	84	83	0.57	0.64	4.54	36	-0.08
930201	0657	1.75	0.074	13.6	90	86	0.58	0.52	3.94	42	-0.01
930201	0955	1.66	0.074	13.6	88	84	0.55	0.70	4.64	37	-0.03
930201	1256	1.70	0.074	13.6	60	83	0.55	0.64	4.49	42	0.07
930201	1557	1.86	0.074	13.6	82	87	0.55	0.62	4.67	36	0.08
930201	1850	1.90	0.074	13.6	84	89	0.55	0.60	4.75	35	0.14
930201	2333	1.98	0.074	13.6	114	95	0.56	0.29	4.22	42	-0.02
930202	0054	2.04	0.074	13.6	74	93	0.54	0.32	4.56	40	0.10
930202	0355	1.74	0.074	13.6	82	93	0.55	0.50	4.84	37	0.20
930202	0652	1.77	0.074	13.6	76	92	0.54	0.52	4.59	38	0.11
930202	0957	1.65	0.083	12.0	86	92	0.53	0.76	5.03	34	0.04
930202	1257	1.56	0.083	12.0	72	90	0.56	0.76	4.68	38	0.18
930202	1557	1.51	0.083	12.0	70	90	0.57	0.93	4.87	39	0.38
930202	1855	1.46	0.083	12.0	76	94	0.57	0.78	4.42	40	0.26
930202	2144	1.32	0.083	12.0	74	97	0.62	0.82	3.91	42	0.07
930203	0155	1.45	0.083	12.0	76	95	0.54	0.64	4.41	40	0.27
930203	0357	1.38	0.083	12.0	100	97	0.55	0.55	4.41	37	-0.06
930203	1240	1.18	0.083	12.0	114	102	0.56	0.42	4.76	37	-0.26
930203	1540	1.18	0.093	10.7	104	101	0.54	0.53	5.15	33	-0.02
930203	1721	1.26	0.093	10.7	106	100	0.53	0.55	5.34	32	-0.09
930203	2158	1.52	0.093	10.7	98	106	0.45	0.22	6.39	26	0.22
930204	0055	1.52	0.093	10.7	96	108	0.47	0.03	5.81	31	0.27
930204	0358	1.49	0.093	10.7	118	108	0.48	-0.30	5.96	30	-0.53
930204	0659	1.84	0.083	12.0	122	106	0.48	-0.38	5.79	34	-0.38
930204	0959	2.36	0.064	15.6	90	102	0.45	-0.10	5.72	32	0.48
930204	1257	3.18	0.064	15.6	92	99	0.41	-0.07	7.47	25	0.62
930204	1859	3.27	0.064	15.6	84	97	0.44	0.01	6.32	31	0.59
930205	0059	2.90	0.074	13.6	80	93	0.47	0.43	4.86	36	0.70
930205	0510	2.51	0.074	13.6	82	97	0.56	0.28	4.17	42	0.53
930205	1003	2.23	0.074	13.6	128	116	0.60	0.26	4.04	45	-0.33
930205	1638	2.91	0.074	13.6	126	115	0.55	-0.08	4.03	44	-0.49
930205	1904	3.07	0.074	13.6	88	109	0.56	0.03	3.90	43	-0.15
930205	2159	3.03	0.074	13.6	116	109	0.55	0.20	3.85	40	-0.14
930206	0059	2.94	0.074	13.6	86	106	0.55	0.13	3.66	43	-0.03
930206	0400	3.11	0.083	12.0	84	105	0.55	0.11	3.55	44	0.03

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930206	0702	3.00	0.083	12.0	88	105	0.54	0.29	3.96	41	0.30
930206	1001	2.85	0.083	12.0	88	107	0.52	0.31	4.41	37	0.16
930206	1302	2.64	0.083	12.0	122	109	0.54	0.05	4.12	41	-0.39
930206	1600	2.50	0.083	12.0	82	104	0.55	0.20	3.75	44	0.14
930206	1902	2.24	0.083	12.0	122	103	0.55	0.04	4.01	44	-0.21
930206	2201	2.00	0.083	12.0	82	103	0.58	0.15	3.82	46	0.13
930207	0058	1.96	0.093	10.7	124	103	0.61	0.06	3.28	50	-0.16
930207	0402	2.00	0.093	10.7	120	104	0.57	-0.03	3.84	44	-0.38
930207	0701	1.92	0.093	10.7	122	102	0.56	-0.21	3.83	44	-0.34
930207	1001	1.90	0.093	10.7	120	103	0.56	-0.22	3.96	41	-0.24
930207	1301	1.75	0.093	10.7	122	104	0.57	-0.06	3.76	45	-0.13
930207	1601	1.61	0.093	10.7	116	104	0.57	-0.09	3.81	42	-0.21
930207	1901	1.42	0.093	10.7	90	105	0.60	0.17	4.26	42	0.10
930207	2202	1.41	0.093	10.7	88	110	0.68	0.86	4.32	44	0.00
930208	0102	1.75	0.162	6.2	90	150	1.16	0.76	1.50	151	0.96
930208	0701	2.97	0.054	18.5	-104	-180	1.18	-0.32	1.31	154	-0.41
930208	1001	2.91	0.054	18.5	84	108	0.83	1.78	3.41	53	0.96
930208	1558	3.17	0.064	15.6	80	98	0.68	1.53	4.22	41	0.84
930208	1903	3.47	0.064	15.6	88	98	0.64	1.80	4.91	30	0.80
930208	2203	3.54	0.064	15.6	84	97	0.62	1.41	4.27	37	0.92
930209	0059	3.28	0.074	13.6	84	104	0.70	0.88	3.10	50	0.54
930209	0353	3.06	0.074	13.6	86	105	0.69	0.67	2.88	52	0.62
930209	0700	3.26	0.064	15.6	90	105	0.65	0.46	3.12	50	0.31
930209	0955	3.37	0.074	13.6	84	103	0.62	0.44	3.21	50	0.54
930209	1259	3.38	0.074	13.6	88	102	0.60	0.30	3.37	46	0.54
930209	1558	3.25	0.074	13.6	82	101	0.57	0.32	3.50	45	0.26
930209	1911	3.54	0.074	13.6	88	97	0.53	0.11	3.82	42	0.07
930209	2159	3.89	0.083	12.0	88	93	0.53	0.27	3.86	42	0.06
930210	0059	3.66	0.083	12.0	90	90	0.54	0.29	4.05	39	0.00
930210	0359	3.39	0.083	12.0	68	86	0.58	0.50	3.67	43	0.32
930210	0659	3.18	0.083	12.0	62	87	0.56	0.46	3.70	45	0.13
930210	1259	2.68	0.083	12.0	58	80	0.59	0.83	3.62	45	0.53
930210	1559	2.54	0.083	12.0	56	80	0.59	0.50	3.27	47	0.20
930210	1858	2.58	0.083	12.0	52	79	0.60	0.54	3.19	51	0.29
930210	2159	2.84	0.083	12.0	52	73	0.55	0.65	3.58	44	0.37
930211	0059	2.67	0.093	10.7	50	72	0.58	0.63	3.40	47	0.30
930211	0654	1.96	0.093	10.7	52	76	0.67	0.66	2.90	57	0.43
930211	0959	1.86	0.093	10.7	58	79	0.64	0.60	3.09	54	0.52
930211	1300	1.80	0.103	9.7	58	83	0.64	0.46	3.12	52	0.27
930211	1600	1.80	0.074	13.6	58	81	0.64	0.68	3.20	50	0.33
930211	1854	1.89	0.074	13.6	56	82	0.65	0.88	3.25	54	0.69
930211	2158	1.89	0.074	13.6	58	82	0.62	0.79	3.69	47	0.41
930212	0057	2.14	0.064	15.6	68	79	0.57	0.96	4.54	34	0.63
930212	0357	2.39	0.064	15.6	68	75	0.53	1.11	5.01	29	0.62
930212	0656	2.78	0.064	15.6	68	73	0.47	1.04	6.33	21	0.39
930212	0956	2.78	0.064	15.6	62	72	0.52	1.05	5.20	32	0.59
930212	1257	3.30	0.064	15.6	68	70	0.48	0.78	5.42	31	0.21
930212	1557	3.41	0.064	15.6	66	70	0.45	0.70	6.10	27	0.21
930212	1859	3.50	0.064	15.6	70	70	0.44	0.65	6.41	26	0.02
930212	2304	3.17	0.064	15.6	68	70	0.47	0.66	5.73	30	0.15
930213	0352	3.21	0.074	13.6	74	68	0.48	0.45	5.69	31	-0.08
930213	0652	2.95	0.074	13.6	54	69	0.50	0.54	5.04	36	0.13
930213	0952	2.68	0.074	13.6	54	69	0.50	0.86	5.82	33	0.31
930213	1252	2.54	0.074	13.6	58	70	0.49	0.89	6.06	31	0.44
930213	1552	2.46	0.074	13.6	60	70	0.49	0.51	5.42	33	0.12
930213	2138	2.21	0.083	12.0	74	70	0.50	0.51	5.48	29	-0.23

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930214	0039	2.17	0.054	18.5	74	71	0.51	0.73	5.39	28	-0.13
930214	0229	2.19	0.054	18.5	70	70	0.48	0.62	6.08	23	-0.10
930214	0651	2.39	0.054	18.5	70	73	0.50	0.92	6.04	25	0.12
930214	1552	3.07	0.054	18.5	68	70	0.42	0.86	7.95	17	0.03
930214	1852	3.26	0.054	18.5	70	69	0.38	0.52	9.63	15	-0.20
930214	2152	3.22	0.054	18.5	70	69	0.39	0.76	8.83	18	-0.34
930215	0348	3.14	0.064	15.6	68	70	0.44	0.79	7.54	20	0.08
930215	0652	3.17	0.064	15.6	64	68	0.44	0.60	6.87	23	0.22
930215	0952	3.10	0.064	15.6	66	68	0.44	0.93	7.50	20	0.04
930215	1252	2.85	0.064	15.6	70	69	0.48	0.79	6.41	25	-0.11
930215	1552	2.40	0.064	15.6	68	69	0.48	0.80	6.54	25	0.10
930215	1853	2.39	0.064	15.6	66	67	0.48	1.01	6.40	25	0.09
930215	2149	2.31	0.064	15.6	66	64	0.47	1.17	6.38	23	-0.18
930216	0352	2.14	0.064	15.6	52	66	0.56	1.19	4.91	35	0.35
930216	0652	2.13	0.074	13.6	54	68	0.59	1.25	4.45	38	0.48
930216	0952	1.93	0.074	13.6	56	68	0.61	1.42	4.50	37	0.47
930216	1252	1.88	0.074	13.6	54	67	0.62	1.36	4.33	38	0.42
930216	1552	1.86	0.064	15.6	44	64	0.63	1.39	4.05	44	0.67
930216	1852	1.71	0.074	13.6	48	64	0.66	1.48	3.97	45	0.81
930216	2152	1.66	0.074	13.6	32	68	0.73	1.13	3.10	58	0.46
930217	0052	1.54	0.074	13.6	34	69	0.77	1.19	2.92	61	0.50
930217	0352	1.51	0.074	13.6	36	76	0.76	0.95	2.73	61	0.25
930217	0652	1.37	0.074	13.6	54	83	0.77	0.78	2.49	66	0.29
930217	1252	1.28	0.074	13.6	62	94	0.79	0.47	2.31	72	0.36
930217	1552	1.31	0.074	13.6	88	109	1.00	0.89	2.32	91	0.48
930217	1852	1.62	0.162	6.2	-110	-177	1.21	-0.51	1.48	155	-0.12
930217	2152	1.80	0.162	6.2	-114	-159	1.11	-1.14	1.83	137	-0.94
930218	0052	1.81	0.162	6.2	-108	-156	1.08	-1.14	1.94	123	-0.50
930218	0352	1.52	0.074	13.6	-174	145	1.03	0.32	1.82	102	-0.10
930218	0647	1.63	0.074	13.6	-180	131	0.81	-0.16	1.97	86	-0.17
930218	1252	2.05	0.162	6.2	-110	-166	0.96	-0.70	2.14	91	0.24
930218	1552	2.68	0.152	6.6	-104	-150	0.84	-0.80	2.71	71	0.24
930218	1853	2.80	0.132	7.6	158	177	0.74	0.45	2.97	45	0.44
930218	2152	2.58	0.113	8.9	164	166	0.65	-0.13	3.71	37	0.08
930219	0046	2.07	0.123	8.2	166	157	0.66	-0.69	3.58	42	-0.53
930219	0352	2.04	0.113	8.9	178	152	0.71	-0.78	3.09	55	-0.65
930219	0652	2.41	0.113	8.9	-176	160	0.74	-0.93	2.98	55	-0.64
930219	0952	2.42	0.113	8.9	176	149	0.78	-0.48	2.55	70	-1.00
930219	1247	2.36	0.123	8.2	-178	145	0.77	-0.34	2.30	75	-0.30
930219	1552	2.46	0.064	15.6	-178	133	0.78	0.11	2.27	77	0.18
930220	0052	2.84	0.103	9.7	174	129	0.76	-0.30	2.16	74	-0.16
930220	0352	2.79	0.113	8.9	136	122	0.76	-0.23	2.16	74	-0.43
930220	0651	2.83	0.113	8.9	80	116	0.76	0.09	2.10	76	0.03
930220	0952	2.98	0.113	8.9	76	105	0.70	0.43	2.44	62	0.34
930220	1252	3.08	0.113	8.9	76	97	0.69	0.56	2.71	57	0.53
930220	1552	3.11	0.083	12.0	70	92	0.70	0.76	2.73	60	0.69
930220	1845	3.40	0.093	10.7	52	83	0.70	0.83	2.88	60	0.60
930220	2152	3.27	0.103	9.7	50	78	0.67	0.95	2.95	55	0.52
930221	0052	2.91	0.113	8.9	70	82	0.71	0.78	2.62	64	0.68
930221	0352	2.75	0.123	8.2	54	87	0.72	0.55	2.53	65	0.47
930221	0652	2.67	0.113	8.9	54	89	0.74	0.48	2.42	68	0.35
930221	0952	2.63	0.113	8.9	74	87	0.69	0.50	2.67	60	0.43
930221	1252	2.58	0.113	8.9	72	89	0.66	0.67	2.87	55	0.64
930221	1549	2.61	0.103	9.7	62	81	0.63	1.05	3.46	47	0.78
930221	1852	2.69	0.093	10.7	56	76	0.62	1.19	3.74	43	0.78
930221	2152	2.97	0.093	10.7	52	70	0.57	1.30	4.45	38	0.69

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930222	0052	3.09	0.093	10.7	54	68	0.56	0.98	4.33	36	0.33
930222	0352	3.15	0.093	10.7	50	65	0.57	1.02	4.39	39	0.45
930222	0652	3.03	0.064	15.6	50	67	0.58	1.09	4.45	38	0.58
930222	0952	2.77	0.064	15.6	48	68	0.59	0.99	4.12	42	0.36
930222	1252	2.61	0.064	15.6	48	69	0.60	1.11	4.27	40	0.01
930222	1552	2.26	0.064	15.6	74	74	0.59	0.94	4.47	34	-0.08
930222	1911	2.17	0.064	15.6	68	74	0.58	1.01	4.47	36	0.32
930223	0100	2.19	0.064	15.6	70	74	0.58	0.95	4.50	37	0.13
930223	0358	2.06	0.064	15.6	70	77	0.58	1.45	4.88	32	0.40
930223	0701	1.95	0.064	15.6	78	82	0.62	1.08	4.20	41	0.19
930223	1007	2.01	0.074	13.6	76	84	0.61	1.14	4.27	37	0.21
930223	1307	1.97	0.074	13.6	60	88	0.63	0.80	3.61	48	0.15
930223	1607	1.84	0.074	13.6	82	91	0.69	0.78	3.12	53	0.24
930223	1904	1.84	0.074	13.6	58	89	0.67	0.81	3.32	53	0.11
930223	2201	1.90	0.074	13.6	62	89	0.64	0.66	3.51	49	0.13
930224	0104	1.81	0.074	13.6	62	91	0.62	0.47	3.32	49	-0.09
930224	0404	1.73	0.074	13.6	64	90	0.62	0.62	3.49	48	0.13
930224	0703	1.94	0.074	13.6	84	89	0.57	0.54	4.00	40	0.16
930224	0958	2.01	0.074	13.6	88	87	0.55	0.41	4.09	39	-0.10
930224	1304	2.54	0.123	8.2	56	74	0.57	0.48	3.65	44	0.00
930224	1600	3.08	0.113	8.9	52	66	0.50	0.58	4.36	37	0.43
930224	1902	2.92	0.103	9.7	58	65	0.53	0.61	4.33	36	0.29
930224	2202	3.14	0.113	8.9	54	65	0.52	0.48	4.30	38	0.04
930225	0054	3.25	0.103	9.7	72	66	0.50	0.43	4.35	37	0.02
930225	0403	3.09	0.074	13.6	56	65	0.51	0.41	4.36	37	0.06
930225	0703	2.88	0.074	13.6	52	63	0.51	0.83	5.11	35	0.50
930225	1002	2.81	0.074	13.6	52	66	0.51	0.71	5.01	34	0.30
930225	1303	2.62	0.074	13.6	52	65	0.54	0.75	4.50	38	0.44
930225	1558	2.36	0.074	13.6	56	65	0.55	0.68	4.52	38	0.24
930225	1902	2.09	0.083	12.0	54	67	0.56	1.01	4.89	39	0.65
930225	2201	2.16	0.083	12.0	62	71	0.56	0.77	4.53	38	0.21
930226	0402	1.54	0.054	18.5	74	77	0.66	1.11	3.96	45	0.17
930226	0704	2.00	0.162	6.2	76	112	0.86	0.35	2.07	84	0.31
930226	1001	2.23	0.064	15.6	68	111	0.80	0.29	2.09	83	0.08
930226	1304	2.22	0.064	15.6	58	95	0.67	0.59	3.02	53	0.07
930226	1604	2.52	0.064	15.6	76	87	0.61	0.56	3.61	43	0.18
930226	1856	2.66	0.074	13.6	56	80	0.59	0.54	3.62	45	0.00
930226	2155	2.69	0.074	13.6	54	76	0.54	0.48	3.78	43	0.23
930227	0113	3.29	0.074	13.6	54	67	0.48	0.63	4.96	34	0.39
930227	0402	3.15	0.074	13.6	54	65	0.49	0.62	5.22	35	0.29
930227	0659	2.70	0.074	13.6	56	68	0.48	0.74	5.64	32	0.26
930227	1000	2.51	0.074	13.6	54	67	0.50	0.84	5.31	35	0.61
930227	1301	2.60	0.093	10.7	54	64	0.49	1.04	6.25	32	0.59
930227	1559	2.50	0.093	10.7	54	63	0.50	1.17	6.18	31	0.33
930227	1901	2.31	0.103	9.7	54	63	0.50	1.33	6.34	30	0.48
930228	0057	2.35	0.083	12.0	54	64	0.52	1.23	5.77	34	0.30
930228	0357	2.26	0.083	12.0	54	65	0.55	1.58	6.17	34	0.40
930228	0657	2.09	0.083	12.0	52	65	0.58	1.77	5.66	34	0.67
930228	0957	2.00	0.074	13.6	56	66	0.54	1.75	6.39	30	0.46
930228	1257	1.88	0.074	13.6	50	66	0.64	1.95	5.16	36	0.50
930228	1557	1.94	0.074	13.6	56	68	0.58	1.84	5.67	32	0.38
930228	1857	2.17	0.074	13.6	54	67	0.58	1.96	5.62	33	0.55
930228	2155	2.12	0.083	12.0	52	67	0.58	1.71	5.55	35	0.63
930301	0057	2.01	0.074	13.6	52	66	0.58	1.63	5.40	35	0.58
930301	0357	1.90	0.074	13.6	48	66	0.68	1.92	4.44	41	0.89
930301	0657	1.85	0.074	13.6	52	68	0.62	1.65	4.96	34	0.32

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930301	0957	1.81	0.074	13.6	50	69	0.66	1.41	4.24	43	0.46
930301	1736	2.28	0.074	13.6	54	64	0.57	1.91	5.84	30	0.65
930301	2014	2.25	0.074	13.6	52	69	0.60	1.42	4.84	36	0.31
930301	2201	2.31	0.074	13.6	56	68	0.61	1.42	4.80	35	0.55
930302	0102	2.34	0.074	13.6	56	64	0.55	1.54	5.75	29	0.33
930302	0402	2.36	0.074	13.6	72	67	0.57	1.26	5.34	31	-0.07
930302	0702	2.36	0.074	13.6	74	68	0.58	1.33	5.25	32	-0.28
930302	1002	2.64	0.074	13.6	72	67	0.52	1.51	6.65	24	-0.23
930302	1301	2.59	0.074	13.6	72	71	0.57	1.36	5.29	31	-0.03
930302	1602	2.83	0.074	13.6	52	72	0.58	1.45	4.89	34	0.08
930302	1855	2.68	0.074	13.6	76	71	0.59	1.33	4.87	35	-0.16
930302	2204	2.76	0.064	15.6	58	71	0.58	1.38	4.98	31	0.18
930303	0102	2.89	0.074	13.6	56	70	0.57	1.38	5.12	32	0.24
930303	0402	2.90	0.064	15.6	68	75	0.56	1.34	5.05	29	0.34
930303	0702	2.47	0.064	15.6	70	75	0.59	1.39	4.84	31	0.09
930303	0959	2.47	0.064	15.6	70	74	0.61	1.50	4.46	33	0.24
930303	1302	2.21	0.064	15.6	76	80	0.66	1.08	3.85	40	0.13
930303	1602	2.25	0.064	15.6	70	79	0.62	1.34	4.17	37	0.43
930303	1859	2.18	0.064	15.6	72	79	0.64	1.35	4.03	36	0.32
930303	2149	2.01	0.074	13.6	72	86	0.67	0.84	3.26	43	0.48
930304	0055	2.32	0.064	15.6	80	87	0.64	0.93	3.67	38	0.25
930304	0355	2.82	0.064	15.6	76	82	0.56	1.16	4.93	27	0.38
930304	0655	3.58	0.064	15.6	76	81	0.50	1.27	6.11	19	0.33
930304	0955	3.94	0.064	15.6	80	78	0.47	0.90	6.65	21	-0.27
930304	1255	4.21	0.064	15.6	82	78	0.47	0.54	6.02	27	-0.65
930304	1611	4.03	0.064	15.6	82	79	0.48	0.51	6.19	26	-0.47
930304	1857	3.84	0.074	13.6	80	79	0.52	0.70	5.26	29	-0.15
930304	2225	3.78	0.074	13.6	80	77	0.50	0.74	5.69	29	-0.19
930305	0107	3.31	0.074	13.6	90	80	0.58	0.56	4.20	42	-0.28
930305	0400	3.30	0.074	13.6	88	80	0.60	0.71	4.04	42	-0.32
930305	0659	3.29	0.074	13.6	90	81	0.58	0.61	4.19	40	-0.40
930305	0959	3.26	0.074	13.6	58	78	0.57	0.85	4.27	40	0.08
930305	1300	3.24	0.074	13.6	72	78	0.54	0.92	4.69	35	0.21
930305	1559	3.37	0.083	12.0	70	77	0.53	1.09	5.38	31	0.41
930305	2012	3.27	0.054	18.5	68	75	0.53	1.45	5.89	25	0.62
930305	2158	3.52	0.054	18.5	68	75	0.52	1.65	5.96	21	0.64
930306	0058	3.68	0.054	18.5	66	74	0.54	1.72	5.91	25	0.54
930306	0358	3.96	0.064	15.6	66	73	0.52	1.74	5.94	24	0.64
930306	0658	3.86	0.064	15.6	68	74	0.49	1.65	7.27	21	0.29
930306	0958	3.77	0.064	15.6	68	75	0.51	1.41	6.25	25	0.31
930306	1258	3.65	0.064	15.6	66	72	0.49	1.55	6.93	23	0.35
930306	2158	3.19	0.074	13.6	62	71	0.50	1.63	6.33	27	0.46
930307	0058	3.23	0.074	13.6	66	70	0.53	1.64	6.20	26	0.31
930307	0358	3.07	0.074	13.6	58	72	0.56	1.61	5.47	32	0.53
930307	0658	2.88	0.074	13.6	60	72	0.51	1.56	6.42	28	0.51
930307	0958	3.13	0.074	13.6	58	70	0.48	1.74	6.88	25	0.27
930307	1258	2.98	0.074	13.6	58	74	0.58	1.87	5.41	31	0.31
930307	1558	2.89	0.074	13.6	58	70	0.52	1.66	6.16	29	0.59
930307	1857	2.99	0.074	13.6	64	74	0.53	1.42	5.89	29	0.32
930307	2158	3.08	0.074	13.6	64	75	0.52	1.22	5.55	29	0.30
930308	0058	3.12	0.074	13.6	76	72	0.48	1.40	6.76	25	0.04
930308	0355	3.13	0.074	13.6	76	75	0.51	1.58	6.53	24	-0.15
930308	0658	3.07	0.074	13.6	62	73	0.49	1.46	6.89	25	0.23
930308	0953	3.25	0.074	13.6	72	73	0.49	1.30	6.10	27	0.09
930308	1258	3.07	0.064	15.6	72	75	0.48	1.08	6.35	27	0.13
930308	1558	2.79	0.064	15.6	72	73	0.50	1.57	6.82	24	0.10

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930308	1859	2.72	0.064	15.6	64	75	0.55	1.42	5.63	31	0.39
930308	2159	2.60	0.064	15.6	64	72	0.49	1.51	6.51	27	0.46
930309	0055	2.52	0.074	13.6	64	73	0.55	1.32	5.02	34	0.50
930309	0357	2.36	0.064	15.6	70	72	0.55	1.43	5.40	32	0.22
930309	0659	2.23	0.064	15.6	70	80	0.59	1.52	4.89	33	0.63
930309	1000	2.11	0.074	13.6	70	78	0.55	1.29	5.08	32	0.34
930309	1300	1.86	0.074	13.6	54	77	0.62	1.33	4.12	43	0.56
930309	1559	1.71	0.074	13.6	56	75	0.64	1.67	4.37	39	0.73
930309	1859	1.61	0.074	13.6	56	81	0.68	1.00	3.28	53	0.75
930309	2214	1.58	0.074	13.6	56	83	0.67	0.93	3.14	52	0.24
930310	0059	1.55	0.074	13.6	64	83	0.65	1.01	3.46	47	0.45
930310	0359	1.33	0.074	13.6	60	93	0.71	0.65	2.88	58	0.11
930310	0659	1.29	0.074	13.6	90	96	0.69	0.56	2.98	55	0.31
930310	0959	1.27	0.074	13.6	56	96	0.72	0.40	2.55	66	0.03
930310	1253	1.23	0.083	12.0	98	98	0.70	0.51	2.75	57	0.04
930310	2159	1.38	0.093	10.7	120	105	0.60	0.21	3.38	46	-0.01
930311	0100	1.38	0.083	12.0	90	101	0.58	0.42	3.83	40	0.68
930311	0359	1.26	0.083	12.0	114	101	0.64	0.27	3.21	48	-0.10
930311	0659	1.32	0.083	12.0	92	98	0.65	0.25	3.28	48	0.01
930311	1000	1.57	0.162	6.2	58	82	0.69	0.29	2.87	55	0.06
930311	1259	1.81	0.162	6.2	82	77	0.66	0.38	3.01	50	-0.11
930311	1604	1.89	0.054	18.5	82	79	0.64	0.43	3.18	43	-0.17
930311	2000	1.96	0.064	15.6	72	85	0.61	0.76	3.93	35	0.43
930311	2158	1.84	0.064	15.6	70	82	0.61	1.02	4.14	35	0.77
930312	0103	1.98	0.064	15.6	74	80	0.54	1.13	5.14	25	0.55
930312	0359	2.16	0.064	15.6	76	79	0.54	1.03	4.94	25	0.12
930312	0659	1.84	0.064	15.6	82	81	0.66	0.98	3.79	36	-0.31
930312	1637	1.50	0.074	13.6	82	86	0.68	1.17	3.54	42	0.32
930312	1908	1.48	0.074	13.6	60	83	0.69	1.03	3.39	46	0.10
930312	2218	1.40	0.074	13.6	56	83	0.72	1.16	3.13	50	0.33
930313	0057	1.34	0.083	12.0	58	82	0.67	1.38	3.79	40	0.29
930313	0357	1.38	0.083	12.0	60	87	0.74	1.15	3.00	51	0.32
930313	1545	1.00	0.083	12.0	86	95	0.74	0.87	2.82	59	0.44
930313	1856	0.92	0.083	12.0	56	96	0.81	0.67	2.12	84	0.60
930313	2154	0.88	0.083	12.0	64	97	0.74	0.70	2.59	63	0.36
930314	0356	0.83	0.083	12.0	100	103	0.74	0.26	2.42	69	0.02
930314	0656	0.76	0.074	13.6	144	111	0.76	-0.09	2.24	72	-0.08
930314	0956	0.79	0.083	12.0	102	104	0.74	0.19	2.63	66	0.06
930314	1249	0.79	0.074	13.6	102	109	0.75	0.23	2.59	63	0.34
930314	1556	0.78	0.093	10.7	110	115	0.72	-0.12	2.62	59	0.16
930314	1932	0.79	0.093	10.7	102	117	0.70	0.00	2.49	61	0.30
930314	2158	0.73	0.093	10.7	106	113	0.70	0.07	2.77	54	0.18
930315	0052	0.75	0.074	13.6	108	114	0.70	0.12	2.90	53	0.24
930315	0656	0.91	0.083	12.0	92	107	0.66	0.26	2.95	51	0.60
930315	0958	1.10	0.093	10.7	96	105	0.53	0.75	4.50	27	0.54
930315	1258	1.34	0.093	10.7	114	102	0.52	0.34	4.73	35	-0.12
930315	1558	1.23	0.103	9.7	112	103	0.57	0.32	4.65	33	-0.41
930315	1919	1.19	0.103	9.7	90	100	0.57	0.47	4.11	36	0.32
930315	2204	1.17	0.103	9.7	90	100	0.59	0.32	3.72	41	0.17
930316	0056	1.24	0.103	9.7	108	99	0.57	0.14	3.94	37	-0.28
930316	0359	1.14	0.103	9.7	102	97	0.65	0.42	3.07	51	0.01
930316	0659	1.15	0.103	9.7	106	95	0.66	0.54	3.11	49	-0.02
930316	1000	1.20	0.064	15.6	98	95	0.62	0.54	3.36	46	0.05
930316	1300	1.31	0.113	8.9	78	90	0.63	0.67	3.43	48	0.21
930316	1602	1.32	0.103	9.7	60	88	0.63	0.66	3.54	46	0.02

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930316	1922	1.30	0.103	9.7	64	86	0.67	0.88	3.37	49	0.42
930317	0354	1.08	0.074	13.6	96	96	0.73	0.41	2.72	61	0.14
930317	0658	1.05	0.074	13.6	56	94	0.73	0.52	2.58	65	0.25
930317	0957	0.96	0.074	13.6	56	95	0.79	0.63	2.27	76	0.41
930317	1259	0.91	0.074	13.6	92	106	0.81	0.28	2.20	76	0.32
930317	1723	1.03	0.074	13.6	58	102	0.73	0.31	2.55	66	0.05
930317	2033	1.08	0.074	13.6	98	98	0.70	0.62	2.77	56	0.09
930318	0041	1.05	0.074	13.6	100	102	0.65	0.56	3.30	40	0.09
930318	0358	1.03	0.074	13.6	104	109	0.74	0.37	2.72	58	0.21
930318	0658	1.10	0.074	13.6	94	102	0.66	0.69	3.28	44	0.42
930318	0959	1.21	0.083	12.0	88	101	0.62	0.61	3.35	43	0.54
930318	1258	1.57	0.074	13.6	88	93	0.57	0.89	4.40	30	0.45
930318	1627	2.09	0.074	13.6	82	90	0.52	0.78	5.32	28	0.40
930318	1901	2.35	0.083	12.0	88	88	0.41	0.78	7.85	18	-0.02
930318	1933	2.29	0.074	13.6	84	85	0.48	0.73	6.27	22	0.07
930318	2250	2.25	0.083	12.0	82	86	0.49	0.46	5.29	26	0.24
930319	0132	2.24	0.083	12.0	90	88	0.53	0.13	4.53	31	-0.13
930319	0658	2.12	0.083	12.0	90	85	0.55	-0.01	4.10	37	-0.12
930319	0958	2.34	0.093	10.7	88	82	0.59	-0.01	3.33	46	-0.20
930319	1300	2.19	0.093	10.7	92	83	0.58	-0.19	3.47	43	-0.41
930319	1559	2.12	0.093	10.7	94	88	0.56	-0.11	3.90	42	-0.12
930319	1903	2.06	0.093	10.7	90	88	0.55	0.06	4.05	39	-0.07
930319	2203	1.94	0.093	10.7	76	89	0.56	-0.02	3.92	40	0.00
930320	0100	1.91	0.093	10.7	74	88	0.58	0.02	3.75	42	0.44
930320	0358	1.82	0.093	10.7	74	87	0.59	-0.21	3.92	40	0.05
930320	0659	1.82	0.054	18.5	96	90	0.62	-0.31	3.95	42	-0.21
930320	0958	1.83	0.054	18.5	74	82	0.57	0.33	3.98	40	0.32
930320	1259	2.17	0.054	18.5	72	75	0.55	0.33	4.09	37	0.13
930320	1558	2.40	0.132	7.6	74	68	0.55	0.35	4.01	39	-0.30
930320	1858	2.53	0.054	18.5	72	68	0.52	0.41	4.54	35	-0.16
930320	2159	2.59	0.064	15.6	74	68	0.52	0.35	4.37	36	-0.35
930321	0058	2.85	0.064	15.6	76	61	0.52	0.35	4.27	38	-0.10
930321	0358	2.80	0.064	15.6	50	56	0.53	0.44	3.92	41	0.12
930321	0658	2.40	0.064	15.6	58	61	0.55	0.48	4.08	41	-0.01
930321	0959	2.70	0.064	15.6	38	59	0.54	0.43	3.96	44	0.04
930321	1255	2.86	0.132	7.6	40	55	0.51	0.55	4.25	39	0.16
930321	1559	2.77	0.064	15.6	60	56	0.49	0.61	4.80	35	-0.04
930321	1858	2.37	0.064	15.6	68	59	0.53	0.46	4.34	40	-0.26
930321	2159	2.21	0.064	15.6	56	67	0.53	0.48	4.70	36	0.11
930322	0059	2.55	0.064	15.6	56	64	0.49	0.52	4.92	36	0.17
930322	0359	2.58	0.132	7.6	58	60	0.48	0.38	4.95	36	-0.08
930322	0659	2.41	0.074	13.6	50	61	0.48	0.64	5.34	33	0.28
930322	0959	2.58	0.064	15.6	56	63	0.44	0.72	6.39	28	0.14
930322	1259	2.75	0.123	8.2	58	62	0.44	0.49	5.95	30	0.10
930322	1559	2.66	0.132	7.6	56	62	0.46	0.70	6.22	30	0.29
930322	1902	2.11	0.074	13.6	60	67	0.50	0.73	6.24	29	0.31
930322	2202	2.08	0.074	13.6	60	68	0.49	0.84	6.48	29	0.49
930323	1001	1.61	0.093	10.7	58	72	0.54	1.00	5.30	36	0.51
930323	1301	1.56	0.083	12.0	58	69	0.55	1.26	5.67	34	0.48
930323	1601	1.51	0.093	10.7	56	70	0.56	1.24	5.33	36	0.76
930323	1903	1.50	0.093	10.7	54	67	0.57	1.42	5.41	36	0.70
930323	2201	1.56	0.083	12.0	54	70	0.62	1.41	4.97	38	0.50
930324	0101	1.80	0.054	18.5	68	73	0.60	1.85	5.50	26	0.43
930324	0703	3.47	0.054	18.5	64	65	0.43	1.94	9.86	14	0.03
930324	1714	3.89	0.064	15.6	66	68	0.50	2.13	8.18	21	0.01

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930324	1934	4.06	0.064	15.6	64	66	0.48	2.10	8.13	20	0.10
930324	2205	4.02	0.064	15.6	66	68	0.53	1.74	6.55	25	0.09
930325	0104	3.93	0.064	15.6	72	74	0.57	1.88	5.77	24	0.01
930325	0401	3.70	0.064	15.6	70	75	0.59	1.90	5.25	25	0.26
930325	0701	3.48	0.064	15.6	64	78	0.69	2.27	4.28	32	0.59
930325	1001	3.48	0.064	15.6	70	75	0.67	2.29	4.50	32	0.22
930325	1300	3.59	0.074	13.6	60	73	0.64	1.81	4.61	33	0.23
930325	1601	3.24	0.074	13.6	58	74	0.72	2.20	4.02	35	0.56
930325	1904	3.25	0.074	13.6	58	81	0.75	1.68	3.32	44	0.49
930325	2205	3.15	0.074	13.6	60	78	0.72	1.80	3.91	41	0.64
930326	0103	3.01	0.074	13.6	60	81	0.83	1.90	3.38	48	0.64
930326	0401	2.74	0.074	13.6	58	85	0.84	1.68	2.83	61	0.85
930326	0701	2.52	0.074	13.6	64	82	0.80	1.95	3.40	47	1.13
930326	1001	2.66	0.074	13.6	56	83	0.79	1.42	3.08	54	0.55
930326	1301	2.63	0.074	13.6	66	82	0.76	1.34	3.16	49	0.58
930326	1602	2.58	0.074	13.6	56	80	0.80	1.58	2.96	52	0.60
930326	1907	2.71	0.074	13.6	82	78	0.77	1.14	3.09	53	-0.12
930326	2202	3.59	0.113	8.9	66	71	0.60	1.00	4.40	39	0.08
930327	0102	3.82	0.093	10.7	78	70	0.63	1.08	4.11	41	-0.05
930327	0401	3.68	0.083	12.0	50	64	0.60	1.20	4.36	41	0.42
930327	0701	3.32	0.083	12.0	72	66	0.65	1.09	3.95	45	0.05
930327	1302	3.12	0.083	12.0	48	67	0.66	1.32	3.81	47	0.38
930327	1602	2.69	0.083	12.0	52	67	0.64	1.66	4.41	41	0.63
930327	1902	2.47	0.083	12.0	56	76	0.70	1.38	3.50	51	0.80
930327	2202	2.25	0.083	12.0	50	75	0.73	1.29	3.32	52	0.31
930328	0101	1.85	0.083	12.0	76	80	0.76	1.14	2.92	55	0.23
930328	0402	1.53	0.093	10.7	48	87	0.85	0.95	2.31	79	0.65
930328	0702	1.70	0.093	10.7	72	84	0.77	0.99	2.75	59	0.44
930328	1001	1.65	0.093	10.7	50	83	0.76	1.11	2.93	58	0.46
930328	1302	1.72	0.054	18.5	72	85	0.75	1.01	2.98	55	0.67
930328	1602	2.05	0.054	18.5	72	82	0.62	1.25	4.23	33	0.97
930328	1902	2.21	0.054	18.5	70	83	0.58	1.27	4.73	29	1.30
930328	2155	2.39	0.054	18.5	68	80	0.61	1.51	4.57	33	0.87
930329	0101	3.00	0.054	18.5	68	75	0.53	1.25	5.54	28	0.50
930329	0402	3.12	0.054	18.5	70	73	0.52	1.09	5.65	27	0.17
930329	0700	3.03	0.054	18.5	70	74	0.55	1.08	5.41	28	0.30
930329	1004	2.99	0.093	10.7	70	73	0.53	0.81	5.58	33	0.13
930329	1304	3.00	0.064	15.6	68	72	0.49	1.14	6.88	25	0.29
930329	1604	3.03	0.064	15.6	68	71	0.49	1.00	6.27	24	0.23
930329	1905	2.98	0.064	15.6	76	73	0.51	0.73	5.87	25	-0.26
930329	2201	3.01	0.064	15.6	66	69	0.49	1.00	6.47	25	0.26
930330	0059	3.09	0.074	13.6	74	68	0.50	0.60	5.68	31	-0.04
930330	0355	3.05	0.074	13.6	78	67	0.51	0.37	5.45	32	-0.14
930330	0655	2.75	0.044	22.5	80	67	0.52	0.24	5.46	30	-0.43
930330	0956	2.90	0.044	22.5	78	73	0.44	0.22	7.64	20	-0.59
930330	1256	2.98	0.044	22.5	78	73	0.46	0.15	7.63	21	-0.44
930330	1901	2.94	0.054	18.5	72	71	0.45	0.88	7.88	17	-0.23
930330	2202	2.99	0.054	18.5	72	71	0.46	1.11	8.12	19	-0.18
930331	0101	3.16	0.054	18.5	76	71	0.42	0.32	8.43	19	-0.59
930331	0352	2.69	0.054	18.5	72	70	0.48	0.54	7.04	21	-0.10
930331	0658	2.97	0.064	15.6	70	71	0.46	0.81	7.64	17	0.03
930331	0959	3.25	0.064	15.6	72	73	0.41	0.79	9.02	16	-0.02
930331	1259	3.08	0.064	15.6	70	72	0.45	0.81	7.87	18	0.03
930331	1558	3.02	0.064	15.6	72	74	0.46	0.96	7.87	19	0.06
930331	1902	2.95	0.064	15.6	72	76	0.48	1.03	7.07	19	0.23
930331	2202	2.84	0.064	15.6	68	73	0.49	1.27	6.54	21	0.38

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930401	0108	2.94	0.064	15.6	68	71	0.43	1.12	8.11	17	0.33
930401	0358	2.91	0.064	15.6	68	70	0.47	1.33	7.31	22	0.22
930401	0658	2.60	0.074	13.6	68	71	0.50	1.52	6.58	23	0.24
930401	0958	2.41	0.074	13.6	58	72	0.60	1.40	4.95	34	0.40
930401	1259	2.59	0.074	13.6	68	74	0.51	1.31	6.06	23	0.39
930401	1600	2.76	0.074	13.6	60	72	0.53	0.75	5.22	35	0.15
930401	1903	2.64	0.074	13.6	76	74	0.54	0.67	4.89	35	-0.04
930401	2202	2.66	0.074	13.6	74	77	0.56	0.65	4.72	36	0.10
930402	0101	2.92	0.074	13.6	62	72	0.52	0.45	4.59	34	0.18
930402	0401	4.21	0.074	13.6	74	65	0.47	0.24	5.08	30	-0.04
930402	0701	5.08	0.074	13.6	72	66	0.45	0.30	5.16	30	-0.05
930402	1001	4.76	0.064	15.6	72	68	0.47	0.35	5.33	29	-0.10
930402	1302	4.29	0.064	15.6	74	68	0.48	0.40	5.16	32	-0.21
930402	1601	4.05	0.074	13.6	54	65	0.51	0.68	5.31	33	0.20
930402	1901	3.88	0.074	13.6	72	65	0.49	0.41	5.05	33	-0.06
930402	2202	4.18	0.074	13.6	76	66	0.49	0.19	4.95	33	-0.44
930403	0111	4.19	0.074	13.6	56	65	0.48	0.37	5.06	32	0.07
930403	0401	3.69	0.083	12.0	52	64	0.49	0.43	5.02	32	0.10
930403	0701	3.34	0.074	13.6	56	66	0.51	0.48	4.86	37	0.04
930403	1601	3.03	0.044	22.5	70	68	0.50	0.34	5.66	31	-0.04
930403	1902	3.16	0.054	18.5	70	70	0.50	0.40	6.00	27	-0.11
930403	2201	3.07	0.054	18.5	70	69	0.46	0.50	7.54	20	-0.17
930404	0101	3.16	0.054	18.5	72	69	0.44	0.30	8.32	19	-0.25
930404	0401	3.34	0.054	18.5	68	66	0.43	0.28	8.66	15	-0.33
930404	1002	3.54	0.054	18.5	64	65	0.42	0.73	9.39	15	0.01
930404	1301	3.42	0.054	18.5	66	66	0.45	0.70	8.24	17	0.03
930404	1901	3.19	0.054	18.5	68	67	0.47	0.88	7.44	21	-0.09
930404	2200	3.29	0.064	15.6	68	67	0.43	0.67	8.05	20	-0.14
930405	0100	3.40	0.064	15.6	68	68	0.43	0.54	7.93	19	-0.07
930405	0401	3.40	0.064	15.6	62	65	0.45	0.43	6.11	26	0.12
930405	0702	3.62	0.064	15.6	64	64	0.45	0.31	5.68	27	-0.09
930405	1655	3.52	0.064	15.6	70	61	0.47	0.27	5.37	31	-0.16
930405	1901	3.33	0.064	15.6	68	64	0.45	0.39	5.87	30	-0.13
930405	2201	3.39	0.064	15.6	74	64	0.46	0.07	5.40	31	-0.34
930406	0102	3.52	0.064	15.6	74	62	0.47	0.20	5.52	31	-0.27
930406	0402	3.59	0.064	15.6	74	61	0.46	0.19	5.26	31	-0.24
930406	0702	3.65	0.064	15.6	72	61	0.46	0.21	5.36	30	-0.18
930406	1001	3.23	0.074	13.6	54	64	0.48	0.50	5.41	33	0.29
930406	1301	2.74	0.064	15.6	76	66	0.48	0.39	5.25	33	-0.14
930406	1601	2.52	0.074	13.6	56	68	0.50	0.94	6.03	32	0.30
930406	1903	2.61	0.074	13.6	56	67	0.48	1.05	6.33	28	0.28
930406	2201	2.69	0.074	13.6	54	67	0.54	1.06	5.02	35	0.80
930407	0649	2.19	0.074	13.6	60	70	0.54	1.10	5.19	32	0.63
930407	0949	2.53	0.074	13.6	56	69	0.52	1.22	5.36	32	0.50
930407	1249	2.59	0.074	13.6	58	67	0.49	0.91	5.65	29	0.22
930407	1546	2.37	0.083	12.0	64	69	0.52	1.49	6.15	25	0.28
930407	1812	2.39	0.074	13.6	60	67	0.49	1.61	7.25	25	0.47
930407	2158	2.87	0.074	13.6	60	69	0.48	0.73	5.80	31	0.23
930408	0114	2.98	0.083	12.0	64	71	0.49	0.61	5.45	32	0.18
930408	0405	2.47	0.074	13.6	68	72	0.48	0.71	5.98	29	0.12
930408	0701	2.28	0.074	13.6	60	70	0.51	1.17	6.03	28	0.54
930408	1003	2.29	0.083	12.0	54	70	0.55	0.90	4.81	38	0.29
930408	1302	2.42	0.083	12.0	58	71	0.53	0.79	4.80	39	0.61
930408	1605	1.96	0.083	12.0	64	75	0.54	0.86	5.25	34	0.30
930408	1913	1.94	0.083	12.0	60	75	0.55	1.17	4.79	36	0.70
930408	2221	1.67	0.083	12.0	62	77	0.59	0.89	4.16	43	0.72

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930409	0104	1.52	0.093	10.7	60	76	0.58	0.92	4.40	39	0.54
930409	0405	1.39	0.093	10.7	80	79	0.62	0.78	3.89	41	0.03
930409	0701	1.37	0.093	10.7	76	81	0.59	1.14	4.65	32	0.22
930409	1529	1.78	0.054	18.5	76	78	0.56	1.09	5.03	29	0.01
930409	1904	2.16	0.064	15.6	68	74	0.52	1.28	5.58	25	0.38
930409	2201	2.27	0.064	15.6	64	71	0.48	1.57	7.05	23	0.26
930410	0102	2.50	0.064	15.6	72	71	0.46	0.60	6.51	24	-0.21
930410	0402	2.97	0.064	15.6	74	71	0.47	0.51	5.58	27	-0.31
930410	0703	3.13	0.064	15.6	72	69	0.43	0.34	6.17	26	-0.23
930410	1303	4.37	0.064	15.6	78	71	0.39	0.21	6.42	27	-0.42
930410	1601	4.33	0.074	13.6	72	73	0.36	0.41	8.47	20	0.07
930410	1902	3.93	0.074	13.6	66	69	0.39	0.65	8.09	22	0.16
930410	2201	3.78	0.074	13.6	56	69	0.45	0.85	6.30	27	0.25
930411	0101	3.66	0.074	13.6	58	69	0.44	0.70	6.70	26	0.06
930411	0819	3.61	0.074	13.6	72	67	0.45	0.46	5.59	27	-0.06
930411	1302	3.50	0.074	13.6	56	66	0.45	0.67	5.40	30	0.14
930411	1602	3.42	0.083	12.0	58	67	0.44	0.66	6.12	29	0.25
930411	1901	3.26	0.083	12.0	56	67	0.46	0.85	6.02	31	0.35
930411	2202	3.53	0.083	12.0	58	68	0.45	0.85	5.85	28	0.16
930412	0102	3.38	0.083	12.0	56	66	0.49	0.75	4.91	33	0.25
930412	0403	3.32	0.113	8.9	54	65	0.53	0.81	4.36	39	0.24
930412	0704	2.90	0.083	12.0	56	66	0.54	1.00	5.05	33	0.25
930412	1005	2.97	0.083	12.0	60	66	0.48	1.24	6.96	25	0.19
930412	1304	2.99	0.093	10.7	58	68	0.48	1.32	6.43	27	0.37
930412	1626	2.91	0.083	12.0	54	67	0.52	1.46	5.88	32	0.53
930412	1929	2.68	0.083	12.0	62	66	0.49	1.72	6.96	25	0.31
930412	2204	2.33	0.093	10.7	58	68	0.56	1.66	5.54	30	0.52
930413	0103	2.11	0.093	10.7	54	67	0.61	1.79	5.05	33	0.30
930413	0403	2.05	0.093	10.7	54	67	0.62	1.89	4.89	35	0.56
930413	0701	2.05	0.093	10.7	56	68	0.64	2.12	4.75	31	0.46
930413	1442	2.20	0.093	10.7	56	77	0.75	1.60	3.21	44	0.46
930413	1902	2.09	0.113	8.9	58	75	0.66	1.77	4.19	36	0.35
930413	2201	2.01	0.123	8.2	58	76	0.76	1.70	3.20	42	0.55
930414	0102	2.25	0.152	6.6	52	71	0.73	1.74	3.55	43	0.40
930414	0402	2.33	0.152	6.6	54	70	0.79	1.40	2.97	54	0.67
930414	0702	2.39	0.132	7.6	56	70	0.75	1.55	3.15	48	0.46
930414	1003	2.42	0.132	7.6	48	68	0.76	1.47	3.14	51	0.51
930414	1610	2.11	0.132	7.6	54	71	0.78	1.31	2.83	56	0.53
930414	2203	1.39	0.064	15.6	54	96	0.95	0.37	1.60	107	0.76
930415	0101	1.41	0.064	15.6	50	83	0.93	0.76	1.87	108	1.03
930415	0401	1.31	0.064	15.6	56	86	0.94	0.64	1.89	103	0.98
930415	0654	1.14	0.074	13.6	82	103	0.94	0.27	1.69	103	0.74
930415	1002	1.16	0.064	15.6	56	94	0.90	0.52	1.94	96	0.86
930415	1301	1.20	0.074	13.6	58	92	0.83	0.79	2.25	85	0.82
930415	1602	1.33	0.064	15.6	54	90	0.82	1.09	2.48	76	0.62
930415	1902	1.33	0.162	6.2	94	86	0.77	1.23	2.85	49	-0.09
930415	2201	1.19	0.064	15.6	88	92	0.80	0.87	2.36	79	0.82
930416	0102	1.26	0.064	15.6	96	87	0.75	0.76	2.69	54	-0.02
930416	1901	4.21	0.064	15.6	72	72	0.45	0.46	5.78	30	0.08
930416	2201	4.06	0.064	15.6	74	76	0.43	0.63	7.53	21	0.19
930417	0101	3.65	0.064	15.6	70	77	0.49	0.49	5.38	35	0.13
930417	0401	3.42	0.064	15.6	80	74	0.47	0.44	6.37	30	-0.40
930417	0701	3.20	0.064	15.6	70	72	0.48	0.84	6.18	31	0.12
930417	1002	3.05	0.074	13.6	74	78	0.43	0.75	7.16	26	0.17
930417	1301	2.60	0.074	13.6	68	75	0.47	1.15	6.95	26	0.43

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930417	1602	2.37	0.074	13.6	64	78	0.48	1.02	6.37	30	0.59
930417	1901	2.44	0.074	13.6	56	72	0.52	1.11	5.75	36	0.52
930417	2201	2.55	0.064	15.6	60	68	0.43	1.42	7.76	20	0.75
930418	0101	2.60	0.074	13.6	58	67	0.47	1.42	7.07	25	0.62
930418	0401	2.70	0.074	13.6	64	70	0.47	1.28	7.55	25	0.29
930418	0702	2.81	0.074	13.6	54	67	0.47	1.08	7.42	26	0.24
930418	1001	2.96	0.074	13.6	58	69	0.44	1.19	8.61	22	0.21
930418	1301	2.90	0.054	18.5	70	70	0.44	1.23	7.91	21	0.09
930418	1602	2.83	0.054	18.5	68	71	0.41	1.65	9.76	16	0.35
930418	1901	2.68	0.054	18.5	66	73	0.47	1.14	7.01	27	0.69
930418	2202	2.84	0.054	18.5	64	71	0.44	1.26	8.14	21	0.53
930419	0101	3.07	0.064	15.6	64	70	0.40	0.93	9.03	18	0.32
930419	0402	3.52	0.064	15.6	68	71	0.41	0.52	7.96	20	0.16
930419	0703	4.01	0.064	15.6	64	71	0.42	0.55	6.69	22	0.37
930419	1002	3.95	0.064	15.6	68	72	0.42	0.37	6.25	25	0.45
930419	1611	3.66	0.074	13.6	66	72	0.42	0.43	6.00	27	0.49
930419	1903	3.49	0.074	13.6	60	72	0.46	0.37	5.23	33	0.40
930419	2209	3.35	0.074	13.6	58	71	0.47	0.59	5.68	33	0.47
930420	0105	3.11	0.083	12.0	62	74	0.46	0.45	5.99	32	0.44
930420	0401	2.87	0.083	12.0	62	75	0.49	0.56	5.28	37	0.65
930420	0703	2.38	0.083	12.0	58	75	0.51	0.52	4.88	41	0.75
930420	1002	2.46	0.074	13.6	60	74	0.49	0.68	5.08	38	0.77
930420	1302	2.08	0.074	13.6	60	78	0.51	0.58	4.84	40	0.36
930420	1623	1.78	0.083	12.0	60	77	0.52	0.81	5.45	39	0.76
930420	1904	1.61	0.083	12.0	60	77	0.53	0.66	4.83	41	0.58
930420	2158	1.50	0.083	12.0	62	78	0.57	0.61	4.43	42	0.17
930421	0105	1.32	0.083	12.0	64	79	0.53	0.73	5.16	37	0.50
930421	0704	1.27	0.083	12.0	64	83	0.53	0.85	5.34	36	0.16
930421	1005	1.45	0.093	10.7	60	85	0.53	0.56	4.63	42	-0.07
930421	1304	1.56	0.064	15.6	82	85	0.49	0.63	5.74	31	0.11
930421	1609	1.77	0.064	15.6	82	85	0.48	0.66	6.14	31	0.19
930421	1901	2.04	0.064	15.6	76	87	0.46	0.42	5.99	31	0.35
930421	2221	2.27	0.074	13.6	108	86	0.49	0.27	5.27	38	-0.05
930422	0108	2.47	0.074	13.6	88	83	0.46	0.29	5.79	34	-0.10
930422	0359	2.64	0.074	13.6	82	83	0.45	0.15	6.28	27	0.05
930422	0708	3.02	0.074	13.6	80	81	0.46	-0.07	5.51	33	0.09
930422	1008	3.41	0.074	13.6	78	77	0.42	0.07	5.98	27	0.03
930422	1608	3.35	0.083	12.0	76	73	0.48	-0.14	4.54	32	-0.09
930422	2004	3.00	0.083	12.0	62	72	0.50	0.12	4.30	37	0.29
930422	2159	3.26	0.083	12.0	60	70	0.48	0.17	4.06	37	0.25
930423	0057	3.44	0.083	12.0	60	66	0.49	0.09	3.80	37	0.05
930423	0359	3.62	0.123	8.2	58	63	0.48	0.21	3.65	36	-0.02
930423	0959	3.66	0.074	13.6	52	62	0.45	0.53	4.80	31	0.44
930423	1301	3.28	0.113	8.9	56	63	0.49	0.46	4.98	32	0.27
930423	1603	2.69	0.083	12.0	58	64	0.49	0.77	5.06	31	0.25
930423	1900	2.67	0.083	12.0	54	66	0.51	0.88	4.74	33	0.45
930423	2201	2.80	0.083	12.0	52	65	0.53	0.77	4.20	38	0.59
930424	0100	2.72	0.083	12.0	62	67	0.54	0.69	4.36	36	0.26
930424	0407	2.25	0.083	12.0	52	66	0.56	0.90	4.55	38	0.42
930424	0709	2.16	0.083	12.0	56	69	0.56	1.12	4.85	36	0.60
930424	1011	1.99	0.093	10.7	58	69	0.58	1.15	4.60	38	0.57
930424	1310	1.73	0.093	10.7	56	71	0.64	1.25	3.94	44	0.53
930424	1610	1.87	0.064	15.6	64	71	0.66	1.19	3.69	42	0.27
930424	1908	1.86	0.093	10.7	50	66	0.64	1.38	4.08	42	0.50
930424	2210	2.09	0.093	10.7	42	62	0.64	1.53	4.19	43	0.87

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930425	0110	2.55	0.083	12.0	50	65	0.61	1.50	4.49	38	0.58
930425	0411	2.48	0.083	12.0	50	66	0.59	1.49	4.77	36	0.51
930425	0710	2.73	0.083	12.0	50	64	0.54	1.55	5.63	31	0.84
930425	1310	2.68	0.074	13.6	54	64	0.54	1.60	6.11	29	0.66
930425	1610	2.68	0.083	12.0	60	67	0.56	1.55	5.76	28	0.23
930425	1910	2.48	0.083	12.0	56	69	0.57	1.41	4.90	33	0.37
930425	2210	2.47	0.083	12.0	58	71	0.58	1.27	4.53	36	0.81
930426	0110	2.37	0.083	12.0	54	68	0.57	1.48	4.93	35	0.73
930426	0410	2.43	0.083	12.0	58	69	0.59	1.11	4.29	36	0.58
930426	0709	2.32	0.083	12.0	58	70	0.58	1.27	4.75	33	0.32
930426	1010	2.34	0.093	10.7	60	70	0.56	1.08	4.89	33	0.20
930426	1310	2.57	0.142	7.0	68	69	0.55	0.82	4.50	34	0.00
930426	1624	2.44	0.142	7.0	58	69	0.58	1.15	4.59	36	0.28
930426	1909	2.71	0.064	15.6	54	65	0.57	1.42	5.02	33	0.50
930426	2159	3.43	0.074	13.6	58	63	0.50	1.61	6.58	22	0.34
930427	0107	3.83	0.074	13.6	66	62	0.47	0.74	6.33	27	-0.15
930427	0407	4.13	0.074	13.6	64	61	0.47	0.80	6.20	27	-0.16
930427	0708	4.07	0.074	13.6	66	61	0.44	0.78	6.86	26	-0.17
930427	1007	4.02	0.103	9.7	58	61	0.46	1.06	6.78	26	0.08
930427	1308	3.92	0.074	13.6	64	64	0.48	0.85	6.00	29	-0.05
930427	1607	3.68	0.083	12.0	58	64	0.51	0.78	5.18	32	0.15
930427	1907	3.74	0.083	12.0	56	62	0.49	1.13	5.77	27	0.34
930427	2200	3.42	0.083	12.0	54	63	0.52	1.20	5.20	30	0.53
930428	0107	3.45	0.093	10.7	56	63	0.53	0.65	4.63	35	0.29
930428	0407	3.29	0.093	10.7	54	63	0.56	1.00	4.68	35	0.39
930428	0705	3.29	0.093	10.7	56	65	0.53	0.86	4.77	35	0.35
930428	1007	3.26	0.083	12.0	48	62	0.56	1.04	4.68	38	0.47
930428	1607	2.82	0.093	10.7	56	62	0.56	1.11	4.94	35	0.40
930428	1910	2.82	0.093	10.7	54	61	0.56	1.38	5.19	32	0.42
930428	2209	2.57	0.093	10.7	56	62	0.54	1.41	5.64	30	0.33
930429	0107	2.57	0.103	9.7	52	61	0.58	1.47	4.89	36	0.49
930429	0409	2.58	0.103	9.7	56	63	0.59	1.35	4.83	36	0.37
930429	0700	2.60	0.103	9.7	58	63	0.54	1.07	5.12	35	0.11
930429	1009	2.48	0.103	9.7	60	63	0.53	1.43	5.98	31	0.06
930429	1305	2.49	0.113	8.9	56	60	0.53	1.31	5.93	29	0.14
930429	1609	2.24	0.113	8.9	52	59	0.53	1.73	6.49	29	0.43
930429	1919	2.08	0.103	9.7	52	62	0.55	1.54	5.46	33	0.55
930429	2159	2.35	0.113	8.9	48	56	0.50	1.85	6.88	26	0.33
930430	0058	2.90	0.113	8.9	52	53	0.46	1.26	6.88	27	0.02
930430	0403	3.03	0.113	8.9	54	54	0.46	0.93	6.30	31	-0.06
930430	0701	3.41	0.103	9.7	60	53	0.45	1.09	7.13	29	-0.01
930430	1003	3.71	0.103	9.7	58	55	0.41	0.85	7.71	26	-0.17
930430	1301	3.70	0.103	9.7	56	55	0.42	0.59	7.08	27	-0.09
930430	1603	3.36	0.103	9.7	56	57	0.42	0.79	7.82	24	-0.04
930430	1901	3.04	0.103	9.7	56	58	0.43	1.02	7.54	25	0.08
930430	2203	2.89	0.093	10.7	48	57	0.42	1.21	7.57	25	0.36
930501	0105	2.74	0.103	9.7	52	60	0.45	0.98	6.74	27	0.37
930501	0403	2.77	0.093	10.7	50	58	0.46	0.64	5.67	32	0.19
930501	0701	2.66	0.103	9.7	50	56	0.44	0.99	6.75	27	0.15
930501	1003	2.62	0.103	9.7	52	58	0.42	1.03	7.60	26	0.27
930501	1301	2.76	0.103	9.7	50	58	0.43	1.08	7.68	28	0.23
930501	1607	2.73	0.103	9.7	48	56	0.42	1.06	8.11	25	0.35
930501	1906	2.80	0.093	10.7	48	54	0.41	1.46	8.50	23	0.32
930501	2208	2.69	0.093	10.7	42	52	0.44	1.45	7.58	25	0.33
930502	0106	2.38	0.093	10.7	48	58	0.44	1.54	8.03	24	0.44
930502	0407	2.23	0.103	9.7	50	57	0.44	1.66	8.66	23	0.41

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930502	1007	2.31	0.083	12.0	52	60	0.46	1.06	6.69	30	0.07
930502	1717	2.27	0.123	8.2	50	57	0.46	1.72	7.93	24	0.36
930503	0106	2.29	0.113	8.9	48	58	0.49	1.71	6.71	28	0.49
930503	0408	2.39	0.123	8.2	52	57	0.46	1.27	7.18	26	0.24
930503	0705	2.42	0.123	8.2	50	56	0.51	1.02	5.40	36	0.17
930503	1006	2.33	0.123	8.2	38	54	0.51	1.21	6.05	33	0.18
930503	1305	2.30	0.074	13.6	48	58	0.53	1.13	5.53	35	0.09
930503	1606	2.31	0.074	13.6	52	58	0.49	1.04	6.21	30	0.36
930503	2207	2.07	0.083	12.0	50	60	0.50	1.22	5.89	31	0.56
930504	0056	1.79	0.093	10.7	50	60	0.57	1.90	5.88	29	0.68
930504	0703	1.68	0.083	12.0	52	60	0.54	2.00	6.40	26	0.54
930504	1006	1.87	0.083	12.0	52	58	0.49	1.47	6.62	27	0.21
930504	1627	1.98	0.083	12.0	48	62	0.53	0.86	4.98	36	0.35
930504	1905	2.30	0.093	10.7	50	60	0.47	0.86	5.74	32	0.30
930504	2207	2.96	0.083	12.0	50	55	0.44	0.86	5.84	28	0.29
930505	0104	4.38	0.074	13.6	52	55	0.38	0.86	8.05	18	0.20
930505	0407	4.09	0.074	13.6	56	55	0.41	0.67	7.30	22	-0.12
930505	0702	3.87	0.074	13.6	50	57	0.43	1.06	7.47	22	0.48
930505	1005	3.63	0.074	13.6	52	58	0.44	1.05	6.92	24	0.38
930505	1304	3.76	0.074	13.6	60	61	0.42	0.53	6.19	25	0.00
930505	1607	3.46	0.074	13.6	54	61	0.44	0.86	6.62	27	0.31
930505	1903	3.00	0.074	13.6	50	58	0.46	1.30	7.00	22	0.60
930505	2009	2.90	0.074	13.6	50	59	0.48	1.25	6.21	26	0.67
930505	2033	2.88	0.074	13.6	50	59	0.49	1.24	5.97	27	0.68
930505	2211	2.89	0.083	12.0	52	58	0.49	1.21	6.09	26	0.30
930506	0100	2.78	0.074	13.6	50	59	0.50	1.06	5.43	33	0.56
930506	0407	2.70	0.074	13.6	56	62	0.45	0.82	6.25	26	0.28
930506	0706	2.37	0.083	12.0	54	64	0.50	1.05	5.81	30	0.59
930506	1007	2.16	0.083	12.0	54	62	0.52	1.18	5.88	32	0.69
930506	1305	2.22	0.083	12.0	56	68	0.52	0.75	4.88	37	0.10
930506	1607	2.23	0.083	12.0	68	69	0.50	1.00	6.01	27	0.09
930506	1906	2.29	0.054	18.5	70	70	0.48	0.78	6.66	24	-0.08
930506	2205	2.65	0.054	18.5	72	72	0.43	0.83	8.82	17	-0.11
930507	0105	2.72	0.054	18.5	72	72	0.38	0.89	10.93	11	-0.10
930507	0407	2.64	0.054	18.5	72	73	0.42	1.17	9.34	14	-0.13
930507	1008	3.22	0.064	15.6	58	61	0.46	0.55	5.97	29	0.00
930507	1612	3.68	0.064	15.6	66	61	0.41	0.43	7.04	22	-0.42
930507	1905	3.60	0.064	15.6	68	62	0.40	0.40	7.63	23	-0.27
930507	2207	3.91	0.064	15.6	70	61	0.44	0.38	5.68	31	-0.02
930508	0121	4.16	0.064	15.6	66	58	0.43	0.27	5.89	29	-0.16
930508	0405	4.20	0.064	15.6	56	58	0.42	0.10	6.34	27	-0.04
930508	0705	4.28	0.103	9.7	54	56	0.41	0.29	5.74	29	0.04
930508	1006	3.52	0.113	8.9	54	56	0.47	0.29	4.80	34	0.01
930508	1305	3.34	0.074	13.6	72	60	0.46	0.16	5.15	33	-0.19
930508	1609	3.17	0.123	8.2	60	59	0.46	0.30	5.10	33	-0.09
930508	2207	3.09	0.103	9.7	56	57	0.47	0.43	5.36	34	0.04
930509	0106	3.23	0.113	8.9	54	58	0.47	0.36	4.88	35	0.15
930509	0406	3.32	0.103	9.7	78	59	0.47	0.16	4.55	37	-0.04
930509	0707	3.13	0.103	9.7	56	58	0.46	0.26	5.41	31	0.10
930509	1006	3.11	0.103	9.7	54	60	0.44	0.79	6.41	27	0.36
930509	1306	3.03	0.103	9.7	54	60	0.45	0.75	6.34	28	0.24
930509	1608	3.08	0.083	12.0	54	59	0.45	0.88	6.78	28	0.28
930509	2207	2.63	0.083	12.0	52	59	0.51	1.64	6.88	27	0.50
930510	0105	2.53	0.083	12.0	56	63	0.52	1.24	6.07	31	0.29
930510	0400	2.30	0.083	12.0	56	66	0.59	1.79	5.25	32	0.35

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930510	0701	2.29	0.083	12.0	62	65	0.57	1.80	5.73	28	0.15
930510	1006	2.28	0.083	12.0	56	66	0.59	2.29	5.71	27	0.22
930510	1305	2.19	0.083	12.0	58	67	0.56	1.99	6.01	29	0.17
930510	1605	1.96	0.083	12.0	68	72	0.65	1.69	4.58	32	0.09
930510	1909	1.79	0.083	12.0	60	74	0.71	2.02	3.83	34	0.59
930510	2228	1.84	0.083	12.0	74	87	0.82	1.23	2.64	66	0.88
930511	0106	1.86	0.074	13.6	76	81	0.71	1.72	3.58	36	0.16
930511	0406	1.84	0.074	13.6	66	85	0.76	1.54	3.01	46	0.75
930511	0702	1.61	0.074	13.6	64	87	0.80	1.40	2.74	71	1.39
930511	1306	1.47	0.074	13.6	58	95	0.89	0.87	1.95	99	1.32
930511	1608	1.45	0.083	12.0	58	92	0.86	1.06	2.21	94	1.24
930511	1908	1.38	0.083	12.0	58	97	0.86	0.77	1.97	95	1.15
930511	2208	1.80	0.083	12.0	64	85	0.71	1.45	3.28	40	0.35
930512	0107	2.32	0.113	8.9	98	84	0.65	0.96	3.52	44	-0.06
930512	0406	2.17	0.123	8.2	86	79	0.68	1.19	3.47	43	-0.07
930512	0707	2.39	0.103	9.7	58	72	0.61	1.82	4.76	34	0.29
930512	1609	2.21	0.113	8.9	52	71	0.67	1.32	3.81	45	0.28
930512	1909	2.17	0.103	9.7	50	73	0.66	1.40	3.95	41	0.18
930512	2209	2.23	0.093	10.7	60	77	0.66	1.32	3.71	44	0.48
930513	0109	2.21	0.093	10.7	54	75	0.67	1.08	3.47	50	0.52
930513	0409	2.19	0.093	10.7	52	75	0.66	1.02	3.45	49	0.35
930513	0709	2.15	0.083	12.0	48	71	0.68	1.60	3.69	45	0.78
930513	1009	2.24	0.083	12.0	52	72	0.68	1.73	3.85	43	1.12
930513	1310	2.35	0.093	10.7	52	72	0.66	1.56	3.93	44	0.91
930513	1609	2.14	0.093	10.7	50	75	0.70	1.34	3.37	51	0.84
930513	1941	1.98	0.093	10.7	54	79	0.68	1.26	3.41	48	0.43
930513	2215	2.04	0.093	10.7	58	79	0.68	1.05	3.19	51	0.60
930514	0407	1.80	0.093	10.7	56	78	0.73	1.28	3.12	52	0.68
930514	0707	1.85	0.103	9.7	60	76	0.73	1.25	3.11	50	0.56
930514	1008	1.67	0.103	9.7	60	76	0.70	1.50	3.60	43	0.41
930514	1307	1.60	0.103	9.7	52	75	0.73	1.39	3.22	50	0.69
930514	1607	1.69	0.064	15.6	58	76	0.72	1.35	3.25	48	0.70
930514	1908	1.72	0.064	15.6	66	73	0.64	1.67	4.18	35	0.38
930515	0406	1.74	0.074	13.6	60	75	0.66	1.62	4.06	36	0.66
930515	1006	1.60	0.074	13.6	62	78	0.70	1.27	3.23	47	0.56
930515	1308	1.61	0.064	15.6	56	78	0.70	1.44	3.55	43	0.39
930515	1606	1.62	0.064	15.6	60	78	0.73	1.36	3.24	47	0.63
930515	1906	1.64	0.074	13.6	56	76	0.71	1.33	3.36	46	0.60
930515	2205	1.75	0.074	13.6	56	74	0.65	1.31	3.71	40	0.49
930516	0106	1.78	0.074	13.6	56	77	0.71	1.08	2.99	49	0.58
930516	0406	1.91	0.074	13.6	56	76	0.64	1.15	3.63	40	0.34
930516	0706	1.98	0.074	13.6	58	76	0.67	1.22	3.38	40	0.41
930516	1007	2.01	0.074	13.6	66	77	0.62	1.22	3.87	35	0.17
930516	1306	1.95	0.074	13.6	60	77	0.67	1.37	3.65	39	0.34
930516	1607	2.02	0.074	13.6	60	75	0.66	1.20	3.62	40	0.30
930516	1906	1.99	0.074	13.6	58	79	0.68	1.11	3.19	44	0.25
930516	2206	1.85	0.083	12.0	82	81	0.67	0.99	3.42	38	-0.11
930517	0406	1.66	0.083	12.0	66	84	0.68	1.14	3.36	42	0.56
930517	0706	1.53	0.083	12.0	80	94	0.75	0.72	2.55	68	0.82
930517	1006	1.45	0.083	12.0	84	96	0.73	0.65	2.52	67	0.84
930517	1307	1.33	0.083	12.0	72	96	0.76	0.77	2.45	70	1.02
930517	1914	1.31	0.093	10.7	80	95	0.79	0.66	2.30	76	0.79
930517	2204	1.22	0.064	15.6	64	101	0.80	0.34	1.94	82	0.65
930518	0105	1.11	0.064	15.6	82	108	0.81	0.18	2.09	77	0.10
930518	0407	1.04	0.064	15.6	78	115	0.86	-0.02	1.88	86	-0.10

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930518	1005	0.98	0.064	15.6	124	127	0.79	-0.32	2.20	82	-0.13
930518	1605	1.00	0.074	13.6	146	138	0.74	-0.49	2.71	65	-0.27
930518	1908	1.10	0.074	13.6	104	133	0.68	-0.07	2.68	61	0.12
930518	2242	1.18	0.074	13.6	108	123	0.63	0.57	3.38	44	1.18
930519	0105	1.37	0.064	15.6	110	121	0.58	0.72	4.24	36	1.10
930519	0407	1.44	0.123	8.2	108	119	0.56	0.80	4.30	34	1.01
930519	0706	1.35	0.123	8.2	110	123	0.57	0.75	4.05	36	1.17
930519	1006	1.19	0.074	13.6	114	130	0.62	0.31	3.39	49	1.05
930519	1305	1.19	0.074	13.6	114	134	0.60	0.19	3.41	47	0.72
930519	1608	1.12	0.074	13.6	118	135	0.65	0.01	3.27	51	0.50
930519	1905	1.15	0.074	13.6	116	140	0.64	-0.24	3.21	55	0.16
930519	2148	1.14	0.074	13.6	118	138	0.68	-0.12	2.85	61	0.14
930520	0108	1.31	0.074	13.6	114	127	0.67	-0.02	2.72	58	0.10
930520	0409	1.33	0.074	13.6	94	128	0.73	0.07	2.38	71	0.37
930520	0705	1.39	0.064	15.6	100	129	0.70	0.02	2.55	65	0.37
930520	1538	1.96	0.074	13.6	80	104	0.69	0.72	2.63	60	0.94
930520	1828	2.36	0.093	10.7	74	95	0.67	1.14	3.28	40	0.26
930520	2208	2.55	0.083	12.0	62	89	0.67	1.10	3.28	45	0.05
930521	0107	2.58	0.083	12.0	76	86	0.63	1.19	3.70	36	0.30
930521	0408	2.42	0.083	12.0	64	82	0.61	1.41	4.15	35	0.53
930521	0746	2.34	0.083	12.0	64	85	0.65	1.44	3.67	38	0.57
930521	1307	2.18	0.083	12.0	60	79	0.63	1.45	4.01	39	0.64
930521	1610	2.31	0.083	12.0	64	78	0.61	1.49	4.35	35	0.86
930521	1907	2.02	0.083	12.0	62	83	0.66	1.34	3.63	43	0.75
930521	2209	1.96	0.083	12.0	74	84	0.65	1.06	3.53	41	0.32
930522	0105	1.85	0.093	10.7	62	80	0.68	1.25	3.44	44	0.63
930522	0405	1.82	0.083	12.0	60	81	0.66	1.34	3.63	42	0.68
930522	0707	2.00	0.093	10.7	62	80	0.59	1.46	4.55	35	0.43
930522	1004	2.06	0.093	10.7	64	78	0.61	1.20	4.21	38	0.51
930522	1849	2.04	0.093	10.7	64	72	0.59	1.29	4.62	35	0.35
930522	2204	2.07	0.132	7.6	62	71	0.59	1.52	5.03	32	0.53
930523	0103	1.97	0.142	7.0	66	71	0.62	1.50	4.74	33	0.23
930523	0404	1.99	0.142	7.0	66	70	0.63	1.40	4.38	37	0.12
930523	0703	1.88	0.142	7.0	62	77	0.64	1.86	4.52	34	0.49
930523	1003	1.94	0.093	10.7	62	75	0.62	1.96	4.98	31	0.51
930523	1303	1.80	0.103	9.7	64	77	0.64	1.51	4.20	36	0.20
930524	1004	1.21	0.113	8.9	56	98	0.92	0.81	1.81	108	1.22
930524	1303	1.11	0.064	15.6	52	99	0.97	0.74	1.65	118	1.15
930524	1605	1.02	0.064	15.6	-176	113	1.01	0.08	1.40	121	0.33
930524	1906	0.89	0.074	13.6	-174	137	0.97	-0.77	1.77	113	-1.06
930524	2205	0.83	0.074	13.6	180	158	0.85	-2.01	3.11	55	-1.22
930525	0104	0.77	0.074	13.6	180	159	0.81	-2.35	3.57	50	-1.15
930525	0403	0.79	0.074	13.6	176	161	0.79	-2.22	3.77	44	-1.17
930525	0703	0.82	0.064	15.6	178	159	0.73	-1.90	3.76	40	-1.11
930525	1003	0.88	0.064	15.6	-174	163	0.75	-1.84	3.65	45	-1.29
930525	1303	0.94	0.064	15.6	-178	163	0.72	-2.03	3.71	41	-1.36
930525	1605	0.91	0.064	15.6	-176	148	0.81	-1.11	2.54	73	-0.81
930525	1913	1.13	0.064	15.6	178	133	0.90	-0.57	1.71	106	-1.22
930525	2206	1.30	0.103	9.7	52	106	0.94	0.51	1.70	112	0.81
930526	0404	1.85	0.103	9.7	60	89	0.75	1.53	3.03	47	0.45
930526	1521	2.02	0.093	10.7	100	99	0.66	1.15	3.45	38	-0.21
930526	1906	1.78	0.093	10.7	110	110	0.67	0.62	3.09	38	-0.06
930526	2206	1.81	0.093	10.7	102	101	0.72	0.76	2.84	48	-0.09
930527	0100	1.83	0.093	10.7	94	95	0.73	1.02	2.95	42	0.17

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930527	0405	1.78	0.103	9.7	96	94	0.72	0.99	2.91	47	-0.05
930527	0706	1.72	0.103	9.7	88	100	0.70	1.02	2.92	49	0.88
930527	1005	1.83	0.103	9.7	92	96	0.69	1.23	3.24	39	0.25
930527	1606	1.83	0.103	9.7	90	94	0.68	1.22	3.33	37	0.21
930527	1910	1.83	0.103	9.7	68	88	0.70	1.37	3.30	42	0.27
930527	2209	1.64	0.113	8.9	66	97	0.79	0.89	2.46	71	0.67
930528	0108	2.04	0.103	9.7	64	83	0.68	1.42	3.56	41	0.44
930528	0409	2.10	0.103	9.7	62	77	0.65	1.94	4.35	34	0.71
930528	0708	1.70	0.113	8.9	60	84	0.75	1.44	3.05	45	0.50
930528	1008	1.43	0.113	8.9	70	94	0.78	1.08	2.53	70	1.37
930528	1610	1.37	0.123	8.2	68	89	0.78	1.30	2.67	68	1.38
930528	1909	1.35	0.123	8.2	62	90	0.81	1.34	2.56	77	1.32
930528	2210	1.29	0.123	8.2	62	95	0.86	0.80	2.06	90	1.04
930529	0112	1.21	0.064	15.6	68	100	0.86	0.76	1.97	89	1.27
930529	0409	1.09	0.064	15.6	66	109	0.91	0.44	1.68	101	1.13
930529	0711	1.08	0.064	15.6	70	113	0.88	0.24	1.71	93	0.75
930529	1010	0.96	0.074	13.6	68	109	0.89	0.42	1.85	93	0.96
930529	1309	0.95	0.074	13.6	66	107	0.90	0.45	1.79	98	1.01
930529	1610	1.00	0.074	13.6	70	110	0.85	0.36	1.80	90	0.90
930529	1909	0.99	0.074	13.6	72	110	0.87	0.36	1.90	90	0.77
930529	2204	1.07	0.083	12.0	70	104	0.85	0.66	2.02	86	1.20
930530	0111	1.01	0.083	12.0	64	102	0.87	0.80	1.97	92	1.47
930530	0710	1.10	0.083	12.0	66	107	0.80	0.42	2.00	82	0.46
930530	1011	1.10	0.083	12.0	70	108	0.76	0.50	2.26	73	0.42
930530	1309	1.04	0.083	12.0	64	108	0.80	0.43	2.13	79	0.22
930530	1609	1.08	0.083	12.0	72	109	0.80	0.36	2.22	76	0.36
930530	1910	0.99	0.083	12.0	74	107	0.82	0.59	2.06	81	0.98
930530	2205	0.96	0.083	12.0	74	113	0.82	0.20	2.08	79	0.26
930531	0109	0.91	0.093	10.7	74	110	0.80	0.37	2.08	79	0.66
930531	0431	0.96	0.093	10.7	74	112	0.79	0.27	2.10	78	0.54
930531	0709	0.95	0.093	10.7	74	106	0.75	0.54	2.29	71	0.65
930531	1010	0.98	0.093	10.7	74	103	0.73	0.66	2.58	66	0.72
930531	1647	1.08	0.132	7.6	96	102	0.68	0.73	3.08	47	0.30
930531	1910	1.21	0.132	7.6	102	100	0.64	0.67	3.34	43	-0.06
930531	2211	1.36	0.093	10.7	70	93	0.63	0.92	3.46	44	0.32
930601	0109	1.40	0.103	9.7	70	89	0.63	1.30	3.82	39	0.67
930601	0409	1.47	0.103	9.7	72	86	0.58	1.45	5.05	30	0.78
930601	0709	1.49	0.103	9.7	72	88	0.60	1.08	4.10	38	0.74
930601	1009	1.57	0.103	9.7	74	91	0.57	0.76	4.14	38	0.27
930601	1551	1.56	0.083	12.0	70	89	0.62	1.06	3.91	41	0.75
930601	1910	1.60	0.093	10.7	72	87	0.60	1.09	4.12	35	0.58
930601	2157	1.62	0.093	10.7	70	90	0.61	1.00	3.94	38	0.30
930602	0059	1.61	0.103	9.7	68	90	0.64	1.09	3.77	39	0.33
930602	0402	1.59	0.093	10.7	68	87	0.69	0.80	3.25	45	0.59
930602	0703	1.74	0.093	10.7	68	79	0.66	0.93	3.62	39	0.35
930602	1004	1.63	0.162	6.2	72	81	0.67	0.77	3.22	43	0.19
930602	1603	1.82	0.152	6.6	70	75	0.73	0.81	2.88	54	0.07
930602	1859	1.93	0.152	6.6	28	71	0.73	0.79	2.72	60	0.20
930602	2210	1.99	0.152	6.6	62	72	0.68	0.76	3.00	53	0.07
930603	0121	2.12	0.142	7.0	94	68	0.68	0.67	3.13	54	0.01
930603	0404	2.23	0.142	7.0	60	65	0.68	1.03	3.39	49	0.06
930603	0703	2.22	0.132	7.6	28	61	0.65	1.03	3.71	49	0.14
930603	1003	2.33	0.132	7.6	36	62	0.60	1.10	4.08	44	0.16
930603	1304	2.14	0.132	7.6	28	64	0.64	0.97	3.45	50	-0.05
930603	1603	1.86	0.142	7.0	88	71	0.71	0.83	3.07	52	-0.29
930603	1943	1.94	0.132	7.6	68	71	0.65	0.88	3.48	45	0.03

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930603	2201	1.95	0.142	7.0	78	69	0.64	0.61	3.59	47	-0.19
930604	0103	2.05	0.152	6.6	64	66	0.64	0.67	3.47	50	-0.14
930604	0704	1.61	0.142	7.0	62	63	0.68	1.34	3.94	44	0.00
930604	1003	1.58	0.142	7.0	28	68	0.72	1.03	3.15	55	0.20
930604	1304	1.65	0.142	7.0	34	67	0.66	1.05	3.57	50	0.02
930604	1604	1.50	0.152	6.6	72	72	0.74	1.01	3.08	53	0.01
930604	1903	1.28	0.152	6.6	30	77	0.85	0.92	2.30	78	0.54
930604	2208	1.16	0.162	6.2	64	76	0.81	0.92	2.56	65	0.47
930605	0110	0.93	0.162	6.2	66	94	0.88	0.42	1.97	92	0.52
930605	0404	0.83	0.074	13.6	74	111	0.86	0.19	1.92	86	0.76
930605	0703	0.85	0.103	9.7	74	115	0.84	0.19	1.97	83	0.62
930605	1908	1.41	0.123	8.2	94	82	0.71	0.93	3.11	45	-0.09
930606	0103	1.63	0.123	8.2	90	76	0.69	0.65	3.24	44	-0.31
930606	0703	1.65	0.123	8.2	66	85	0.68	1.09	3.32	40	0.41
930606	1004	1.75	0.113	8.9	90	83	0.65	1.07	3.69	38	-0.05
930606	1304	1.80	0.113	8.9	90	78	0.65	0.90	3.50	40	-0.14
930606	1604	1.86	0.113	8.9	90	79	0.66	0.82	3.30	40	-0.08
930606	1904	2.10	0.113	8.9	62	78	0.63	0.79	3.44	41	0.13
930607	0703	1.81	0.103	9.7	60	78	0.65	1.18	3.81	39	0.36
930607	1305	1.74	0.103	9.7	64	74	0.70	1.06	3.07	48	0.15
930607	1603	1.84	0.103	9.7	30	65	0.70	1.28	3.22	51	0.36
930607	1905	1.72	0.113	8.9	34	71	0.74	0.96	2.81	56	0.11
930607	2204	1.70	0.113	8.9	28	74	0.74	0.72	2.62	60	-0.14
930608	0103	1.75	0.113	8.9	30	72	0.73	0.80	2.76	56	0.02
930608	0408	2.01	0.162	6.2	46	62	0.73	0.92	2.97	54	0.18
930608	0708	2.24	0.142	7.0	24	55	0.68	1.28	3.58	51	0.23
930608	1007	2.26	0.123	8.2	46	55	0.68	1.29	3.42	50	0.43
930608	1309	2.14	0.123	8.2	28	58	0.65	1.17	3.45	51	0.46
930608	1608	2.11	0.123	8.2	54	64	0.65	1.19	3.57	47	0.22
930608	1906	2.20	0.123	8.2	52	60	0.61	0.85	3.86	45	0.08
930608	2206	2.56	0.113	8.9	84	61	0.60	0.71	3.86	47	-0.12
930609	0125	2.74	0.113	8.9	30	55	0.56	0.93	4.45	44	0.28
930609	0406	2.91	0.113	8.9	26	50	0.53	1.01	4.75	40	0.27
930609	0706	2.72	0.113	8.9	48	51	0.53	1.23	5.47	35	0.11
930609	1557	2.48	0.113	8.9	44	51	0.51	1.24	5.47	36	0.51
930609	1906	2.42	0.113	8.9	48	54	0.54	1.19	5.13	39	0.33
930609	2210	2.17	0.113	8.9	42	57	0.56	1.01	4.94	43	0.51
930610	0407	2.12	0.123	8.2	24	51	0.53	1.06	5.14	39	0.04
930610	0704	2.37	0.123	8.2	50	52	0.48	1.01	5.63	34	0.11
930610	1004	2.24	0.113	8.9	48	53	0.47	0.89	6.02	31	0.37
930610	1302	2.30	0.123	8.2	50	53	0.49	0.68	5.44	36	0.19
930610	1606	2.10	0.123	8.2	24	51	0.51	0.97	5.50	38	-0.11
930610	1907	2.11	0.123	8.2	28	52	0.48	0.94	5.96	37	-0.03
930610	2206	2.30	0.123	8.2	48	53	0.47	0.81	5.83	34	0.25
930611	0107	2.02	0.132	7.6	50	53	0.49	0.70	5.77	34	0.20
930611	0404	2.01	0.132	7.6	48	55	0.51	1.00	5.74	35	0.28
930611	0708	2.62	0.123	8.2	50	52	0.46	0.69	5.69	32	0.09
930611	1007	2.96	0.113	8.9	50	52	0.42	0.69	5.86	29	0.13
930611	1307	3.03	0.113	8.9	50	53	0.44	0.54	5.16	34	0.13
930611	2208	3.10	0.103	9.7	56	53	0.43	0.56	6.31	31	-0.06
930612	0108	3.14	0.103	9.7	48	53	0.42	0.56	6.42	29	0.22
930612	0709	2.97	0.103	9.7	46	53	0.41	1.37	7.65	23	0.51
930612	1008	2.78	0.103	9.7	46	54	0.46	1.17	6.79	30	0.38
930612	1307	2.65	0.103	9.7	50	55	0.43	1.32	8.47	23	0.29

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930612	1608	2.39	0.113	8.9	44	52	0.46	1.94	8.35	23	0.47
930612	1902	2.48	0.103	9.7	44	50	0.42	2.07	9.68	19	0.42
930612	2207	2.43	0.103	9.7	46	50	0.45	1.72	8.74	23	0.17
930613	0106	2.42	0.103	9.7	44	49	0.47	1.83	8.10	22	0.43
930613	0405	2.43	0.103	9.7	44	51	0.47	1.34	7.14	26	0.46
930613	0707	2.72	0.103	9.7	48	50	0.43	1.25	7.87	25	0.11
930613	1008	2.41	0.103	9.7	50	51	0.46	1.42	7.47	28	0.05
930613	1307	2.30	0.113	8.9	46	53	0.45	1.46	7.96	25	0.46
930613	1607	2.32	0.113	8.9	48	52	0.45	1.86	8.71	22	0.35
930613	1908	2.27	0.113	8.9	44	57	0.50	1.29	6.96	30	0.30
930613	2207	2.16	0.113	8.9	44	54	0.52	1.61	6.60	32	0.55
930614	0107	2.28	0.113	8.9	48	55	0.50	1.45	6.45	32	0.35
930614	0408	2.13	0.113	8.9	44	58	0.51	1.51	6.62	33	0.34
930614	0707	2.08	0.113	8.9	50	56	0.51	2.14	7.83	27	0.24
930614	1309	1.79	0.113	8.9	46	60	0.63	2.82	5.69	31	0.92
930614	1606	1.60	0.113	8.9	44	61	0.69	2.68	4.82	36	1.14
930614	1908	1.59	0.123	8.2	42	57	0.73	2.73	4.41	39	1.05
930614	2212	1.58	0.123	8.2	40	61	0.74	2.99	4.42	38	0.56
930615	0109	1.58	0.123	8.2	44	62	0.80	3.28	3.97	39	1.04
930617	0707	2.57	0.093	10.7	46	53	0.54	2.49	7.54	24	0.50
930618	0056	1.81	0.093	10.7	50	65	0.72	2.75	4.30	32	1.08
930618	2219	1.45	0.054	18.5	46	110	0.98	-0.04	1.45	114	-0.34
930619	0108	1.33	0.054	18.5	44	106	0.98	0.04	1.49	114	-0.18
930619	0407	1.39	0.054	18.5	42	104	1.01	0.12	1.49	120	-0.07
930619	0708	1.41	0.054	18.5	44	103	0.99	0.12	1.49	111	0.04
930619	1007	1.58	0.103	9.7	48	83	0.93	0.96	1.86	104	1.71
930619	1254	1.50	0.064	15.6	42	93	0.97	0.43	1.60	107	0.74
930619	1556	1.49	0.064	15.6	44	87	0.96	0.70	1.70	106	1.27
930619	2153	1.35	0.064	15.6	52	107	0.93	0.04	1.52	104	-0.09
930620	0055	1.27	0.064	15.6	54	107	0.93	0.05	1.57	103	-0.16
930620	0353	1.24	0.064	15.6	50	96	0.95	0.43	1.69	102	0.82
930620	0653	1.41	0.103	9.7	56	79	0.89	1.12	2.22	94	1.38
930620	0956	1.35	0.064	15.6	34	89	0.94	0.48	1.64	107	0.83
930620	1253	1.44	0.103	9.7	52	77	0.88	1.07	2.11	98	1.48
930620	1553	1.41	0.064	15.6	44	72	0.89	1.25	2.16	103	1.50
930621	1251	1.17	0.064	15.6	36	75	0.92	1.10	2.06	105	1.23
930621	1551	1.05	0.064	15.6	32	81	0.97	0.73	1.72	115	1.03
930621	2154	1.27	0.152	6.6	40	59	0.83	2.04	3.09	53	1.20
930622	0107	1.42	0.142	7.0	42	58	0.75	1.78	3.64	43	0.40
930622	0406	1.45	0.162	6.2	40	56	0.72	1.88	3.91	45	0.40
930622	0706	2.11	0.132	7.6	26	44	0.56	1.97	5.98	33	0.26
930622	1006	2.81	0.113	8.9	42	46	0.49	1.28	6.51	29	0.10
930622	1253	2.67	0.113	8.9	46	49	0.45	1.86	8.18	24	0.14
930622	1552	2.69	0.113	8.9	48	50	0.44	1.55	7.87	26	0.10
930622	1853	2.83	0.113	8.9	34	46	0.46	1.64	7.25	28	0.31
930622	2210	3.02	0.113	8.9	50	47	0.47	1.28	6.27	31	-0.03
930623	0053	3.31	0.113	8.9	26	48	0.46	0.99	5.68	34	0.01
930623	0347	3.27	0.113	8.9	48	49	0.45	1.10	6.38	31	0.07
930623	0652	3.35	0.103	9.7	44	50	0.41	1.13	7.76	27	0.20
930623	0952	3.40	0.103	9.7	42	46	0.40	1.99	9.51	18	0.27
930623	1548	3.03	0.103	9.7	48	50	0.45	1.27	6.98	26	0.01
930623	1852	2.94	0.103	9.7	48	50	0.46	1.30	7.05	28	0.17

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930624	0052	2.75	0.103	9.7	42	50	0.47	1.58	6.73	25	0.55
930624	0720	2.53	0.103	9.7	44	53	0.44	2.22	8.74	20	0.59
930624	0953	2.61	0.103	9.7	46	51	0.48	1.56	6.73	25	0.30
930624	1253	2.59	0.103	9.7	48	51	0.53	1.50	5.90	30	0.23
930624	1854	2.25	0.113	8.9	46	53	0.55	2.17	6.31	25	0.53
930624	2152	2.01	0.113	8.9	46	56	0.60	2.13	5.51	31	0.77
930625	0053	1.98	0.113	8.9	36	54	0.66	2.27	4.91	39	0.74
930625	0353	1.90	0.113	8.9	30	55	0.69	2.39	4.70	40	0.44
930625	0654	1.58	0.113	8.9	48	68	0.80	2.13	3.30	49	0.96
930625	1552	1.79	0.113	8.9	50	70	0.82	2.04	3.15	49	1.03
930626	0052	1.57	0.113	8.9	50	83	0.87	1.36	2.47	87	1.04
930626	0353	1.68	0.113	8.9	40	82	0.91	1.21	2.22	99	1.02
930626	0433	1.63	0.113	8.9	40	81	0.90	1.27	2.34	93	0.89
930626	0652	1.58	0.113	8.9	44	84	0.93	1.16	2.04	105	1.26
930626	0953	1.44	0.064	15.6	52	99	0.92	0.52	1.61	108	1.02
930626	1029	1.46	0.064	15.6	52	97	0.92	0.64	1.69	102	1.15
930626	1322	1.37	0.064	15.6	52	97	0.94	0.67	1.72	107	1.13
930626	1553	1.49	0.064	15.6	56	97	0.92	0.58	1.65	101	1.23
930626	1853	1.39	0.113	8.9	46	86	0.94	1.07	1.94	107	1.37
930626	2155	1.36	0.064	15.6	48	91	0.93	0.74	1.74	104	1.30
930627	0053	1.41	0.064	15.6	48	100	0.95	0.46	1.57	108	0.90
930627	0354	1.46	0.064	15.6	48	87	0.93	0.95	1.85	105	1.44
930627	0953	1.45	0.113	8.9	46	72	0.83	1.94	2.88	65	1.50
930627	1254	1.42	0.113	8.9	44	69	0.84	2.09	2.96	63	1.34
930627	1622	1.32	0.123	8.2	44	73	0.89	1.72	2.54	91	1.48
930627	1852	1.39	0.113	8.9	46	70	0.89	1.98	2.66	91	1.88
930627	2152	1.53	0.113	8.9	44	61	0.78	2.79	3.73	40	1.41
930628	0353	1.79	0.113	8.9	40	60	0.72	2.23	3.96	42	0.86
930628	0653	1.80	0.113	8.9	34	58	0.66	2.35	4.64	37	0.46
930628	1034	2.02	0.103	9.7	40	54	0.62	2.53	5.41	31	0.52
930628	1253	2.25	0.113	8.9	46	53	0.55	2.26	6.25	29	0.31
930628	1708	2.42	0.113	8.9	48	57	0.53	1.78	6.01	33	0.39
930628	1932	2.32	0.113	8.9	44	55	0.54	1.84	5.84	32	0.52
930628	2210	2.32	0.103	9.7	54	55	0.53	1.36	5.60	36	0.15
930629	0410	2.82	0.103	9.7	36	48	0.47	1.35	6.74	29	0.38
930629	0710	2.66	0.103	9.7	46	52	0.46	1.51	7.14	26	0.28
930629	1009	2.58	0.103	9.7	46	52	0.46	1.64	7.40	24	0.49
930629	1308	2.30	0.113	8.9	44	51	0.47	2.01	7.73	23	0.60
930629	1610	2.03	0.113	8.9	42	55	0.52	1.51	5.91	34	0.69
930629	1910	2.08	0.113	8.9	44	53	0.51	2.02	6.86	27	0.45
930629	2208	2.26	0.103	9.7	46	51	0.47	1.80	7.75	26	0.29
930630	0108	2.35	0.103	9.7	42	51	0.50	1.94	7.02	27	0.47
930630	0405	2.29	0.103	9.7	42	53	0.49	1.93	6.86	27	0.70
930630	0707	2.11	0.103	9.7	50	56	0.48	2.05	8.00	22	0.37
930630	1009	2.02	0.103	9.7	52	57	0.47	2.36	8.37	16	0.34
930630	1606	2.09	0.103	9.7	44	53	0.51	2.66	7.76	22	0.54
930630	1908	2.13	0.103	9.7	44	51	0.50	2.64	7.89	19	0.59
930630	2208	2.14	0.103	9.7	42	51	0.52	2.56	7.18	20	0.71
930701	0107	2.02	0.103	9.7	46	53	0.55	2.70	6.86	20	0.55
930701	1625	2.10	0.113	8.9	46	53	0.57	2.98	6.88	24	0.46
930701	1908	2.18	0.113	8.9	42	52	0.55	3.08	7.38	24	0.62
930701	2308	2.11	0.113	8.9	44	54	0.59	3.56	6.84	24	0.71
930702	0201	1.76	0.113	8.9	44	56	0.63	3.34	5.91	24	0.67
930702	0404	1.92	0.113	8.9	44	55	0.61	3.51	6.36	22	0.82
930702	0707	1.81	0.103	9.7	40	55	0.67	3.40	5.33	29	1.03

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930702	1006	1.59	0.103	9.7	48	66	0.70	2.41	4.16	36	0.95
930702	1906	1.85	0.103	9.7	44	59	0.61	2.42	5.49	33	0.87
930703	1045	1.90	0.123	8.2	50	73	0.59	1.06	4.54	42	0.20
930703	1401	2.04	0.123	8.2	54	75	0.61	0.74	3.88	46	0.26
930703	1705	2.07	0.103	9.7	46	70	0.62	1.03	3.95	50	0.78
930703	2042	1.76	0.103	9.7	50	65	0.63	1.53	4.79	43	0.95
930703	2305	1.77	0.103	9.7	50	62	0.61	2.24	5.59	32	1.14
930704	0200	1.89	0.103	9.7	50	63	0.59	2.29	5.85	31	0.62
930704	0505	1.96	0.103	9.7	56	64	0.54	1.97	6.44	28	0.12
930704	1105	2.09	0.113	8.9	48	61	0.61	1.89	5.32	37	0.71
930704	1405	1.93	0.113	8.9	40	63	0.71	2.12	4.17	46	0.86
930704	1700	1.74	0.113	8.9	42	62	0.70	2.43	4.47	42	0.96
930704	2002	1.63	0.113	8.9	44	63	0.72	2.49	4.40	41	1.02
930704	2305	1.45	0.113	8.9	46	70	0.84	2.32	3.25	51	0.94
930705	0202	1.33	0.113	8.9	50	79	0.89	1.64	2.55	87	1.42
930705	0505	1.61	0.123	8.2	50	70	0.80	2.27	3.40	40	0.61
930705	0805	1.72	0.113	8.9	54	68	0.79	2.39	3.50	37	0.63
930705	1059	1.81	0.113	8.9	52	67	0.75	2.62	4.01	35	0.66
930705	1405	1.67	0.103	9.7	58	77	0.81	2.12	3.25	44	0.70
930705	1659	1.65	0.103	9.7	52	71	0.77	2.58	3.82	38	0.71
930705	2002	1.74	0.103	9.7	58	77	0.82	2.15	3.12	54	1.25
930705	2301	1.39	0.103	9.7	54	90	0.93	1.19	2.05	104	1.68
930706	0302	1.52	0.093	10.7	50	77	0.82	1.62	2.87	66	1.24
930706	0537	1.65	0.093	10.7	50	75	0.84	1.74	2.79	67	1.42
930706	0814	1.52	0.103	9.7	50	70	0.81	2.30	3.26	47	1.42
930706	1056	1.44	0.103	9.7	46	69	0.83	2.27	3.14	57	1.68
930706	1442	1.41	0.103	9.7	52	78	0.81	1.63	2.84	63	1.21
930706	1705	1.54	0.093	10.7	52	74	0.79	2.07	3.26	47	1.23
930706	2003	1.43	0.093	10.7	50	79	0.88	1.64	2.51	91	1.91
930706	2302	1.39	0.093	10.7	48	86	0.93	1.01	2.00	102	1.42
930707	0203	1.58	0.103	9.7	50	72	0.82	1.59	2.77	64	1.24
930707	0502	1.62	0.093	10.7	48	64	0.75	2.24	3.78	37	0.79
930707	2308	2.11	0.093	10.7	48	65	0.73	2.43	3.88	31	0.78
930708	1738	2.25	0.093	10.7	42	63	0.78	1.90	3.26	46	1.11
930711	1401	1.78	0.064	15.6	56	86	1.00	0.77	1.73	110	1.48
930714	0206	1.93	0.103	9.7	50	61	0.85	2.80	3.41	46	0.94
930714	2051	2.14	0.113	8.9	46	53	0.70	2.85	5.04	33	0.28
930714	2302	2.29	0.113	8.9	46	52	0.66	3.18	5.68	28	0.27
930715	0456	2.30	0.113	8.9	50	54	0.61	3.02	6.16	27	0.08
930715	0755	2.36	0.113	8.9	48	55	0.60	3.04	6.39	26	0.31
930715	1056	2.50	0.113	8.9	44	50	0.56	3.08	7.28	24	0.32
930715	1401	2.42	0.113	8.9	54	53	0.53	2.90	7.76	24	-0.05
930716	0459	2.61	0.113	8.9	52	52	0.59	2.61	6.22	30	0.06
930716	0759	2.42	0.113	8.9	52	52	0.60	2.61	6.06	30	-0.02
930716	1114	2.36	0.113	8.9	42	53	0.68	3.00	5.07	30	0.44
930716	1703	2.44	0.113	8.9	44	52	0.62	3.22	6.00	24	0.45
930716	2002	2.38	0.113	8.9	46	55	0.69	3.17	5.00	28	0.50
930717	0246	2.19	0.113	8.9	50	61	0.73	2.58	4.03	36	0.77
930717	1100	2.13	0.113	8.9	42	60	0.77	2.45	3.76	47	1.23
930717	2046	1.73	0.113	8.9	48	85	0.96	1.11	1.85	110	2.16
930717	2258	1.68	0.113	8.9	48	86	0.95	1.04	1.85	108	1.80

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930718	0246	1.81	0.113	8.9	50	85	0.98	1.09	1.78	117	1.91
930718	0459	1.78	0.123	8.2	50	81	0.95	1.33	1.98	111	2.16
930718	0848	1.60	0.054	18.5	44	103	1.02	0.23	1.42	119	0.37
930718	1444	1.75	0.054	18.5	38	101	1.04	0.21	1.35	125	0.36
930718	1703	1.64	0.123	8.2	44	100	1.03	0.39	1.39	124	0.90
930718	1951	1.65	0.064	15.6	46	106	1.02	0.18	1.34	121	0.45
930719	1110	1.45	0.064	15.6	42	117	0.99	-0.38	1.51	119	-0.77
930719	1402	1.48	0.064	15.6	38	103	1.01	0.10	1.44	119	0.08
930719	1729	1.39	0.064	15.6	42	97	1.00	0.39	1.47	115	0.56
930719	2303	1.44	0.064	15.6	44	73	0.95	1.39	2.14	109	1.88
930720	1105	1.81	0.132	7.6	38	57	0.79	2.32	3.50	49	1.21
930720	1404	1.76	0.132	7.6	40	59	0.76	2.19	3.70	45	1.03
930720	1704	1.67	0.132	7.6	40	58	0.76	2.35	3.76	43	0.99
930720	2004	1.74	0.132	7.6	38	50	0.78	2.66	3.88	41	0.93
930720	2303	1.59	0.132	7.6	46	64	0.86	2.21	2.93	65	1.68
930721	0205	1.67	0.132	7.6	36	59	0.87	2.19	2.97	69	1.68
930721	0504	1.62	0.132	7.6	40	74	0.92	1.53	2.32	99	1.50
930721	0804	1.71	0.074	13.6	42	77	0.97	1.33	2.01	118	1.67
930721	1104	1.52	0.132	7.6	44	78	1.01	1.31	1.94	120	1.74
930721	1405	1.40	0.083	12.0	44	90	0.99	0.70	1.59	120	1.06
930721	1658	1.46	0.142	7.0	54	88	0.98	0.84	1.73	118	1.37
930721	2004	1.54	0.152	6.6	50	73	0.92	1.78	2.51	98	1.51
930721	2304	1.36	0.142	7.0	52	74	0.88	1.72	2.66	77	1.53
930722	0203	1.60	0.132	7.6	46	58	0.72	2.63	4.38	36	1.03
930722	0505	1.54	0.132	7.6	46	60	0.74	2.46	4.21	36	0.93
930722	0804	1.58	0.132	7.6	42	57	0.72	2.41	4.31	39	0.91
930722	1116	1.53	0.132	7.6	42	57	0.73	2.71	4.46	39	1.00
930722	2005	1.93	0.132	7.6	46	54	0.56	3.08	7.24	22	0.35
930722	2306	1.84	0.123	8.2	50	55	0.55	3.00	7.21	18	0.45
930723	0206	1.95	0.113	8.9	50	57	0.54	2.89	7.40	17	0.38
930723	0506	2.03	0.113	8.9	52	59	0.55	2.09	6.35	23	0.49
930723	0807	1.77	0.123	8.2	48	63	0.59	1.98	5.36	32	0.80
930723	1109	1.75	0.123	8.2	48	63	0.58	2.18	5.67	32	0.94
930723	1404	2.00	0.123	8.2	52	71	0.57	1.45	4.95	37	0.60
930723	1707	2.01	0.123	8.2	58	75	0.57	0.84	4.74	39	0.15
930723	2007	1.87	0.132	7.6	56	74	0.56	1.52	5.58	33	-0.03
930723	2306	1.62	0.132	7.6	54	72	0.60	1.90	5.23	33	0.38
930724	0207	1.60	0.123	8.2	52	72	0.69	1.24	3.85	45	0.70
930724	0507	1.93	0.132	7.6	52	70	0.56	1.18	4.88	40	0.62
930724	0807	2.21	0.123	8.2	48	67	0.53	1.23	5.20	39	0.60
930724	1107	2.29	0.103	9.7	48	61	0.55	1.76	5.71	34	0.77
930724	1407	2.40	0.103	9.7	48	63	0.53	1.38	5.39	36	0.58
930724	1704	2.74	0.093	10.7	50	66	0.50	1.49	6.25	32	0.59
930724	2006	2.77	0.103	9.7	52	65	0.47	1.98	7.43	28	0.77
930724	2307	2.47	0.093	10.7	50	62	0.52	2.25	6.84	28	0.63
930725	0209	2.22	0.093	10.7	50	65	0.59	2.27	5.56	31	0.68
930725	0507	2.49	0.093	10.7	50	64	0.54	2.24	6.51	29	0.60
930725	0807	2.52	0.093	10.7	50	60	0.54	2.29	6.56	28	0.41
930725	1107	2.29	0.093	10.7	48	61	0.62	2.68	5.50	30	0.87
930725	1407	2.23	0.093	10.7	46	60	0.66	2.57	5.03	33	0.89
930725	1707	2.33	0.093	10.7	48	62	0.63	2.82	5.52	29	0.99
930725	2006	2.21	0.093	10.7	50	68	0.69	2.58	4.34	34	0.84
930725	2307	2.02	0.093	10.7	50	70	0.75	2.29	3.64	39	0.91
930726	0207	1.83	0.093	10.7	52	74	0.77	1.81	3.04	51	1.26
930726	0506	2.11	0.093	10.7	50	70	0.75	2.07	3.37	47	1.26

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930726	0807	2.11	0.103	9.7	48	67	0.77	2.32	3.56	43	1.12
930726	1108	1.99	0.093	10.7	50	67	0.78	2.48	3.52	40	1.13
930726	1407	1.77	0.093	10.7	52	75	0.80	1.85	3.00	55	1.36
930726	1706	1.84	0.093	10.7	52	75	0.82	1.99	2.92	56	1.52
930726	2007	1.94	0.103	9.7	46	65	0.82	2.72	3.42	45	1.44
930726	2307	1.88	0.093	10.7	46	69	0.88	2.17	2.72	83	1.98
930727	0737	1.95	0.093	10.7	44	59	0.75	3.05	4.21	33	1.03
930727	1120	1.67	0.103	9.7	42	60	0.77	2.80	3.90	38	0.94
930727	1408	1.70	0.093	10.7	46	65	0.78	2.43	3.48	44	1.28
930727	1715	1.62	0.103	9.7	40	64	0.83	2.21	3.08	59	1.51
930727	2008	1.60	0.103	9.7	40	60	0.84	2.59	3.28	50	1.22
930727	2307	1.48	0.103	9.7	38	59	0.83	2.51	3.32	50	1.11
930728	0210	1.38	0.113	8.9	42	68	0.88	1.90	2.65	78	1.74
930728	0507	1.32	0.113	8.9	40	70	0.84	1.55	2.61	71	1.29
930728	1108	1.22	0.113	8.9	36	63	0.89	1.85	2.67	77	1.45
930728	1443	1.24	0.113	8.9	36	65	0.87	1.76	2.67	76	1.34
930728	1708	1.26	0.123	8.2	38	68	0.91	1.62	2.41	95	1.72
930728	2009	1.23	0.123	8.2	36	70	0.94	1.55	2.32	104	1.56
930728	2307	1.11	0.123	8.2	32	85	0.99	0.71	1.64	117	1.06
930729	0210	1.07	0.123	8.2	28	90	1.00	0.48	1.55	116	0.85
930729	0504	0.95	0.123	8.2	40	94	1.00	0.34	1.51	114	0.54
930729	0810	0.97	0.054	18.5	152	111	0.99	-0.22	1.52	112	-0.55
930729	1108	0.97	0.054	18.5	160	115	0.99	-0.34	1.55	116	-0.69
930729	1409	0.94	0.054	18.5	178	121	1.00	-0.56	1.65	117	-0.93
930729	2008	0.96	0.054	18.5	152	139	0.90	-1.48	2.57	85	-1.24
930729	2307	0.94	0.054	18.5	-180	145	0.88	-1.50	2.74	73	-0.84
930730	0209	0.89	0.054	18.5	152	146	0.80	-1.56	3.15	58	-0.57
930730	0507	0.97	0.064	15.6	178	133	0.91	-1.08	2.19	99	-1.06
930730	0808	1.25	0.064	15.6	156	102	0.98	0.09	1.50	110	0.47
930730	1159	1.51	0.152	6.6	24	72	0.93	1.08	2.18	105	1.05
930730	1410	1.57	0.142	7.0	46	69	0.92	1.37	2.27	104	1.38
930730	2306	1.65	0.093	10.7	44	65	0.84	2.00	3.00	60	1.43
930731	0208	1.68	0.093	10.7	54	68	0.82	1.84	3.00	53	0.76
930731	0508	1.83	0.123	8.2	46	64	0.80	1.93	3.16	50	0.70
930731	0858	1.64	0.103	9.7	46	69	0.86	1.68	2.63	78	1.35
930731	1748	1.54	0.103	9.7	48	62	0.85	2.17	3.08	55	1.00
930731	2004	1.65	0.113	8.9	56	69	0.87	1.68	2.65	76	1.11
930731	2302	1.60	0.113	8.9	52	69	0.87	1.86	2.70	75	1.30
930801	0204	1.52	0.113	8.9	48	71	0.79	2.01	3.22	47	0.72
930801	0503	1.44	0.123	8.2	56	74	0.86	1.72	2.67	81	1.37
930801	0803	1.39	0.123	8.2	30	78	0.98	1.11	1.93	113	1.33
930801	1105	1.46	0.113	8.9	46	77	0.92	1.26	2.16	101	1.59
930801	1402	1.39	0.123	8.2	54	86	0.90	1.16	2.09	101	1.62
930801	1743	1.36	0.113	8.9	62	78	0.87	1.26	2.44	79	0.98
930801	2004	1.38	0.113	8.9	56	79	0.93	1.17	2.21	96	1.37
930801	2340	1.48	0.123	8.2	52	74	0.88	1.52	2.47	88	1.51
930802	0204	1.68	0.113	8.9	50	65	0.74	2.44	3.83	38	1.08
930802	0803	1.42	0.103	9.7	48	74	0.88	1.44	2.42	88	1.63
930802	1104	1.44	0.103	9.7	50	76	0.88	1.45	2.45	86	1.70
930802	1501	1.32	0.113	8.9	44	77	0.90	1.40	2.32	97	1.56
930803	1103	1.34	0.093	10.7	40	76	0.95	1.20	2.08	105	1.44
930803	1432	1.42	0.103	9.7	46	75	0.91	1.50	2.30	97	1.99
930803	1726	1.36	0.103	9.7	50	76	0.88	1.52	2.44	90	1.67
930803	2002	1.29	0.064	15.6	48	82	0.94	1.18	2.06	100	1.54
930803	2301	1.20	0.064	15.6	56	88	0.97	0.81	1.83	102	1.36

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930804	0158	1.21	0.064	15.6	50	88	0.94	0.82	1.81	104	1.42
930804	0456	1.14	0.064	15.6	48	88	0.93	0.89	1.84	104	1.39
930804	1130	1.21	0.064	15.6	48	86	0.96	0.89	1.79	109	1.39
930804	1404	1.27	0.103	9.7	48	78	0.91	1.29	2.22	97	1.66
930804	1703	1.23	0.113	8.9	46	78	0.90	1.32	2.22	97	1.66
930804	2002	1.12	0.064	15.6	50	87	0.94	0.80	1.82	101	1.29
930804	2301	1.11	0.064	15.6	46	80	0.94	1.08	2.01	102	1.54
930805	0501	1.12	0.103	9.7	44	79	0.92	1.13	2.07	100	1.42
930805	0802	1.13	0.113	8.9	44	80	0.94	1.18	1.99	107	1.63
930805	1105	1.09	0.074	13.6	40	82	0.95	0.93	1.91	104	1.25
930805	1730	1.67	0.162	6.2	52	61	0.76	1.75	3.47	48	0.47
930805	2005	2.01	0.152	6.6	52	52	0.64	1.57	4.54	41	0.06
930805	2258	1.89	0.142	7.0	58	56	0.66	1.74	4.56	40	-0.08
930806	0203	1.90	0.132	7.6	32	52	0.61	2.00	5.32	36	0.15
930806	1321	1.80	0.132	7.6	34	52	0.64	2.40	5.37	33	0.38
930806	1849	1.81	0.142	7.0	54	56	0.63	1.60	4.84	40	0.11
930806	2255	1.63	0.142	7.0	52	56	0.65	1.82	4.82	40	0.14
930807	0156	1.46	0.142	7.0	46	62	0.70	2.65	4.70	34	0.41
930807	0455	1.23	0.142	7.0	46	64	0.77	2.61	3.83	41	1.21
930807	0752	1.41	0.132	7.6	42	59	0.73	2.60	4.21	36	0.66
930807	1056	1.39	0.123	8.2	48	58	0.71	2.90	4.63	29	0.59
930807	1355	1.23	0.132	7.6	46	66	0.82	2.68	3.36	48	1.59
930807	1656	0.96	0.074	13.6	48	81	0.94	1.40	2.09	110	2.23
930807	1956	0.95	0.142	7.0	46	69	0.85	2.41	3.14	56	1.11
930807	2327	0.99	0.132	7.6	50	69	0.83	2.57	3.41	42	0.77
930808	0455	0.82	0.074	13.6	50	90	0.98	0.90	1.77	114	1.60
930808	1055	0.96	0.074	13.6	50	81	0.94	1.68	2.28	106	2.24
930808	1356	0.83	0.074	13.6	56	87	0.99	1.42	2.02	118	2.25
930808	1656	0.91	0.074	13.6	56	86	0.96	1.37	2.04	111	2.08
930808	1955	1.04	0.074	13.6	50	74	0.90	2.14	2.68	97	2.02
930808	2255	1.11	0.103	9.7	52	69	0.82	2.58	3.35	38	0.90
930809	0155	0.95	0.074	13.6	52	79	0.93	1.68	2.30	108	2.29
930809	0755	0.91	0.103	9.7	48	79	0.96	1.57	2.10	113	2.59
930809	1055	0.84	0.103	9.7	50	90	0.98	0.97	1.73	116	2.00
930809	1454	0.93	0.103	9.7	48	76	0.94	1.76	2.36	106	2.33
930809	1708	0.98	0.103	9.7	48	72	0.92	2.18	2.67	98	2.19
930809	2305	0.87	0.103	9.7	52	79	0.91	1.56	2.31	102	1.95
930810	0248	0.83	0.074	13.6	48	88	0.99	0.94	1.69	116	1.91
930810	0503	0.86	0.103	9.7	48	80	0.93	1.44	2.14	106	2.42
930810	0804	0.93	0.103	9.7	44	73	0.99	1.77	2.45	108	1.69
930810	1117	0.92	0.103	9.7	48	71	0.85	1.96	2.77	74	1.97
930810	1401	0.85	0.103	9.7	48	75	0.92	1.76	2.40	106	2.23
930810	1721	0.79	0.103	9.7	46	75	0.94	1.45	2.25	106	1.79
930810	2301	0.79	0.162	6.2	48	70	0.93	1.69	2.43	99	1.62
930811	0202	1.04	0.162	6.2	48	56	0.86	2.17	3.17	52	0.46
930811	0502	1.36	0.162	6.2	32	49	0.67	2.32	5.02	36	0.29
930811	0902	1.67	0.142	7.0	26	49	0.59	1.79	5.73	37	0.13
930811	1113	1.55	0.152	6.6	50	56	0.62	2.17	5.50	34	0.21
930811	1818	1.78	0.142	7.0	48	46	0.58	2.11	6.31	32	-0.04
930811	2303	1.89	0.142	7.0	24	49	0.56	1.75	6.28	35	-0.09
930812	0805	1.61	0.142	7.0	52	53	0.58	2.26	6.30	29	-0.03
930812	1413	1.16	0.152	6.6	52	64	0.72	2.60	4.51	36	0.47
930812	2302	1.86	0.142	7.0	48	52	0.59	1.88	5.98	33	0.14
930813	0201	1.70	0.142	7.0	54	57	0.60	3.12	6.55	24	0.16

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930813	0503	1.69	0.123	8.2	52	58	0.71	3.18	4.96	31	0.39
930813	0819	1.58	0.123	8.2	48	68	0.90	2.87	3.06	56	1.39
930813	1121	1.46	0.132	7.6	50	73	0.98	2.13	2.40	123	1.99
930813	2302	1.55	0.083	12.0	52	86	0.99	1.07	1.76	121	1.69
930814	0503	1.43	0.083	12.0	44	97	1.07	0.61	1.36	131	1.48
930814	0802	1.48	0.083	12.0	170	116	1.05	-0.15	1.22	125	-0.94
930814	1402	1.52	0.083	12.0	50	106	1.03	0.26	1.26	122	1.18
930814	1704	1.35	0.083	12.0	170	110	1.07	0.08	1.24	127	0.43
930814	2301	1.40	0.083	12.0	42	125	1.09	-0.50	1.34	134	-1.47
930815	0201	1.29	0.083	12.0	42	130	1.07	-0.70	1.45	132	-1.60
930815	0501	1.27	0.083	12.0	-176	118	1.07	-0.23	1.25	131	-1.00
930815	1101	1.31	0.083	12.0	40	107	1.04	-0.02	1.26	125	0.03
930815	1401	1.29	0.132	7.6	42	92	1.01	0.54	1.45	120	1.21
930815	1701	1.26	0.074	13.6	40	94	1.03	0.40	1.40	120	0.91
930815	2001	1.18	0.074	13.6	160	102	1.04	0.16	1.34	120	0.70
930815	2301	1.07	0.093	10.7	154	124	0.96	-0.65	1.65	110	-1.47
930816	0202	1.03	0.074	13.6	148	124	0.93	-0.50	1.76	102	-1.28
930816	0457	0.97	0.093	10.7	152	128	0.88	-0.82	2.00	94	-1.45
930816	0914	1.01	0.074	13.6	148	124	0.94	-0.59	1.75	107	-1.20
930816	1355	1.09	0.162	6.2	54	99	0.93	0.25	1.58	102	0.53
930816	1701	1.10	0.162	6.2	60	100	0.96	0.22	1.57	104	0.64
930816	2001	1.10	0.162	6.2	62	105	0.95	0.20	1.54	104	0.73
930816	2301	1.08	0.162	6.2	58	97	0.92	0.56	1.76	98	1.34
930817	0202	1.16	0.064	15.6	60	99	0.89	0.47	1.72	97	0.97
930817	0501	1.33	0.074	13.6	58	102	0.90	0.32	1.59	101	0.69
930817	0803	1.35	0.142	7.0	58	89	0.88	0.74	1.92	97	1.17
930817	1137	1.44	0.074	13.6	56	85	0.85	0.91	2.16	92	1.24
930817	1443	1.46	0.132	7.6	54	78	0.83	1.36	2.52	79	1.52
930817	1713	1.39	0.132	7.6	54	82	0.89	1.00	2.13	94	1.57
930817	1958	1.53	0.132	7.6	62	81	0.83	1.32	2.47	85	1.64
930817	2258	1.53	0.064	15.6	56	79	0.82	1.67	2.80	70	1.54
930818	0158	1.58	0.074	13.6	52	79	0.86	1.76	2.65	83	1.69
930818	0459	1.76	0.074	13.6	56	78	0.82	1.56	2.77	72	1.56
930818	0759	1.84	0.074	13.6	52	69	0.75	2.35	3.69	38	1.11
930818	1149	1.76	0.074	13.6	50	68	0.79	2.41	3.47	43	1.23
930818	1439	1.79	0.074	13.6	52	70	0.76	2.17	3.49	42	1.14
930818	1702	1.77	0.083	12.0	54	68	0.69	2.34	4.25	31	0.94
930818	1952	1.91	0.074	13.6	54	67	0.71	2.08	3.97	35	0.85
930818	2253	1.95	0.074	13.6	52	64	0.74	2.61	4.27	30	0.88
930819	0148	1.82	0.074	13.6	54	69	0.77	2.38	3.76	37	0.99
930819	0448	2.02	0.083	12.0	56	64	0.63	2.93	5.43	22	0.57
930819	0749	1.86	0.083	12.0	48	65	0.74	2.54	4.03	38	1.16
930819	1706	1.75	0.123	8.2	50	64	0.63	2.69	5.22	28	0.86
930819	1955	1.70	0.123	8.2	56	64	0.65	2.48	5.04	26	0.36
930819	2254	1.59	0.093	10.7	56	65	0.65	2.88	5.19	23	0.64
930820	0232	1.84	0.132	7.6	52	61	0.60	2.87	5.94	22	0.47
930820	0455	1.70	0.132	7.6	54	60	0.62	2.71	5.76	24	0.35
930820	0751	1.59	0.142	7.0	52	62	0.66	2.75	5.08	28	0.64
930820	1648	1.36	0.142	7.0	54	64	0.65	2.29	4.80	30	0.51
930820	1957	1.50	0.162	6.2	56	60	0.61	1.68	5.07	34	0.16
930820	2256	1.81	0.142	7.0	52	55	0.55	1.53	5.78	32	0.17
930821	0157	1.92	0.132	7.6	52	55	0.56	1.53	6.01	29	0.08
930821	0456	1.78	0.132	7.6	54	59	0.56	2.46	6.91	22	0.20
930821	0756	1.57	0.132	7.6	54	60	0.59	2.76	6.42	24	0.21
930821	1056	1.54	0.132	7.6	54	61	0.57	3.36	7.23	20	0.36

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930821	1357	1.49	0.132	7.6	50	58	0.64	3.62	6.17	21	0.37
930821	1656	1.56	0.132	7.6	52	65	0.71	3.24	4.78	32	0.87
930821	1956	1.65	0.132	7.6	60	70	0.72	2.77	4.39	31	0.32
930822	0456	1.39	0.123	8.2	52	83	0.91	1.79	2.42	103	1.90
930822	0753	1.44	0.123	8.2	50	81	0.95	1.74	2.32	112	1.87
930822	1122	1.45	0.093	10.7	48	95	1.04	0.83	1.57	129	1.33
930822	1357	1.41	0.093	10.7	50	89	1.04	1.20	1.78	127	1.85
930822	1656	1.39	0.123	8.2	48	86	1.02	1.35	1.91	126	1.86
930822	1957	1.39	0.123	8.2	48	77	0.94	1.87	2.42	109	1.74
930822	2256	1.25	0.123	8.2	54	86	0.97	1.47	2.04	121	2.11
930823	0158	1.11	0.093	10.7	50	99	1.04	0.65	1.48	129	1.34
930823	0540	1.14	0.093	10.7	48	94	1.01	0.78	1.68	120	1.24
930823	0757	1.44	0.093	10.7	48	81	0.93	1.59	2.21	110	1.93
930823	1058	1.54	0.132	7.6	46	78	0.99	1.64	2.11	119	2.21
930823	1401	1.76	0.123	8.2	52	74	0.89	2.23	2.78	83	1.84
930823	1956	1.82	0.132	7.6	46	64	0.86	3.17	3.42	43	1.20
930823	2257	1.64	0.132	7.6	46	65	0.91	2.65	2.96	62	1.46
930824	0157	1.61	0.132	7.6	48	71	0.88	2.24	2.86	68	1.46
930824	0456	1.81	0.113	8.9	48	70	0.89	2.42	2.88	72	1.95
930824	0838	2.15	0.113	8.9	50	62	0.75	3.21	4.33	30	0.54
930824	1105	2.28	0.103	9.7	46	61	0.73	2.75	4.42	35	0.62
930824	1656	2.56	0.093	10.7	50	58	0.61	3.38	6.47	23	0.50
930824	2256	2.73	0.093	10.7	46	57	0.63	3.69	6.03	22	0.83
930825	0457	2.45	0.083	12.0	48	62	0.67	2.84	4.87	30	1.11
930825	0757	2.38	0.083	12.0	46	65	0.75	2.57	3.87	42	1.69
930825	1053	2.50	0.093	10.7	42	60	0.72	2.57	4.22	40	1.32
930825	1354	2.51	0.093	10.7	42	58	0.77	3.37	4.22	36	1.49
930825	1803	2.46	0.093	10.7	44	64	0.82	2.63	3.38	46	1.68
930825	2046	2.34	0.093	10.7	44	66	0.84	2.47	3.17	50	1.65
930825	2256	2.58	0.093	10.7	46	60	0.76	3.21	4.08	29	1.16
930826	0157	2.21	0.093	10.7	44	69	0.92	2.01	2.51	109	2.35
930826	0826	2.21	0.093	10.7	36	65	0.92	2.10	2.68	79	1.41
930826	1121	2.23	0.093	10.7	44	68	0.89	2.04	2.73	69	1.37
930826	1656	2.15	0.093	10.7	42	65	0.83	2.47	3.23	50	1.42
930826	1956	2.09	0.093	10.7	46	74	0.86	1.70	2.64	79	1.56
930826	2256	2.00	0.093	10.7	46	67	0.81	2.33	3.34	46	1.15
930827	0158	2.03	0.093	10.7	44	68	0.84	2.07	2.92	58	1.22
930827	0457	1.95	0.093	10.7	46	66	0.84	2.31	3.14	53	1.19
930827	0757	1.79	0.093	10.7	44	74	0.90	1.77	2.45	104	2.00
930827	1056	1.82	0.093	10.7	46	72	0.87	1.91	2.73	77	1.54
930827	1356	1.85	0.093	10.7	44	67	0.84	2.19	3.01	55	1.49
930827	1657	1.61	0.103	9.7	50	79	0.91	1.33	2.21	105	1.51
930828	0238	1.71	0.103	9.7	42	69	0.90	1.91	2.66	87	1.29
930828	0501	1.60	0.103	9.7	42	74	0.94	1.68	2.26	112	2.12
930828	0801	1.52	0.093	10.7	42	78	0.98	1.44	2.02	119	1.99
930828	1142	1.57	0.103	9.7	40	74	0.96	1.51	2.09	115	2.21
930828	1359	1.60	0.103	9.7	42	73	0.96	1.75	2.24	114	2.24
930828	1959	1.46	0.103	9.7	44	95	1.04	0.68	1.54	125	1.30
930829	0158	1.51	0.064	15.6	46	100	1.04	0.41	1.35	125	1.13
930829	0457	1.62	0.064	15.6	46	100	1.01	0.38	1.38	118	1.06
930829	0757	1.73	0.083	12.0	44	91	1.04	0.76	1.49	123	1.87
930829	1052	2.02	0.064	15.6	42	95	1.06	0.52	1.34	126	1.50
930829	1352	2.08	0.064	15.6	44	93	1.05	0.62	1.44	126	1.46
930829	2252	1.76	0.093	10.7	46	97	1.03	0.53	1.45	121	1.35

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930830	0155	1.76	0.064	15.6	46	102	1.02	0.33	1.33	121	1.02
930830	0753	1.89	0.064	15.6	44	95	1.03	0.55	1.40	122	1.41
930830	1659	1.60	0.074	13.6	44	114	1.04	-0.10	1.28	125	-0.54
930830	1956	1.58	0.074	13.6	46	125	1.03	-0.53	1.42	125	-1.44
930830	2257	1.40	0.074	13.6	46	120	1.01	-0.42	1.43	120	-1.41
930831	0158	1.41	0.064	15.6	46	108	1.01	0.06	1.35	118	0.12
930831	0850	1.50	0.093	10.7	42	89	1.01	0.78	1.59	117	1.68
930831	1722	1.38	0.074	13.6	-180	107	1.05	0.00	1.30	124	0.12
930831	1956	1.31	0.074	13.6	-178	111	1.05	-0.04	1.30	129	-0.04
930831	2256	1.23	0.074	13.6	44	122	1.02	-0.50	1.45	124	-1.29
930901	0156	1.12	0.074	13.6	-180	120	1.00	-0.41	1.50	120	-0.84
930901	0456	1.18	0.074	13.6	176	121	0.99	-0.44	1.51	118	-1.05
930901	0847	1.21	0.074	13.6	-180	104	1.01	0.32	1.42	121	0.94
930901	1057	1.16	0.083	12.0	44	106	1.01	0.16	1.43	120	0.33
930901	1352	1.10	0.074	13.6	-180	118	1.03	-0.31	1.41	127	-0.73
930901	1720	1.10	0.074	13.6	58	102	0.98	0.22	1.48	110	0.75
930901	2004	1.08	0.074	13.6	180	104	1.00	0.13	1.43	115	0.41
930901	2303	1.10	0.074	13.6	46	100	1.01	0.31	1.42	119	0.87
930902	0204	1.04	0.083	12.0	44	91	0.98	0.61	1.58	115	1.18
930902	0505	1.05	0.074	13.6	44	89	0.98	0.75	1.66	112	1.34
930902	0804	1.07	0.074	13.6	48	88	0.97	0.87	1.72	111	1.51
930902	1448	1.06	0.074	13.6	46	90	0.95	0.66	1.67	107	1.21
930902	1704	0.99	0.074	13.6	50	89	0.92	0.72	1.81	102	1.22
930902	1956	1.04	0.064	15.6	58	89	0.93	0.73	1.79	102	1.25
930902	2256	1.01	0.074	13.6	50	88	0.92	0.74	1.80	101	1.39
930903	0156	0.98	0.074	13.6	46	86	0.92	0.84	1.87	102	1.26
930903	0456	1.04	0.113	8.9	46	84	0.92	0.92	1.91	102	1.32
930903	0756	1.15	0.162	6.2	52	81	0.86	1.18	2.35	91	1.39
930903	1222	1.03	0.152	6.6	50	80	0.88	1.16	2.20	92	1.77
930903	1434	1.09	0.162	6.2	48	81	0.89	0.99	2.01	98	1.53
930903	1649	1.05	0.152	6.6	40	87	0.92	0.70	1.80	104	1.05
930903	1948	1.08	0.064	15.6	46	78	0.87	1.18	2.26	94	1.29
930903	2249	0.99	0.152	6.6	50	75	0.84	1.37	2.48	81	1.63
930904	0148	0.95	0.162	6.2	44	80	0.88	0.89	2.04	97	1.48
930904	0443	1.10	0.162	6.2	46	76	0.78	1.09	2.64	63	0.69
930904	0748	1.17	0.162	6.2	42	70	0.74	1.56	3.43	47	0.42
930904	1048	1.39	0.142	7.0	46	60	0.68	1.85	4.13	40	0.69
930904	1648	1.76	0.132	7.6	40	59	0.59	1.45	4.85	39	0.60
930904	1949	1.76	0.132	7.6	36	54	0.58	1.48	4.90	40	0.45
930904	2248	1.73	0.132	7.6	38	49	0.59	1.78	5.19	36	0.47
930905	0148	1.69	0.123	8.2	32	50	0.61	1.80	4.83	40	0.71
930905	0907	2.00	0.123	8.2	36	50	0.55	1.60	5.67	35	0.41
930905	1208	1.51	0.132	7.6	40	55	0.65	1.83	4.60	41	0.76
930905	1741	1.20	0.132	7.6	36	63	0.76	1.58	3.27	52	0.57
930905	1948	1.21	0.142	7.0	36	62	0.79	1.74	3.17	55	0.73
930905	2248	1.08	0.152	6.6	44	61	0.82	1.65	3.08	60	0.60
930906	0239	1.19	0.142	7.0	32	68	0.88	1.47	2.50	77	0.99
930906	0449	1.15	0.142	7.0	42	72	0.82	1.67	2.83	64	1.00
930906	0749	1.20	0.142	7.0	46	70	0.78	1.93	3.34	48	0.81
930906	1048	1.17	0.142	7.0	46	76	0.89	1.35	2.34	98	1.37
930906	1348	1.09	0.064	15.6	56	85	0.92	1.04	2.10	101	1.46
930906	1648	1.10	0.064	15.6	56	92	0.93	0.86	1.87	106	1.48
930907	0148	0.94	0.054	18.5	160	142	0.83	-1.30	2.45	83	-1.55
930907	0749	0.98	0.054	18.5	156	143	0.92	-0.89	2.37	87	-0.87

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930908	1510	1.16	0.064	15.6	162	146	0.87	-1.41	2.59	84	-1.22
930908	1721	1.42	0.064	15.6	160	122	0.98	-0.58	1.60	110	-1.50
930908	1951	1.58	0.064	15.6	162	100	0.99	0.19	1.45	115	0.76
930908	2250	1.45	0.064	15.6	162	105	1.00	0.04	1.45	112	0.56
930909	0151	1.36	0.064	15.6	178	110	0.96	-0.06	1.52	108	0.25
930909	0450	1.27	0.064	15.6	154	113	0.97	-0.24	1.58	107	-0.73
930909	0748	1.44	0.152	6.6	58	88	0.95	0.67	1.80	106	1.16
930909	1420	1.44	0.152	6.6	50	85	0.96	0.86	1.74	113	1.52
930909	1741	1.67	0.142	7.0	48	72	0.85	1.61	2.63	67	1.13
930909	1948	1.74	0.142	7.0	44	69	0.84	1.53	2.69	60	0.75
930909	2313	1.81	0.132	7.6	28	61	0.76	1.79	3.48	49	0.29
930910	0433	2.03	0.132	7.6	52	59	0.74	2.22	3.90	39	0.19
930910	0733	1.91	0.123	8.2	50	56	0.72	2.40	4.42	35	0.18
930910	1102	1.76	0.123	8.2	54	63	0.73	2.28	4.02	37	0.26
930910	1353	1.81	0.132	7.6	40	66	0.75	2.46	3.87	39	0.38
930910	1652	1.82	0.123	8.2	54	63	0.71	2.47	4.33	33	0.59
930910	1941	1.93	0.123	8.2	54	60	0.71	2.06	4.30	30	0.26
930910	2246	1.83	0.123	8.2	54	58	0.74	2.12	3.94	39	0.09
930911	0146	1.84	0.132	7.6	52	63	0.72	2.26	4.13	33	0.27
930911	0446	1.85	0.123	8.2	50	62	0.67	2.56	4.73	27	0.33
930911	0746	2.18	0.123	8.2	52	60	0.59	2.18	5.89	28	0.17
930911	1047	2.53	0.123	8.2	52	56	0.54	2.08	7.12	26	0.14
930911	1346	2.30	0.113	8.9	56	59	0.56	2.42	6.79	25	0.13
930911	1646	1.93	0.113	8.9	58	62	0.66	2.28	5.07	29	0.12
930911	1946	2.27	0.113	8.9	48	57	0.60	2.19	5.97	28	0.16
930911	2246	2.58	0.113	8.9	60	55	0.55	1.26	5.78	31	-0.17
930912	0143	2.66	0.123	8.2	54	54	0.52	1.63	6.53	26	0.03
930912	0446	2.55	0.113	8.9	52	55	0.54	2.03	6.70	26	0.13
930912	0746	2.00	0.123	8.2	50	57	0.61	2.52	6.14	26	0.17
930912	1346	1.74	0.123	8.2	56	63	0.64	2.33	5.33	35	0.41
930912	1946	2.00	0.103	9.7	48	64	0.73	3.20	4.54	32	0.58
930912	2247	2.13	0.103	9.7	48	65	0.78	3.10	4.09	36	0.65
930913	0147	2.20	0.103	9.7	50	69	0.81	2.88	3.66	39	0.62
930913	0446	2.17	0.093	10.7	48	65	0.75	3.35	4.49	34	0.75
930913	0746	2.41	0.093	10.7	48	64	0.74	3.68	4.67	32	1.03
930913	1104	2.20	0.093	10.7	48	67	0.78	3.13	4.09	37	0.99
930913	1947	1.93	0.093	10.7	50	80	0.95	1.77	2.43	104	1.70
930913	2254	1.85	0.093	10.7	50	81	0.98	1.73	2.24	116	1.92
930914	0152	1.75	0.093	10.7	46	91	1.03	1.05	1.77	126	1.43
930914	0452	1.65	0.103	9.7	46	86	0.98	1.14	1.92	116	1.47
930914	0805	1.65	0.093	10.7	44	89	1.01	0.82	1.68	118	1.32
930914	1114	1.60	0.093	10.7	44	98	1.07	0.61	1.46	128	1.09
930914	1349	1.52	0.093	10.7	42	104	1.06	0.27	1.35	128	0.64
930914	1949	1.39	0.103	9.7	178	132	0.99	-0.69	1.62	118	-1.35
930914	2249	1.38	0.103	9.7	-178	144	0.93	-1.33	2.14	108	-1.53
930915	0149	1.43	0.093	10.7	180	138	0.95	-1.14	1.94	115	-1.53
930915	0450	1.35	0.103	9.7	180	128	1.01	-0.57	1.51	121	-1.36
930915	0800	1.33	0.093	10.7	174	142	0.93	-1.50	2.23	109	-1.76
930915	1046	1.36	0.103	9.7	174	145	0.94	-1.63	2.28	114	-1.77
930915	1343	1.18	0.093	10.7	160	139	0.94	-1.30	2.11	112	-1.64
930915	1722	1.20	0.074	13.6	158	134	0.93	-0.99	1.94	108	-1.54
930915	1952	1.21	0.074	13.6	170	134	0.94	-0.98	1.89	111	-1.53
930915	2251	1.17	0.083	12.0	178	126	0.98	-0.55	1.59	114	-1.27
930916	0151	1.10	0.083	12.0	-180	123	0.98	-0.49	1.51	116	-1.23
930916	0446	1.12	0.083	12.0	176	124	0.98	-0.48	1.50	116	-1.16

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930916	0751	1.10	0.083	12.0	-180	118	0.99	-0.26	1.49	116	-0.63
930916	1037	1.06	0.083	12.0	154	120	0.95	-0.29	1.54	108	-1.05
930916	1357	1.07	0.083	12.0	52	118	0.95	-0.19	1.49	110	-0.66
930916	1646	1.15	0.093	10.7	58	99	0.91	0.61	1.82	99	1.11
930916	1937	1.03	0.083	12.0	56	102	0.94	0.43	1.52	108	1.17
930916	2237	1.01	0.093	10.7	52	106	0.95	0.16	1.48	107	0.49
930917	0135	1.01	0.093	10.7	54	104	0.93	0.23	1.54	105	0.67
930917	0437	1.12	0.162	6.2	54	87	0.92	0.77	1.90	101	1.18
930917	0737	1.01	0.093	10.7	52	88	0.90	0.61	1.90	97	1.04
930917	1039	0.94	0.093	10.7	50	101	0.93	0.21	1.57	105	0.48
930917	1354	0.91	0.093	10.7	48	103	0.96	0.17	1.53	108	0.49
930917	1651	0.91	0.162	6.2	58	101	0.92	0.25	1.61	101	0.73
930917	1937	0.93	0.162	6.2	54	94	0.92	0.46	1.64	103	1.06
930917	2237	0.99	0.162	6.2	52	89	0.90	0.63	1.79	100	1.23
930918	0137	1.16	0.162	6.2	50	77	0.81	1.16	2.51	74	1.18
930918	0437	1.28	0.152	6.6	60	70	0.71	1.47	3.43	41	0.38
930918	0737	1.30	0.162	6.2	48	67	0.78	1.38	3.06	51	0.43
930918	1037	1.40	0.152	6.6	54	67	0.73	1.76	3.71	38	0.31
930918	1337	1.40	0.142	7.0	60	65	0.69	2.40	4.36	27	0.18
930918	1637	1.46	0.152	6.6	62	66	0.71	1.84	3.88	37	0.04
930918	1937	1.58	0.142	7.0	66	58	0.63	1.85	5.04	36	-0.14
930918	2237	1.71	0.132	7.6	60	56	0.64	2.41	5.03	34	-0.05
930919	0137	1.55	0.132	7.6	56	60	0.68	2.40	4.56	31	0.07
930919	0437	1.74	0.132	7.6	46	59	0.61	2.61	5.72	30	0.20
930919	0737	1.93	0.123	8.2	54	55	0.58	2.22	6.04	30	-0.04
930919	1037	1.56	0.123	8.2	42	54	0.67	3.67	5.44	25	0.65
930919	1637	1.36	0.132	7.6	48	60	0.66	2.81	5.22	29	0.21
930919	1934	1.37	0.132	7.6	56	60	0.66	2.19	4.91	32	0.03
930919	2237	1.28	0.132	7.6	52	61	0.72	2.64	4.44	30	0.28
930920	0221	1.13	0.123	8.2	50	70	0.84	2.27	3.07	64	1.56
930920	0437	1.05	0.123	8.2	44	70	0.85	1.91	2.85	69	1.41
930920	0737	1.05	0.132	7.6	44	68	0.88	2.09	2.94	65	1.15
930920	1036	1.26	0.123	8.2	44	60	0.76	2.76	4.03	32	0.62
930920	1335	1.34	0.113	8.9	40	57	0.73	3.33	4.64	30	0.74
930920	1705	1.55	0.113	8.9	42	56	0.65	2.99	5.64	28	0.20
930920	1934	1.80	0.113	8.9	44	57	0.61	2.25	5.63	31	0.50
930920	2245	1.79	0.103	9.7	44	53	0.57	3.40	7.17	22	0.49
930921	0445	2.19	0.093	10.7	44	56	0.51	2.24	7.42	28	0.66
930921	0753	2.32	0.093	10.7	42	55	0.55	1.86	6.23	34	0.57
930921	1057	2.13	0.093	10.7	48	58	0.52	2.69	7.76	25	0.50
930921	1650	2.58	0.103	9.7	42	49	0.49	2.36	8.06	23	0.65
930921	1943	2.52	0.103	9.7	50	48	0.54	1.93	6.73	32	-0.14
930921	2243	2.20	0.103	9.7	40	44	0.54	2.37	6.98	30	0.24
930922	0143	2.01	0.093	10.7	30	49	0.56	2.16	6.60	34	0.13
930922	0443	2.02	0.093	10.7	38	51	0.59	2.65	6.40	31	0.45
930922	0734	1.97	0.103	9.7	50	51	0.56	2.06	6.43	31	0.04
930922	1048	2.04	0.103	9.7	46	50	0.55	2.02	6.64	31	0.12
930922	1336	1.95	0.103	9.7	44	53	0.57	1.62	5.98	35	0.04
930922	1633	2.03	0.103	9.7	32	51	0.55	1.62	6.16	35	0.19
930922	1933	2.30	0.103	9.7	32	50	0.52	1.55	6.33	35	0.40
930922	2233	2.19	0.103	9.7	52	51	0.50	1.59	6.99	29	-0.13
930923	0133	1.94	0.103	9.7	38	52	0.54	1.79	6.37	32	0.34
930923	0433	1.76	0.103	9.7	44	52	0.55	2.21	6.67	28	0.46
930923	0747	1.79	0.103	9.7	44	49	0.56	2.29	6.57	30	0.27
930923	1035	1.83	0.103	9.7	46	51	0.55	2.10	6.42	29	0.25
930923	1335	1.54	0.103	9.7	44	54	0.60	2.38	5.96	30	0.48

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
930923	1635	1.65	0.103	9.7	42	55	0.56	2.58	6.55	27	0.64
930923	1935	1.72	0.103	9.7	46	55	0.54	2.32	6.86	23	0.52
930923	2235	1.61	0.152	6.6	50	57	0.57	1.62	5.70	32	0.17
930924	0135	1.58	0.152	6.6	50	60	0.63	1.94	4.88	34	0.53
930924	0435	1.43	0.103	9.7	48	62	0.65	2.40	5.07	31	0.74
930924	0735	1.47	0.103	9.7	44	59	0.67	2.35	4.68	31	0.49
930924	1332	1.53	0.113	8.9	46	61	0.73	2.30	3.88	36	0.89
930924	1632	1.31	0.132	7.6	48	69	0.80	1.90	3.19	46	0.85
930924	1949	1.19	0.064	15.6	56	80	0.82	1.37	2.64	76	1.47
930924	2249	1.17	0.064	15.6	54	86	0.87	0.87	2.03	94	1.31
930925	0149	1.18	0.064	15.6	52	81	0.88	1.14	2.22	95	1.45
930925	0449	1.32	0.064	15.6	46	92	0.93	0.62	1.65	106	1.24
930925	0749	1.34	0.064	15.6	50	79	0.90	1.31	2.27	94	1.67
930925	1049	1.36	0.064	15.6	48	83	0.90	0.95	1.97	102	1.42
930925	1349	1.23	0.064	15.6	48	95	0.94	0.45	1.59	108	0.95
930925	1649	1.23	0.064	15.6	54	98	0.92	0.46	1.63	103	1.11
930925	1949	1.26	0.064	15.6	58	101	0.92	0.35	1.56	103	1.15
930925	2249	1.14	0.064	15.6	52	97	0.99	0.42	1.52	112	1.24
930926	0149	1.21	0.064	15.6	48	89	0.99	0.74	1.63	115	1.51
930926	0447	1.10	0.064	15.6	46	107	0.97	0.04	1.44	112	0.13
930926	0747	1.13	0.064	15.6	44	104	0.99	0.21	1.43	116	0.61
930926	1649	1.01	0.064	15.6	176	123	0.95	-0.51	1.64	109	-1.17
930926	1949	1.00	0.064	15.6	176	127	0.95	-0.61	1.71	108	-1.18
930926	2249	0.94	0.064	15.6	176	128	0.91	-0.61	1.81	104	-1.01
930927	0149	0.98	0.064	15.6	156	136	0.84	-1.00	2.26	92	-1.42
930927	0449	0.95	0.064	15.6	52	122	0.93	-0.40	1.68	108	-0.96
930927	0749	1.00	0.064	15.6	180	130	0.94	-0.69	1.85	108	-1.16
930927	1042	0.99	0.064	15.6	52	116	0.96	-0.28	1.56	109	-0.89
930927	1342	1.04	0.064	15.6	54	107	0.98	0.14	1.50	110	0.31
930927	1659	1.03	0.064	15.6	56	112	0.97	-0.02	1.50	111	-0.14
930927	1932	1.06	0.064	15.6	62	115	0.95	-0.02	1.54	106	-0.33
930927	2232	1.02	0.064	15.6	58	101	0.95	0.37	1.56	105	1.27
930928	0132	1.09	0.064	15.6	60	99	0.93	0.42	1.55	105	1.28
930928	0430	1.06	0.064	15.6	52	99	0.95	0.45	1.66	106	1.00
930928	0730	1.09	0.064	15.6	56	90	0.94	0.62	1.71	104	1.32
930928	1032	1.19	0.132	7.6	54	74	0.86	1.65	2.64	79	1.46
930928	1422	1.34	0.142	7.0	52	73	0.82	1.70	2.75	62	1.13
930928	1523	1.26	0.132	7.6	50	70	0.80	1.83	3.01	47	0.70
930928	1934	1.22	0.132	7.6	52	70	0.84	1.59	2.77	58	0.76
930928	2234	1.15	0.123	8.2	52	69	0.80	1.95	3.18	44	0.72
930929	0434	1.29	0.132	7.6	54	62	0.72	2.27	4.13	34	0.27
930929	0736	1.29	0.123	8.2	52	60	0.70	2.43	4.44	30	0.35
930929	1954	1.14	0.123	8.2	50	58	0.81	2.07	3.46	45	0.23
930929	2255	1.07	0.123	8.2	54	63	0.84	2.29	3.27	45	0.74
930930	0154	1.16	0.123	8.2	58	64	0.69	2.56	4.55	30	0.17
930930	0454	1.07	0.123	8.2	50	61	0.74	2.86	4.36	34	0.44
930930	0755	0.96	0.123	8.2	44	60	0.81	2.50	3.62	42	0.72
930930	1044	0.92	0.132	7.6	48	64	0.87	2.24	3.03	56	0.98
930930	1348	0.84	0.132	7.6	50	72	0.89	2.02	2.75	76	1.25
930930	1959	0.72	0.142	7.0	56	77	0.97	1.29	2.14	109	1.42
930930	2254	0.68	0.093	10.7	52	88	0.99	0.93	1.80	115	1.47
931001	0459	0.61	0.103	9.7	52	92	0.98	0.84	1.77	113	1.22
931001	0759	0.64	0.113	8.9	48	80	0.95	1.15	2.09	104	1.27
931001	1059	0.71	0.162	6.2	56	73	0.89	1.66	2.65	83	1.51
931001	1350	0.86	0.162	6.2	60	66	0.76	1.71	3.59	40	0.29

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931001	1634	1.01	0.162	6.2	44	51	0.73	2.10	4.32	43	0.32
931001	1931	1.18	0.162	6.2	42	48	0.67	1.75	4.81	39	0.29
931001	2240	1.31	0.152	6.6	24	47	0.58	1.54	5.58	38	0.12
931002	0140	1.37	0.152	6.6	54	53	0.56	1.23	5.65	33	-0.11
931002	0440	1.50	0.142	7.0	52	51	0.53	0.75	5.58	35	-0.05
931002	0740	1.52	0.142	7.0	50	48	0.52	1.04	6.08	32	-0.12
931002	1041	1.50	0.142	7.0	52	50	0.50	1.16	7.07	28	-0.08
931002	1330	1.47	0.132	7.6	50	54	0.50	1.24	7.17	27	0.23
931002	1637	1.84	0.142	7.0	56	54	0.49	0.70	6.03	33	-0.10
931002	1942	1.90	0.142	7.0	54	47	0.50	0.51	5.10	36	-0.30
931002	2242	1.66	0.132	7.6	48	47	0.50	0.61	5.60	36	-0.09
931003	0142	1.49	0.132	7.6	56	56	0.52	0.69	6.35	29	-0.05
931003	0442	1.46	0.142	7.0	58	58	0.50	1.13	7.28	25	-0.01
931003	0742	1.38	0.142	7.0	50	55	0.52	1.10	6.60	29	0.23
931003	1042	1.46	0.142	7.0	50	56	0.49	1.37	8.08	22	0.23
931003	1342	1.37	0.054	18.5	68	60	0.52	1.51	7.21	26	-0.31
931003	1642	1.50	0.142	7.0	58	62	0.53	1.41	6.34	27	0.09
931003	1942	1.27	0.152	6.6	56	60	0.54	1.57	6.62	26	0.20
931003	2242	1.31	0.152	6.6	54	61	0.56	1.41	5.99	28	0.38
931004	0142	1.21	0.152	6.6	54	62	0.59	1.50	5.85	28	0.36
931004	0442	1.16	0.162	6.2	56	63	0.56	2.08	6.30	26	0.29
931004	0742	1.19	0.064	15.6	52	64	0.55	1.71	6.20	28	0.45
931004	1032	1.05	0.064	15.6	54	68	0.63	1.63	5.08	31	0.51
931004	1340	1.10	0.064	15.6	56	67	0.61	1.65	5.38	29	0.37
931004	1640	1.06	0.064	15.6	52	70	0.64	1.51	4.38	38	0.42
931004	1940	1.04	0.064	15.6	54	71	0.64	1.67	4.52	37	0.79
931004	2240	0.99	0.074	13.6	52	75	0.68	1.75	4.14	38	0.32
931005	0140	0.90	0.074	13.6	58	79	0.71	1.67	3.94	38	0.36
931005	0440	0.97	0.074	13.6	56	72	0.65	1.91	4.85	34	0.64
931005	0741	0.91	0.074	13.6	58	75	0.67	1.77	4.18	37	0.74
931005	1118	0.81	0.074	13.6	68	81	0.69	1.57	3.97	37	0.82
931005	1341	0.87	0.074	13.6	58	78	0.72	1.70	3.83	42	0.78
931005	1640	0.98	0.083	12.0	54	74	0.67	1.79	4.17	41	0.89
931005	1940	0.91	0.074	13.6	66	76	0.63	1.90	4.81	30	0.47
931005	2240	0.78	0.083	12.0	60	79	0.72	1.58	3.60	44	0.77
931006	0140	0.86	0.083	12.0	58	76	0.70	2.14	4.13	35	0.59
931006	0440	0.89	0.083	12.0	58	81	0.74	1.51	3.32	47	0.57
931006	0741	0.85	0.083	12.0	56	86	0.80	1.49	2.93	56	0.57
931006	1038	0.81	0.093	10.7	58	92	0.90	1.22	2.31	88	1.08
931006	1341	0.77	0.093	10.7	56	100	0.96	0.95	1.95	114	1.23
931006	1641	0.96	0.162	6.2	56	80	0.88	1.60	2.79	60	0.70
931006	1940	1.46	0.162	6.2	54	58	0.70	1.61	4.32	42	0.25
931006	2240	1.62	0.162	6.2	60	56	0.64	1.38	4.75	41	-0.16
931007	0140	1.53	0.074	13.6	54	63	0.63	1.42	5.03	33	0.22
931007	0440	1.68	0.074	13.6	56	62	0.56	1.52	6.01	29	0.19
931007	0740	1.75	0.074	13.6	50	60	0.56	1.60	6.27	31	0.33
931007	1040	1.48	0.083	12.0	56	62	0.60	1.62	5.71	29	0.20
931007	1359	1.31	0.083	12.0	58	65	0.61	2.04	5.58	25	0.37
931007	1640	1.29	0.083	12.0	54	64	0.62	2.02	5.70	27	0.50
931007	1938	1.34	0.083	12.0	52	63	0.68	1.85	4.68	34	0.67
931007	2240	1.40	0.083	12.0	60	64	0.61	1.78	5.52	28	0.07
931008	0140	1.27	0.093	10.7	58	65	0.67	1.72	4.54	28	0.33
931008	0440	1.46	0.093	10.7	54	64	0.63	2.18	5.20	28	0.42
931008	0740	1.42	0.142	7.0	54	64	0.65	2.09	4.89	30	0.42
931008	1040	1.44	0.093	10.7	56	66	0.66	2.68	5.12	27	0.39
931008	1340	1.36	0.142	7.0	54	66	0.65	2.53	5.18	27	0.46

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931008	1640	1.45	0.132	7.6	58	70	0.66	2.41	4.72	28	0.33
931008	1940	1.32	0.123	8.2	62	69	0.72	2.00	4.16	30	0.21
931008	2240	1.37	0.064	15.6	58	65	0.68	1.78	4.28	33	0.17
931009	0137	1.58	0.064	15.6	58	65	0.59	1.70	5.12	27	0.21
931009	0440	1.59	0.064	15.6	56	73	0.71	1.87	3.80	35	0.59
931009	0742	1.64	0.074	13.6	62	69	0.57	2.36	6.03	20	0.32
931009	1040	1.63	0.074	13.6	62	75	0.69	1.71	4.00	32	0.44
931009	1340	1.74	0.074	13.6	60	70	0.55	2.12	6.09	22	0.39
931009	1640	1.70	0.074	13.6	58	70	0.59	2.05	5.60	26	0.59
931009	1940	1.60	0.074	13.6	56	70	0.61	2.17	5.02	26	0.88
931009	2240	1.74	0.074	13.6	58	71	0.61	2.13	5.01	28	0.74
931010	0140	1.52	0.074	13.6	56	70	0.59	2.13	5.37	28	0.70
931010	0440	1.48	0.074	13.6	54	70	0.64	1.81	4.20	35	0.84
931010	1040	1.45	0.083	12.0	56	75	0.72	1.69	3.54	40	0.76
931010	1340	1.38	0.083	12.0	56	75	0.72	1.66	3.52	42	1.04
931010	1640	1.30	0.083	12.0	56	82	0.79	1.36	2.94	57	0.88
931010	1940	1.36	0.083	12.0	54	78	0.76	1.42	3.06	53	0.95
931010	2240	1.23	0.083	12.0	52	82	0.80	1.36	2.81	64	0.85
931011	0140	1.21	0.083	12.0	54	83	0.79	1.25	2.67	68	1.03
931011	0441	1.22	0.093	10.7	58	96	0.87	0.85	2.06	95	1.09
931011	0740	1.26	0.093	10.7	54	90	0.84	1.05	2.29	90	1.12
931011	1040	1.27	0.093	10.7	56	92	0.85	0.93	2.12	94	1.22
931011	1340	1.26	0.093	10.7	58	98	0.88	0.73	2.01	94	0.98
931011	1640	1.21	0.093	10.7	158	112	0.87	0.17	1.72	94	0.54
931011	2240	1.24	0.093	10.7	46	105	0.95	0.19	1.52	110	0.56
931012	0137	1.32	0.064	15.6	72	114	0.91	-0.02	1.60	98	0.40
931012	0439	1.34	0.054	18.5	52	117	0.93	-0.07	1.50	106	-0.12
931012	0739	1.44	0.054	18.5	174	116	0.94	-0.08	1.54	107	-0.24
931012	1043	1.44	0.054	18.5	162	119	0.92	-0.18	1.56	104	-0.54
931012	1340	1.45	0.064	15.6	60	116	0.92	-0.07	1.49	105	-0.49
931012	1645	1.44	0.054	18.5	56	119	0.95	-0.11	1.51	111	-0.31
931012	1942	1.59	0.074	13.6	62	110	0.94	0.21	1.56	105	0.60
931012	2242	1.60	0.074	13.6	178	118	0.95	-0.08	1.57	108	-0.11
931013	0142	1.70	0.074	13.6	58	100	0.91	0.61	1.67	104	1.34
931013	0442	1.64	0.074	13.6	52	108	0.95	0.23	1.49	112	0.61
931013	0743	1.70	0.074	13.6	54	98	0.92	0.63	1.70	105	1.24
931013	1041	1.61	0.074	13.6	56	98	0.92	0.58	1.78	101	0.98
931013	1641	1.42	0.074	13.6	52	103	0.88	0.36	1.78	98	0.62
931013	1940	1.69	0.083	12.0	60	93	0.80	0.97	2.30	85	1.23
931013	2240	1.70	0.083	12.0	56	93	0.83	0.84	2.11	92	1.17
931014	0140	1.67	0.083	12.0	52	97	0.85	0.65	1.91	96	0.93
931014	0440	1.64	0.083	12.0	52	101	0.88	0.39	1.83	99	0.65
931014	0740	1.62	0.083	12.0	56	102	0.86	0.49	1.83	96	1.08
931014	1038	1.65	0.054	18.5	66	98	0.86	0.67	1.93	93	1.47
931014	1337	1.65	0.054	18.5	74	95	0.81	1.01	2.30	82	2.07
931014	1659	1.44	0.054	18.5	72	106	0.87	0.39	1.95	87	1.39
931014	1935	1.62	0.054	18.5	72	107	0.85	0.38	1.91	88	1.12
931014	2235	1.71	0.054	18.5	72	103	0.84	0.54	2.06	84	1.48
931015	0135	1.68	0.064	15.6	68	116	0.89	0.08	1.73	96	0.22
931015	0435	1.50	0.064	15.6	74	117	0.92	0.03	1.71	98	0.29
931015	0738	1.69	0.064	15.6	68	109	0.89	0.33	1.71	96	1.04
931015	1335	1.61	0.064	15.6	64	117	0.89	-0.03	1.57	99	-0.14
931015	1732	1.52	0.064	15.6	166	122	0.90	-0.28	1.84	95	-0.60
931015	1936	1.50	0.064	15.6	62	121	0.90	-0.24	1.70	99	-0.93
931015	2236	1.62	0.064	15.6	64	110	0.90	0.21	1.59	97	0.80

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931016	0136	1.55	0.064	15.6	64	120	0.90	-0.20	1.65	100	-0.68
931016	0435	1.50	0.064	15.6	58	121	0.91	-0.27	1.64	101	-0.99
931016	1036	1.70	0.074	13.6	56	120	0.90	-0.22	1.78	98	-0.57
931016	1336	1.55	0.074	13.6	74	116	0.87	0.03	1.88	90	0.12
931016	1635	1.57	0.074	13.6	64	115	0.91	0.05	1.69	101	-0.05
931016	1936	1.53	0.074	13.6	180	137	0.93	-0.86	2.03	102	-1.16
931016	2232	1.60	0.074	13.6	56	122	0.95	-0.27	1.54	111	-0.83
931017	0132	1.64	0.074	13.6	174	120	0.93	-0.20	1.56	106	-0.56
931017	0432	1.67	0.064	15.6	56	106	0.95	0.25	1.54	108	0.78
931017	0732	2.00	0.064	15.6	52	77	0.96	1.01	2.02	108	1.17
931017	1032	1.88	0.064	15.6	52	79	0.93	1.12	2.12	103	1.36
931017	1330	2.00	0.064	15.6	58	74	0.93	1.22	2.29	94	1.26
931017	1636	2.07	0.064	15.6	54	64	0.88	1.86	2.79	61	0.83
931017	1936	2.15	0.064	15.6	52	61	0.85	1.72	2.92	60	0.58
931017	2236	2.02	0.064	15.6	54	65	0.90	1.70	2.70	75	0.82
931018	0135	2.01	0.064	15.6	46	69	0.91	1.64	2.52	94	1.51
931018	0435	1.98	0.123	8.2	50	62	0.85	2.04	3.03	55	0.76
931018	0736	1.88	0.064	15.6	54	57	0.80	2.18	3.55	46	0.22
931018	1035	1.82	0.123	8.2	46	55	0.84	2.43	3.38	46	0.50
931018	1336	1.63	0.064	15.6	52	63	0.92	1.87	2.60	92	1.37
931018	1639	1.66	0.064	15.6	18	54	0.90	2.26	2.94	65	0.61
931018	1934	1.70	0.074	13.6	16	52	0.86	2.12	3.15	61	0.34
931018	2234	1.77	0.074	13.6	52	56	0.86	2.24	3.24	53	0.22
931019	0134	1.82	0.074	13.6	50	57	0.79	2.64	3.88	34	0.40
931019	0434	1.64	0.083	12.0	46	57	0.82	2.28	3.47	46	0.72
931019	0734	1.62	0.083	12.0	46	57	0.80	2.38	3.66	44	0.75
931019	1034	1.50	0.083	12.0	48	62	0.83	2.21	3.37	47	0.66
931019	1634	1.24	0.083	12.0	46	68	0.86	1.73	2.86	63	0.95
931019	1934	1.30	0.093	10.7	24	61	0.85	1.86	3.05	59	0.32
931020	0434	1.43	0.113	8.9	30	59	0.75	2.12	3.84	44	0.20
931020	0734	1.23	0.103	9.7	44	59	0.76	2.23	3.97	40	0.59
931020	1034	1.25	0.103	9.7	48	59	0.75	2.75	4.26	35	0.43
931020	1346	1.20	0.103	9.7	54	62	0.73	2.46	4.29	32	0.53
931020	1640	1.14	0.074	13.6	52	66	0.79	1.93	3.49	43	0.48
931020	1934	1.15	0.093	10.7	46	60	0.77	2.32	3.80	42	0.70
931020	2234	1.18	0.093	10.7	50	60	0.76	2.19	3.89	42	0.35
931021	0134	1.19	0.074	13.6	64	66	0.74	1.83	3.78	37	0.01
931021	0434	1.10	0.083	12.0	56	71	0.77	1.72	3.37	45	0.76
931021	0734	1.05	0.093	10.7	54	68	0.75	2.00	3.59	40	0.75
931021	1041	0.95	0.093	10.7	52	69	0.79	1.79	3.17	49	0.93
931021	1334	1.02	0.103	9.7	50	66	0.75	2.29	3.80	38	0.71
931021	1634	0.95	0.103	9.7	56	70	0.75	2.33	3.77	34	0.70
931021	1934	0.90	0.103	9.7	48	75	0.84	1.63	2.80	69	1.09
931021	2231	0.93	0.103	9.7	54	74	0.86	2.02	2.97	61	1.29
931022	0134	0.84	0.064	15.6	52	75	0.87	1.59	2.69	77	1.38
931022	0734	0.86	0.074	13.6	56	80	0.89	1.32	2.49	84	1.45
931022	1034	0.92	0.074	13.6	54	83	0.87	1.32	2.41	86	1.34
931022	1634	0.91	0.083	12.0	56	83	0.90	1.39	2.45	89	1.28
931022	1934	0.90	0.074	13.6	46	83	0.92	1.03	2.23	95	1.00
931022	2234	0.90	0.083	12.0	50	84	0.89	1.16	2.25	91	1.21
931023	0134	0.92	0.083	12.0	50	80	0.84	1.38	2.66	70	0.95
931023	0734	1.03	0.083	12.0	48	75	0.85	1.77	2.78	69	1.57
931023	1030	1.01	0.093	10.7	50	78	0.90	1.44	2.42	89	1.35
931023	1334	1.05	0.093	10.7	58	75	0.88	1.31	2.62	71	0.75
931023	1634	1.15	0.093	10.7	60	69	0.79	1.97	3.46	43	0.42
931023	1934	1.31	0.064	15.6	54	67	0.76	2.25	3.81	35	0.88

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931023	2234	1.75	0.064	15.6	60	66	0.62	2.91	5.55	17	0.57
931024	0134	2.08	0.064	15.6	60	63	0.56	2.93	6.73	16	0.02
931024	0434	2.35	0.074	13.6	64	62	0.57	2.42	6.36	23	0.01
931024	0734	2.11	0.074	13.6	58	61	0.63	3.09	6.28	20	0.26
931024	1655	2.38	0.074	13.6	60	62	0.60	2.14	6.07	24	0.12
931024	1944	2.42	0.074	13.6	52	62	0.60	2.29	5.98	26	0.59
931024	2255	2.49	0.074	13.6	54	62	0.56	2.28	6.46	23	0.43
931025	0155	2.40	0.064	15.6	58	64	0.59	1.98	5.57	26	0.36
931025	0455	2.43	0.074	13.6	58	66	0.60	1.95	5.28	27	0.25
931025	0755	2.36	0.074	13.6	56	65	0.64	2.30	4.97	26	0.50
931025	1403	2.44	0.074	13.6	54	63	0.63	1.73	4.81	30	0.44
931025	1655	2.23	0.074	13.6	54	61	0.63	2.40	5.31	26	0.47
931025	1955	2.10	0.083	12.0	58	63	0.64	2.04	4.89	28	0.17
931025	2256	2.27	0.093	10.7	54	58	0.60	2.11	5.55	30	0.06
931026	0155	2.09	0.083	12.0	54	60	0.62	2.10	5.14	31	0.25
931026	0455	1.98	0.093	10.7	52	59	0.61	2.59	5.56	25	0.26
931026	0751	1.90	0.083	12.0	52	57	0.65	2.22	5.03	29	0.33
931026	1055	1.87	0.083	12.0	48	61	0.75	1.79	3.58	46	0.79
931026	1343	1.70	0.083	12.0	54	64	0.74	1.78	3.70	40	0.43
931026	1647	1.57	0.093	10.7	54	66	0.81	1.63	3.02	54	0.52
931026	1951	1.43	0.093	10.7	54	72	0.87	1.39	2.54	81	1.10
931026	2255	1.41	0.103	9.7	48	76	0.91	1.32	2.20	105	1.56
931027	0155	1.41	0.113	8.9	52	76	0.90	1.17	2.17	101	1.38
931027	0452	1.24	0.064	15.6	42	86	0.96	0.76	1.77	110	1.15
931027	0755	1.33	0.064	15.6	36	93	1.01	0.40	1.55	116	0.83
931027	1055	1.34	0.064	15.6	54	92	1.01	0.53	1.65	111	1.22
931027	1346	1.25	0.064	15.6	58	86	0.97	0.78	1.85	106	1.39
931027	1654	1.22	0.064	15.6	52	105	0.97	0.11	1.54	108	0.41
931027	1955	1.26	0.064	15.6	60	111	0.94	-0.03	1.51	103	-0.19
931028	0155	1.19	0.064	15.6	60	108	0.95	0.10	1.54	105	0.43
931028	0455	1.22	0.064	15.6	58	103	0.95	0.21	1.56	105	0.71
931028	0755	1.20	0.064	15.6	64	111	0.96	0.05	1.56	102	0.53
931028	1046	1.09	0.064	15.6	66	115	0.97	-0.02	1.64	106	0.12
931028	2255	1.12	0.074	13.6	64	113	0.90	0.11	1.75	97	0.15
931029	0157	1.15	0.074	13.6	60	109	0.87	0.13	1.69	93	0.24
931029	0755	1.05	0.083	12.0	64	112	0.94	0.19	1.73	104	0.46
931029	1055	1.05	0.074	13.6	64	108	0.92	0.26	1.72	99	0.62
931029	1655	0.95	0.074	13.6	66	120	0.92	-0.09	1.64	102	-0.37
931029	1954	0.85	0.074	13.6	162	127	0.92	-0.40	1.85	98	-0.76
931029	2255	0.88	0.074	13.6	176	128	0.94	-0.40	1.70	106	-0.73
931030	0155	0.86	0.074	13.6	168	125	0.90	-0.30	1.71	99	-0.63
931030	0455	0.83	0.074	13.6	154	123	0.90	-0.24	1.81	93	-0.63
931030	0755	0.90	0.074	13.6	48	107	0.97	0.16	1.58	111	0.24
931030	1055	0.93	0.074	13.6	52	107	0.99	0.08	1.60	111	0.29
931030	1355	0.90	0.093	10.7	50	107	0.95	0.25	1.75	106	0.55
931030	1654	0.87	0.074	13.6	56	109	0.92	0.26	1.70	102	0.67
931030	1955	0.84	0.074	13.6	176	116	0.93	0.07	1.58	106	0.41
931030	2255	0.89	0.074	13.6	152	120	0.93	-0.18	1.64	104	-0.62
931031	0155	0.92	0.064	15.6	56	116	0.92	0.03	1.68	102	0.03
931031	0755	1.05	0.064	15.6	64	115	0.88	0.10	1.71	95	0.19
931031	1055	1.12	0.074	13.6	-176	123	0.90	-0.17	1.83	97	-0.38
931031	1355	1.10	0.074	13.6	154	126	0.87	-0.29	1.84	93	-0.64
931031	1655	1.07	0.074	13.6	176	116	0.87	-0.05	1.74	93	-0.14
931031	1955	1.04	0.074	13.6	176	119	0.90	-0.15	1.66	102	-0.28
931031	2255	1.04	0.074	13.6	58	117	0.90	-0.11	1.70	102	-0.29

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931101	0156	1.06	0.074	13.6	56	118	0.89	-0.13	1.66	99	-0.37
931101	0457	1.02	0.074	13.6	-178	115	0.92	0.05	1.57	106	0.17
931101	0744	1.03	0.074	13.6	60	106	0.92	0.41	1.70	106	0.90
931101	1055	1.09	0.064	15.6	60	106	0.94	0.39	1.75	102	0.92
931101	1955	1.83	0.103	9.7	46	58	0.66	3.24	5.21	25	0.70
931101	2037	1.89	0.103	9.7	44	57	0.67	3.26	5.15	24	0.68
931101	2255	1.91	0.103	9.7	46	56	0.64	3.11	5.67	24	0.57
931102	0155	1.93	0.093	10.7	50	58	0.63	3.36	5.90	21	0.43
931102	0455	2.00	0.083	12.0	48	59	0.64	3.20	5.62	24	0.68
931102	1059	2.00	0.074	13.6	48	60	0.56	3.09	7.13	21	0.50
931102	2300	1.71	0.074	13.6	54	64	0.57	2.76	6.59	21	0.51
931103	0200	1.62	0.074	13.6	52	65	0.63	2.29	5.14	28	0.71
931103	0500	1.62	0.074	13.6	52	63	0.55	2.41	6.85	25	0.46
931103	0832	1.51	0.074	13.6	54	65	0.65	2.59	5.27	28	0.73
931103	1400	1.40	0.074	13.6	54	62	0.60	2.44	5.76	26	0.56
931103	1701	1.34	0.074	13.6	50	60	0.66	2.52	5.08	29	0.52
931103	2000	1.23	0.074	13.6	56	68	0.70	2.15	4.30	31	0.54
931104	1100	1.83	0.064	15.6	52	62	0.57	2.11	6.35	26	0.30
931104	1400	2.11	0.064	15.6	48	58	0.48	1.69	7.46	25	0.36
931104	1734	2.34	0.113	8.9	50	55	0.47	2.29	8.67	21	0.31
931104	2000	2.55	0.103	9.7	52	55	0.46	1.88	8.59	22	0.20
931104	2305	2.24	0.103	9.7	52	56	0.49	2.17	8.15	21	0.26
931105	0200	2.25	0.103	9.7	48	55	0.50	2.36	8.20	22	0.50
931105	0500	2.21	0.103	9.7	48	56	0.48	2.43	8.60	21	0.57
931105	0800	2.26	0.103	9.7	50	57	0.50	2.74	8.17	20	0.38
931105	1100	2.32	0.093	10.7	48	56	0.46	2.64	9.29	20	0.50
931105	1359	2.31	0.093	10.7	48	54	0.51	2.43	8.28	22	0.45
931105	1706	2.41	0.093	10.7	48	52	0.46	2.25	9.48	17	0.37
931105	2001	1.98	0.103	9.7	48	56	0.51	3.07	8.43	19	0.56
931105	2301	1.85	0.093	10.7	50	57	0.51	2.56	8.22	20	0.49
931106	0501	1.83	0.103	9.7	52	57	0.57	2.42	6.66	21	0.41
931106	0801	1.75	0.093	10.7	50	55	0.57	2.68	7.08	23	0.37
931106	1101	1.67	0.093	10.7	50	54	0.60	1.98	5.71	29	0.22
931106	1401	1.90	0.093	10.7	48	55	0.56	1.92	6.38	27	0.46
931106	2001	1.70	0.103	9.7	52	60	0.62	2.19	5.54	29	0.35
931106	2301	1.66	0.074	13.6	52	61	0.63	1.89	5.17	30	0.31
931107	0159	1.63	0.074	13.6	50	57	0.64	1.77	5.06	36	0.28
931107	0501	1.63	0.083	12.0	50	62	0.66	1.65	4.73	36	0.13
931107	0759	1.56	0.083	12.0	50	67	0.73	1.89	3.99	40	0.25
931107	1101	1.53	0.074	13.6	56	69	0.73	2.02	3.98	38	0.50
931107	1359	1.61	0.074	13.6	54	67	0.65	2.02	4.82	32	0.52
931107	2001	1.57	0.074	13.6	60	66	0.60	2.26	5.78	23	0.29
931107	2301	1.57	0.074	13.6	54	66	0.71	2.37	4.46	32	0.65
931108	0201	1.77	0.074	13.6	52	64	0.65	2.29	5.00	28	0.51
931108	0459	1.75	0.074	13.6	52	62	0.67	2.58	4.99	26	0.78
931108	0801	1.73	0.074	13.6	48	62	0.71	2.29	4.23	34	1.01
931108	1356	1.59	0.083	12.0	52	66	0.75	2.14	3.84	38	0.96
931108	1658	1.47	0.083	12.0	50	69	0.80	2.12	3.39	46	1.13
931109	1406	1.41	0.064	15.6	62	87	0.84	1.14	2.36	86	1.60
931109	1706	1.46	0.064	15.6	60	82	0.83	1.35	2.52	80	1.67
931109	2007	1.47	0.064	15.6	58	90	0.89	0.71	2.18	87	0.89
931109	2306	1.49	0.064	15.6	54	83	0.86	1.26	2.37	90	1.46
931110	0206	1.47	0.074	13.6	58	94	0.94	0.66	1.85	104	1.07
931110	0806	1.42	0.074	13.6	52	91	0.91	0.89	2.02	102	1.10

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931110	1050	1.43	0.074	13.6	50	92	0.92	0.78	1.92	102	0.99
931110	1350	1.36	0.074	13.6	52	82	0.85	1.39	2.47	84	1.56
931110	1708	1.35	0.074	13.6	54	84	0.82	1.16	2.46	78	1.21
931110	2016	1.37	0.074	13.6	54	85	0.80	1.09	2.38	81	1.34
931110	2314	1.32	0.074	13.6	54	84	0.80	1.13	2.44	79	1.26
931111	0215	1.29	0.083	12.0	50	86	0.82	0.99	2.45	75	0.61
931111	0515	1.61	0.083	12.0	54	91	0.72	0.64	2.56	63	0.38
931111	0814	2.12	0.152	6.6	66	87	0.64	0.68	3.20	50	0.35
931111	1115	2.56	0.123	8.2	88	90	0.54	0.23	3.85	39	-0.07
931111	1412	2.69	0.083	12.0	84	85	0.55	0.37	3.84	39	-0.02
931111	1714	2.74	0.083	12.0	100	80	0.59	0.45	3.46	47	-0.19
931111	2015	3.07	0.083	12.0	46	72	0.56	0.66	3.99	43	-0.05
931111	2315	3.47	0.083	12.0	50	63	0.52	0.89	4.61	35	0.42
931112	0215	3.63	0.093	10.7	48	58	0.52	0.88	4.67	37	0.27
931112	0515	3.60	0.083	12.0	48	55	0.50	0.99	5.32	33	0.25
931112	0815	3.24	0.093	10.7	48	53	0.50	1.40	6.32	27	0.33
931112	1115	3.09	0.093	10.7	48	56	0.53	1.25	5.62	34	0.27
931112	1359	3.03	0.093	10.7	48	55	0.55	1.48	5.61	34	0.32
931112	1655	3.16	0.093	10.7	44	50	0.52	1.56	5.91	29	0.32
931112	2002	3.61	0.093	10.7	48	52	0.51	1.18	5.62	31	0.28
931112	2302	4.31	0.074	13.6	48	53	0.46	1.40	7.00	23	0.44
931113	0203	3.85	0.074	13.6	48	53	0.46	1.54	7.90	22	0.49
931113	0500	3.47	0.074	13.6	48	54	0.49	1.58	7.37	25	0.47
931113	0803	3.48	0.074	13.6	42	52	0.54	2.14	6.90	26	0.65
931113	1102	3.53	0.074	13.6	42	49	0.52	2.02	7.13	22	0.54
931113	1402	3.73	0.074	13.6	42	48	0.51	1.84	6.99	25	0.39
931113	1702	3.64	0.074	13.6	44	47	0.50	1.75	7.54	25	0.17
931113	2004	3.52	0.074	13.6	44	50	0.49	1.53	7.12	26	0.39
931113	2302	3.26	0.083	12.0	46	49	0.44	1.69	8.68	19	0.29
931114	0203	3.19	0.083	12.0	44	51	0.51	1.86	7.39	26	0.49
931114	0503	3.18	0.083	12.0	46	51	0.45	1.36	8.19	25	0.21
931114	0801	3.25	0.083	12.0	46	49	0.44	1.21	8.07	23	0.22
931114	1103	3.21	0.083	12.0	44	50	0.43	1.79	9.02	20	0.51
931114	1402	3.63	0.083	12.0	44	50	0.39	1.53	9.62	20	0.23
931114	1703	3.65	0.083	12.0	46	50	0.40	1.50	10.01	20	0.22
931114	2002	3.18	0.083	12.0	50	52	0.42	1.62	10.06	19	0.10
931114	2303	2.68	0.093	10.7	48	52	0.44	1.96	10.08	18	0.28
931115	0200	2.50	0.093	10.7	46	51	0.45	1.97	9.67	20	0.37
931115	0503	2.58	0.093	10.7	46	50	0.44	2.23	10.07	20	0.18
931115	0803	2.26	0.093	10.7	48	51	0.48	2.18	9.67	20	0.09
931115	1103	1.97	0.093	10.7	46	53	0.54	3.27	8.19	18	0.44
931115	1402	1.74	0.093	10.7	48	56	0.53	2.36	7.13	23	0.40
931115	1702	1.75	0.074	13.6	48	58	0.60	2.94	6.43	26	0.59
931115	2002	1.64	0.074	13.6	50	55	0.57	3.70	7.34	17	0.35
931115	2302	1.67	0.074	13.6	46	57	0.59	2.85	6.19	24	0.65
931116	0203	1.66	0.074	13.6	48	59	0.68	3.33	5.24	26	0.74
931116	0503	1.72	0.074	13.6	46	58	0.59	2.33	5.62	27	0.85
931116	0803	1.53	0.074	13.6	44	58	0.59	2.22	5.70	29	0.40
931116	1102	1.32	0.074	13.6	48	61	0.79	2.40	3.78	40	0.89
931116	1403	1.31	0.074	13.6	44	66	0.79	2.00	3.45	47	0.92
931116	1725	1.42	0.083	12.0	50	59	0.62	2.74	5.78	26	0.48
931116	2003	1.54	0.083	12.0	48	54	0.57	2.97	6.91	20	0.32
931116	2302	1.35	0.083	12.0	50	59	0.63	2.87	5.52	22	0.53
931117	0203	1.23	0.083	12.0	48	64	0.78	2.78	3.85	38	1.14
931117	0503	1.15	0.083	12.0	52	66	0.75	2.34	4.04	37	0.68
931117	0800	1.10	0.083	12.0	48	64	0.74	2.53	4.24	37	0.86

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931117	1109	1.15	0.083	12.0	52	62	0.69	3.31	5.09	25	0.71
931117	1402	1.22	0.093	10.7	48	65	0.74	2.53	4.10	36	1.11
931117	1703	1.26	0.093	10.7	50	61	0.64	2.82	5.45	26	0.67
931117	2000	1.29	0.083	12.0	52	61	0.69	2.96	5.00	25	0.52
931117	2302	1.28	0.083	12.0	48	59	0.70	3.10	4.91	27	0.75
931118	0503	1.29	0.083	12.0	50	62	0.65	2.88	5.25	28	0.66
931118	0803	1.31	0.083	12.0	54	61	0.58	2.55	6.33	23	0.26
931118	1103	1.35	0.093	10.7	48	58	0.62	2.84	5.79	24	0.67
931118	1402	1.63	0.083	12.0	54	59	0.51	2.65	8.11	19	0.21
931118	1702	1.51	0.083	12.0	46	58	0.62	2.70	5.87	28	0.69
931118	2303	1.21	0.083	12.0	44	68	0.80	1.46	3.30	50	0.34
931119	0154	1.23	0.083	12.0	48	61	0.68	2.73	5.00	31	0.73
931119	0503	1.47	0.083	12.0	50	56	0.52	3.05	7.96	17	0.32
931119	0803	1.37	0.083	12.0	52	57	0.53	2.85	7.79	19	0.28
931119	1059	1.52	0.083	12.0	48	57	0.57	2.68	6.63	22	0.65
931119	1359	1.54	0.083	12.0	48	54	0.54	3.37	8.18	17	0.46
931119	1700	1.43	0.083	12.0	46	55	0.60	2.60	6.30	24	0.54
931119	2003	1.38	0.093	10.7	48	55	0.57	2.67	6.67	22	0.59
931119	2302	1.28	0.093	10.7	48	55	0.55	2.70	7.34	22	0.42
931120	0203	1.21	0.093	10.7	48	55	0.62	3.76	6.68	19	0.52
931120	0503	1.17	0.103	9.7	46	53	0.60	3.32	6.70	19	0.40
931120	0803	1.24	0.093	10.7	46	53	0.60	2.84	6.27	24	0.43
931120	1100	1.18	0.093	10.7	48	55	0.65	2.94	5.55	28	0.42
931120	1403	1.08	0.093	10.7	48	62	0.68	2.56	4.84	33	0.49
931120	2002	0.97	0.103	9.7	46	65	0.78	2.28	3.56	44	0.77
931121	0803	0.93	0.103	9.7	60	70	0.74	1.76	3.52	42	0.35
931121	1102	0.94	0.103	9.7	66	76	0.81	1.38	2.83	59	0.57
931121	1400	0.87	0.103	9.7	64	86	0.90	1.08	2.19	94	1.18
931121	1702	0.87	0.113	8.9	50	84	0.88	1.20	2.34	94	1.30
931121	2003	0.81	0.093	10.7	48	85	0.93	1.00	1.98	105	1.33
931121	2302	0.72	0.103	9.7	50	105	0.96	0.14	1.61	108	0.25
931122	0203	0.77	0.083	12.0	50	97	0.95	0.48	1.66	106	0.93
931122	0503	0.90	0.093	10.7	48	90	0.91	0.76	1.85	101	1.25
931122	0802	0.81	0.093	10.7	48	105	0.97	0.27	1.58	109	0.51
931122	1110	0.83	0.103	9.7	62	109	0.93	0.16	1.59	102	0.52
931122	1403	0.90	0.103	9.7	52	91	0.91	0.83	1.84	101	1.37
931122	1703	1.01	0.083	12.0	50	88	0.91	0.99	1.99	99	1.39
931122	2003	1.14	0.083	12.0	50	76	0.86	1.59	2.52	87	1.79
931122	2303	1.28	0.083	12.0	50	78	0.86	1.53	2.50	87	1.92
931123	0203	1.33	0.083	12.0	50	71	0.81	2.20	3.10	55	1.81
931123	0500	1.23	0.083	12.0	54	86	0.94	1.15	2.04	102	1.85
931123	0800	1.55	0.083	12.0	56	68	0.77	2.48	3.70	30	0.88
931123	1103	1.65	0.074	13.6	52	64	0.74	2.29	3.92	33	0.74
931123	1359	1.62	0.074	13.6	50	62	0.73	2.74	4.26	26	0.64
931123	1704	1.96	0.074	13.6	50	57	0.62	2.56	5.76	22	0.43
931123	1958	1.88	0.074	13.6	50	56	0.72	2.31	4.34	30	0.33
931123	2258	1.83	0.074	13.6	50	56	0.70	2.72	4.83	27	0.44
931124	0156	1.88	0.123	8.2	50	59	0.67	2.28	4.77	30	0.30
931124	0458	1.89	0.074	13.6	54	61	0.65	2.53	5.28	23	0.25
931124	0758	1.85	0.083	12.0	56	60	0.69	2.33	4.58	28	0.16
931124	1101	1.73	0.083	12.0	46	56	0.74	2.36	4.23	37	0.35
931124	1402	1.63	0.152	6.6	50	56	0.73	2.46	4.37	36	0.11
931124	1704	1.60	0.113	8.9	54	61	0.75	2.07	3.86	35	0.22
931124	2003	1.65	0.162	6.2	56	59	0.79	2.20	3.68	38	0.14
931124	2300	1.55	0.123	8.2	56	65	0.85	2.00	2.96	53	0.47

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931125	0203	1.35	0.103	9.7	58	70	0.90	1.63	2.50	89	1.20
931125	0503	1.22	0.074	13.6	62	81	0.98	1.07	1.94	116	1.34
931125	0803	1.31	0.064	15.6	58	84	0.99	0.94	1.77	118	1.40
931125	1103	1.27	0.064	15.6	-178	91	1.02	0.75	1.62	123	1.37
931125	1403	1.16	0.064	15.6	56	101	1.01	0.38	1.47	117	1.06
931125	2000	1.16	0.074	13.6	60	119	0.98	-0.08	1.56	110	-0.68
931125	2303	1.28	0.074	13.6	60	115	0.96	0.08	1.53	109	-0.01
931126	0203	1.25	0.074	13.6	170	126	0.94	-0.43	1.70	105	-0.87
931126	0503	1.20	0.074	13.6	58	123	0.96	-0.25	1.77	105	-0.56
931126	1100	1.26	0.074	13.6	54	115	0.98	0.01	1.66	110	-0.11
931126	1700	1.12	0.074	13.6	62	121	0.94	-0.03	1.65	107	-0.26
931126	2002	1.09	0.074	13.6	-180	132	0.93	-0.45	1.88	102	-0.61
931127	0203	0.99	0.074	13.6	166	132	0.88	-0.50	2.10	90	-0.77
931127	0501	0.97	0.074	13.6	162	124	0.88	-0.26	2.03	90	-0.49
931127	0803	1.05	0.064	15.6	70	118	0.87	-0.01	2.07	86	-0.01
931127	1102	1.08	0.064	15.6	152	127	0.88	-0.31	2.04	89	-0.58
931127	1700	1.20	0.074	13.6	176	128	0.87	-0.24	2.04	90	-0.31
931127	2002	1.46	0.064	15.6	68	104	0.83	0.52	2.07	84	0.83
931128	0203	1.86	0.064	15.6	64	87	0.76	1.34	2.79	64	1.53
931128	0503	1.82	0.064	15.6	80	94	0.72	0.85	2.82	62	0.90
931128	0803	1.99	0.074	13.6	110	102	0.80	0.41	2.34	72	0.13
931128	1102	2.21	0.064	15.6	66	85	0.66	1.14	3.34	48	0.98
931128	1402	2.07	0.074	13.6	64	99	0.78	0.64	2.38	72	0.46
931128	1701	2.00	0.074	13.6	62	97	0.74	0.81	2.65	63	0.56
931128	2002	1.98	0.074	13.6	88	104	0.73	0.42	2.50	61	0.06
931129	0203	2.25	0.083	12.0	62	94	0.67	0.54	2.85	57	0.08
931129	0501	2.22	0.083	12.0	76	95	0.64	0.65	3.25	47	0.25
931129	0803	2.33	0.093	10.7	80	94	0.66	0.79	3.42	47	0.23
931129	1403	2.21	0.093	10.7	74	95	0.65	0.75	3.33	47	0.08
931129	1705	2.00	0.083	12.0	110	101	0.69	0.63	2.91	50	0.01
931130	0201	1.80	0.093	10.7	60	91	0.69	0.77	2.96	55	0.15
931130	0503	1.90	0.103	9.7	64	85	0.64	0.91	3.65	42	0.28
931130	0803	2.46	0.142	7.0	72	71	0.65	0.48	3.42	47	-0.01
931130	1104	2.80	0.132	7.6	54	67	0.63	0.62	3.62	44	0.24
931130	1704	3.09	0.113	8.9	58	64	0.54	0.70	4.57	36	0.30
931130	2005	3.32	0.103	9.7	56	62	0.53	0.81	4.78	33	0.33
931201	0206	3.09	0.093	10.7	60	63	0.46	1.16	7.32	24	0.23
931201	0503	2.76	0.083	12.0	58	64	0.52	1.42	6.69	28	0.13
931201	0805	2.55	0.083	12.0	58	63	0.50	1.78	7.60	23	0.34
931201	1107	2.34	0.083	12.0	54	61	0.52	1.60	6.75	26	0.47
931201	1406	2.21	0.083	12.0	58	63	0.49	1.51	7.36	24	0.22
931201	1735	2.35	0.083	12.0	58	61	0.48	1.08	7.55	23	0.17
931201	2004	2.06	0.083	12.0	58	62	0.49	1.09	7.35	23	0.14
931202	0204	2.18	0.074	13.6	56	62	0.43	1.93	10.11	18	0.20
931202	0506	2.71	0.074	13.6	56	59	0.38	1.05	11.05	18	0.18
931202	0806	3.12	0.074	13.6	58	59	0.38	0.61	10.28	20	-0.02
931202	1105	3.16	0.074	13.6	54	59	0.39	0.80	10.60	19	0.11
931202	1404	3.24	0.074	13.6	56	60	0.39	0.79	10.90	19	0.08
931202	1709	3.82	0.074	13.6	62	61	0.35	0.44	12.46	16	-0.06
931202	2009	4.06	0.064	15.6	62	62	0.33	0.72	13.68	14	-0.09
931203	0210	3.50	0.064	15.6	58	61	0.38	1.01	12.40	16	0.26
931203	0507	3.26	0.064	15.6	60	61	0.38	0.96	11.96	17	0.13
931203	0810	3.49	0.064	15.6	66	63	0.35	0.53	12.21	18	-0.15
931203	1111	3.25	0.074	13.6	64	62	0.39	0.69	10.67	20	-0.04
931203	1413	3.07	0.074	13.6	56	64	0.42	0.48	8.95	23	0.09

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931203	1707	2.79	0.074	13.6	62	63	0.40	0.61	10.43	21	0.08
931203	2010	2.57	0.074	13.6	58	62	0.37	0.78	11.65	19	0.15
931204	0210	2.21	0.074	13.6	56	63	0.45	0.90	7.67	24	0.48
931204	1226	2.48	0.074	13.6	70	63	0.44	0.23	6.53	26	-0.05
931204	1408	2.51	0.054	18.5	70	65	0.46	0.17	6.28	26	-0.21
931204	1705	2.62	0.054	18.5	70	65	0.42	-0.01	7.38	23	-0.41
931204	2006	2.93	0.054	18.5	70	59	0.42	0.01	6.43	28	-0.19
931205	0205	3.03	0.083	12.0	66	61	0.40	0.48	9.77	21	-0.02
931205	0806	3.04	0.064	15.6	56	62	0.38	0.49	10.29	21	0.18
931205	1105	2.78	0.064	15.6	54	63	0.41	0.69	9.10	24	0.24
931205	1407	2.80	0.064	15.6	54	64	0.41	0.64	8.52	24	0.26
931205	1705	2.84	0.074	13.6	58	64	0.40	0.61	8.53	23	0.19
931205	2006	2.82	0.064	15.6	58	64	0.40	0.68	8.50	23	0.14
931206	0206	2.78	0.064	15.6	54	62	0.44	0.52	6.38	28	0.25
931206	0506	2.90	0.074	13.6	58	64	0.44	0.45	6.88	27	0.09
931206	0802	2.94	0.074	13.6	54	65	0.44	0.61	7.04	29	0.19
931206	1108	2.81	0.074	13.6	54	64	0.42	1.09	8.20	26	0.30
931206	1410	2.43	0.083	12.0	56	66	0.45	1.01	7.42	27	0.24
931206	1703	2.39	0.074	13.6	58	68	0.47	0.93	6.20	28	0.39
931206	2002	2.35	0.074	13.6	56	66	0.48	0.76	6.22	29	0.27
931206	2303	2.15	0.083	12.0	56	67	0.51	0.71	5.91	30	0.09
931207	0202	2.09	0.064	15.6	62	68	0.50	0.81	6.22	28	0.25
931207	0449	2.31	0.064	15.6	66	69	0.46	1.07	7.70	21	0.29
931207	0803	2.85	0.064	15.6	64	68	0.44	1.09	7.99	22	0.31
931207	1400	2.71	0.074	13.6	68	66	0.43	1.12	8.34	24	0.01
931207	1702	2.63	0.064	15.6	68	67	0.47	1.31	7.19	26	0.08
931207	2002	2.62	0.074	13.6	58	71	0.46	0.89	7.15	27	0.08
931208	0203	2.61	0.074	13.6	62	69	0.43	0.96	8.80	22	0.25
931208	0503	2.35	0.074	13.6	58	71	0.48	0.82	6.95	29	0.04
931208	0803	2.55	0.074	13.6	66	71	0.40	0.88	8.93	22	0.26
931208	1100	2.35	0.074	13.6	58	70	0.43	1.15	8.09	27	0.31
931208	1401	2.35	0.074	13.6	56	70	0.51	1.27	6.43	32	0.31
931208	1702	2.19	0.083	12.0	58	69	0.48	1.37	7.17	27	0.34
931208	2000	2.36	0.083	12.0	58	68	0.47	1.24	7.43	27	0.42
931209	0201	2.76	0.083	12.0	64	68	0.39	0.88	9.53	21	0.15
931209	0500	2.45	0.074	13.6	58	69	0.46	0.99	6.79	29	0.37
931209	0800	2.67	0.074	13.6	56	69	0.46	0.93	7.14	28	0.32
931209	1100	3.36	0.074	13.6	56	65	0.41	0.85	7.86	25	0.51
931209	1400	4.09	0.074	13.6	62	65	0.38	0.84	8.49	21	0.23
931209	1657	3.88	0.074	13.6	62	65	0.40	0.79	7.82	23	0.19
931209	2000	3.63	0.074	13.6	56	66	0.41	0.73	7.81	24	0.19
931210	0800	2.99	0.074	13.6	54	68	0.47	0.70	6.60	29	0.16
931210	1100	2.84	0.074	13.6	56	69	0.47	0.89	6.97	27	0.25
931210	1400	2.92	0.064	15.6	66	69	0.45	0.86	7.31	22	0.29
931210	1709	2.85	0.064	15.6	62	68	0.47	1.10	7.05	25	0.51
931210	2001	3.25	0.064	15.6	62	65	0.43	1.08	7.63	20	0.20
931210	2300	3.80	0.064	15.6	68	69	0.39	1.05	10.05	15	0.10
931211	0200	3.70	0.064	15.6	70	71	0.39	1.04	9.96	17	0.12
931211	0458	3.03	0.064	15.6	70	74	0.46	0.96	7.91	21	0.29
931211	0757	2.93	0.064	15.6	68	75	0.44	1.37	8.87	20	0.26
931211	1400	3.88	0.074	13.6	76	81	0.54	1.10	4.49	33	0.30
931211	1700	4.03	0.074	13.6	54	79	0.58	0.98	3.99	42	0.21
931211	2000	3.96	0.074	13.6	56	78	0.55	0.93	4.17	39	0.41
931212	0200	3.70	0.074	13.6	78	79	0.53	0.34	4.08	37	0.09

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931212	1400	3.76	0.074	13.6	80	75	0.49	0.26	4.82	33	0.00
931212	1700	3.54	0.083	12.0	60	72	0.51	0.42	4.41	36	0.29
931212	2000	3.31	0.083	12.0	56	71	0.51	0.37	4.50	36	0.23
931213	0200	3.12	0.064	15.6	74	75	0.45	0.06	5.90	25	0.11
931213	0459	2.98	0.074	13.6	72	70	0.50	0.54	5.09	31	0.09
931213	0800	3.06	0.074	13.6	72	71	0.48	0.56	6.07	27	-0.04
931213	1100	3.13	0.074	13.6	58	72	0.51	0.60	5.33	32	0.24
931213	1401	2.83	0.074	13.6	76	75	0.53	0.66	5.27	32	0.04
931213	1700	2.43	0.074	13.6	68	75	0.51	0.79	5.48	29	0.54
931213	2000	2.25	0.074	13.6	74	77	0.58	0.63	4.51	38	0.17
931214	0201	2.52	0.074	13.6	56	71	0.51	1.11	5.45	32	0.64
931214	0501	3.12	0.074	13.6	64	70	0.44	1.34	7.84	20	0.35
931214	0800	3.57	0.074	13.6	74	72	0.45	1.17	8.09	22	-0.04
931215	1702	4.38	0.064	15.6	74	69	0.44	0.14	6.04	26	-0.36
931215	2005	4.18	0.083	12.0	70	66	0.45	0.24	5.83	25	-0.15
931216	0201	3.57	0.064	15.6	64	66	0.48	0.50	5.42	28	0.01
931216	0504	3.47	0.064	15.6	70	67	0.47	0.49	5.63	28	-0.12
931216	0807	3.34	0.074	13.6	54	63	0.47	0.68	5.78	29	0.13
931216	1110	3.34	0.074	13.6	56	63	0.48	0.64	6.08	27	0.21
931216	1404	3.10	0.083	12.0	54	65	0.50	0.84	5.68	30	0.40
931217	0204	2.22	0.083	12.0	58	68	0.57	0.81	4.38	37	0.40
931217	0804	2.09	0.083	12.0	58	70	0.60	1.10	4.07	38	0.57
931217	1100	2.13	0.093	10.7	66	73	0.58	0.91	4.39	34	0.49
931217	1404	2.10	0.054	18.5	68	74	0.58	1.15	4.41	33	0.51
931217	1705	1.96	0.054	18.5	70	76	0.59	0.86	4.33	34	0.26
931217	2004	2.07	0.054	18.5	68	76	0.61	1.29	4.37	32	0.47
931218	0205	2.43	0.064	15.6	62	67	0.54	1.68	6.01	22	0.21
931218	0504	2.37	0.064	15.6	62	68	0.54	1.45	5.75	26	0.23
931218	0804	2.25	0.064	15.6	60	70	0.60	1.98	5.28	25	0.56
931218	1100	2.47	0.064	15.6	64	69	0.56	1.99	6.22	22	0.20
931218	1402	2.47	0.064	15.6	52	72	0.61	1.55	5.11	32	0.05
931218	1702	2.12	0.064	15.6	66	74	0.62	1.69	4.49	34	0.47
931218	2004	2.35	0.064	15.6	66	73	0.63	1.72	4.40	31	0.54
931219	0204	2.37	0.064	15.6	64	78	0.81	2.03	3.64	48	0.83
931219	0504	2.20	0.064	15.6	66	78	0.71	1.76	4.25	39	0.73
931219	0804	2.12	0.074	13.6	58	76	0.68	1.91	4.04	35	1.00
931219	1104	1.88	0.074	13.6	56	84	0.76	1.09	2.84	62	0.85
931219	1402	1.95	0.074	13.6	60	81	0.72	1.25	3.03	51	0.84
931219	1704	2.31	0.074	13.6	58	76	0.69	1.79	3.65	38	1.05
931219	2004	2.24	0.064	15.6	64	77	0.73	1.58	3.28	43	0.87
931220	0154	2.32	0.064	15.6	60	80	0.76	1.64	2.91	57	1.74
931220	0504	2.28	0.064	15.6	60	79	0.75	1.63	3.06	53	1.59
931220	0804	2.23	0.074	13.6	54	79	0.83	1.28	2.53	82	1.50
931220	1115	2.11	0.074	13.6	54	74	0.77	1.66	3.04	51	1.31
931220	1402	2.19	0.074	13.6	58	76	0.75	1.64	3.10	49	1.60
931220	1708	2.00	0.074	13.6	54	74	0.73	1.76	3.41	39	0.90
931220	2004	2.08	0.074	13.6	54	73	0.75	1.61	3.14	45	1.10
931221	0204	1.77	0.074	13.6	54	80	0.78	1.24	2.57	75	1.71
931221	0504	1.78	0.074	13.6	56	78	0.77	1.48	2.88	61	1.23
931221	0804	1.74	0.074	13.6	54	73	0.76	1.76	3.23	47	1.21
931221	1104	1.90	0.074	13.6	54	73	0.75	1.66	3.11	47	1.43
931221	1404	1.75	0.083	12.0	50	72	0.73	1.63	3.19	50	1.29
931221	1704	1.71	0.074	13.6	58	74	0.68	1.53	3.58	40	0.78

Table A1 (Continued)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931222	0204	1.76	0.064	15.6	54	73	0.73	1.33	3.37	41	0.48
931222	0504	1.80	0.064	15.6	54	72	0.68	1.52	3.61	40	0.94
931222	0804	1.92	0.064	15.6	52	70	0.68	1.67	3.84	35	0.54
931222	1104	1.96	0.064	15.6	52	68	0.67	1.52	3.69	38	0.61
931222	1400	2.01	0.064	15.6	56	69	0.64	1.62	4.21	32	0.69
931222	1700	1.96	0.074	13.6	54	69	0.66	1.90	4.26	35	0.88
931223	0200	1.71	0.074	13.6	54	67	0.67	1.59	3.88	35	0.56
931223	0500	1.63	0.074	13.6	52	68	0.68	1.77	3.94	36	0.87
931223	0800	1.58	0.074	13.6	50	67	0.66	1.61	4.26	34	0.67
931223	1100	1.61	0.074	13.6	54	67	0.66	1.65	4.18	35	0.51
931223	1400	1.67	0.074	13.6	54	68	0.63	1.86	4.52	31	0.57
931223	1958	1.55	0.074	13.6	56	67	0.61	1.50	4.50	33	0.44
931224	1100	1.23	0.083	12.0	50	69	0.68	1.73	3.97	40	0.63
931225	0800	1.22	0.074	13.6	76	77	0.62	1.36	4.80	34	0.09
931225	1056	1.31	0.064	15.6	76	76	0.57	1.58	5.67	27	0.06
931225	1400	1.28	0.064	15.6	72	77	0.56	1.89	6.08	23	0.27
931225	2000	1.51	0.064	15.6	72	77	0.51	1.33	6.06	24	0.31
931226	0200	1.71	0.064	15.6	74	77	0.48	1.18	6.54	24	0.16
931226	0500	1.72	0.064	15.6	74	77	0.47	1.08	6.54	26	0.19
931226	0800	1.72	0.074	13.6	74	79	0.52	0.94	5.71	29	0.32
931226	1100	1.91	0.074	13.6	76	78	0.49	0.78	5.72	31	0.04
931226	1400	1.74	0.074	13.6	62	78	0.53	0.98	5.22	35	0.34
931226	1700	1.59	0.074	13.6	54	80	0.61	0.95	4.27	42	-0.04
931226	2000	1.70	0.074	13.6	60	80	0.54	0.94	4.96	36	0.15
931227	0200	1.88	0.074	13.6	62	76	0.53	1.07	5.25	33	0.49
931227	0500	1.71	0.074	13.6	60	80	0.56	0.91	4.75	37	0.06
931227	0800	1.75	0.074	13.6	60	80	0.58	0.94	4.66	38	0.18
931227	1100	1.58	0.083	12.0	56	78	0.61	1.03	4.15	43	0.32
931227	1403	1.61	0.083	12.0	60	80	0.58	1.06	4.14	42	0.64
931227	1710	1.53	0.083	12.0	80	84	0.59	0.90	3.99	41	0.16
931227	1958	1.44	0.083	12.0	60	83	0.60	0.95	4.04	43	0.29
931228	0156	1.42	0.083	12.0	58	83	0.63	0.90	3.49	47	0.36
931228	0452	1.45	0.083	12.0	56	81	0.62	0.96	3.68	46	0.29
931228	0800	1.38	0.093	10.7	56	80	0.63	0.92	3.77	45	0.28
931228	1400	1.50	0.093	10.7	76	80	0.59	1.09	4.48	35	0.15
931228	1707	1.77	0.064	15.6	70	77	0.54	1.25	5.10	26	0.58
931228	2000	1.75	0.054	18.5	74	77	0.53	1.28	5.61	22	0.10
931229	0200	2.21	0.054	18.5	72	73	0.49	1.18	6.63	24	-0.01
931229	0500	2.15	0.054	18.5	72	73	0.48	1.31	6.90	24	-0.06
931229	0800	2.07	0.064	15.6	72	71	0.49	1.51	7.61	21	-0.02
931229	1100	2.12	0.064	15.6	66	73	0.51	1.62	6.85	22	0.38
931229	1359	2.15	0.064	15.6	64	73	0.54	1.48	5.85	30	0.50
931229	1659	2.27	0.064	15.6	68	72	0.48	1.50	7.17	23	0.17
931229	1957	2.24	0.064	15.6	68	73	0.52	1.51	6.01	24	0.39
931230	0159	2.23	0.064	15.6	66	73	0.53	1.56	6.22	27	0.44
931230	0459	2.28	0.064	15.6	70	72	0.50	1.53	7.05	25	0.14
931230	0759	2.18	0.064	15.6	64	74	0.53	1.31	5.75	30	0.65
931230	1117	2.15	0.064	15.6	72	80	0.52	1.20	6.04	27	0.55
931230	1359	2.13	0.064	15.6	72	77	0.50	1.40	6.94	23	0.28
931230	1659	2.14	0.064	15.6	70	77	0.52	1.41	5.97	25	0.37
931230	1959	1.92	0.064	15.6	72	80	0.54	1.35	5.47	29	0.65
931231	0159	2.12	0.064	15.6	68	77	0.51	1.04	5.22	31	0.59
931231	0459	2.04	0.074	13.6	76	79	0.49	0.82	5.64	30	0.16
931231	0756	1.99	0.074	13.6	56	82	0.56	0.76	4.32	43	0.21

Table A1 (Concluded)

Date	Time GMT	H_{mo} m	f_p Hz	T_p sec	θ_p deg	θ_0 deg	σ	γ	δ	$\Delta\theta$ deg	A
931231	1059	2.05	0.074	13.6	66	82	0.52	0.67	5.01	36	0.23
931231	1359	2.03	0.074	13.6	58	82	0.57	0.56	4.08	45	0.15
931231	1956	2.11	0.074	13.6	62	77	0.55	0.84	4.66	37	0.43

Appendix B
Time Series Graphs of Bulk Parameters

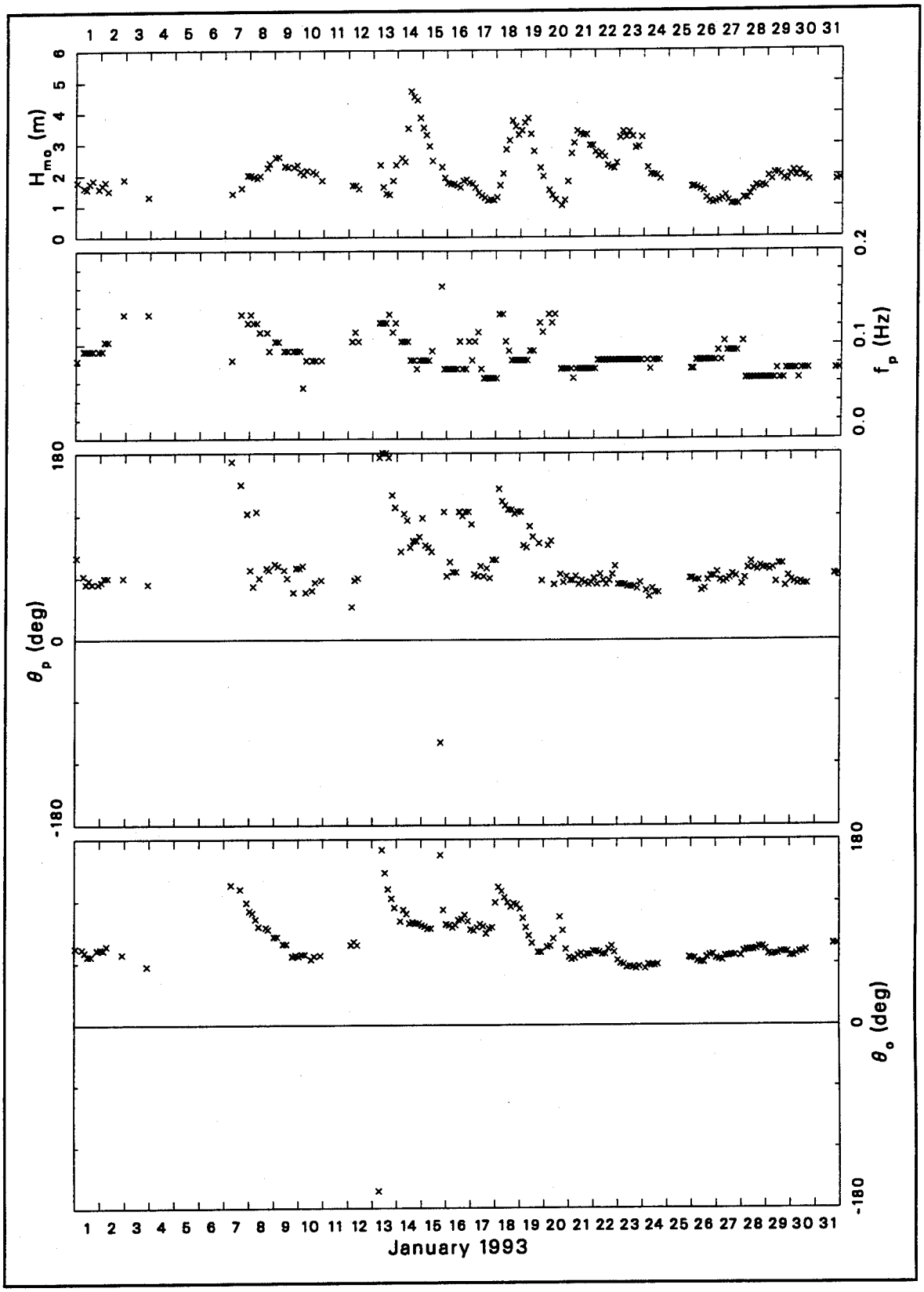

Figure B1. Bulk data for January 1993 (Continued)

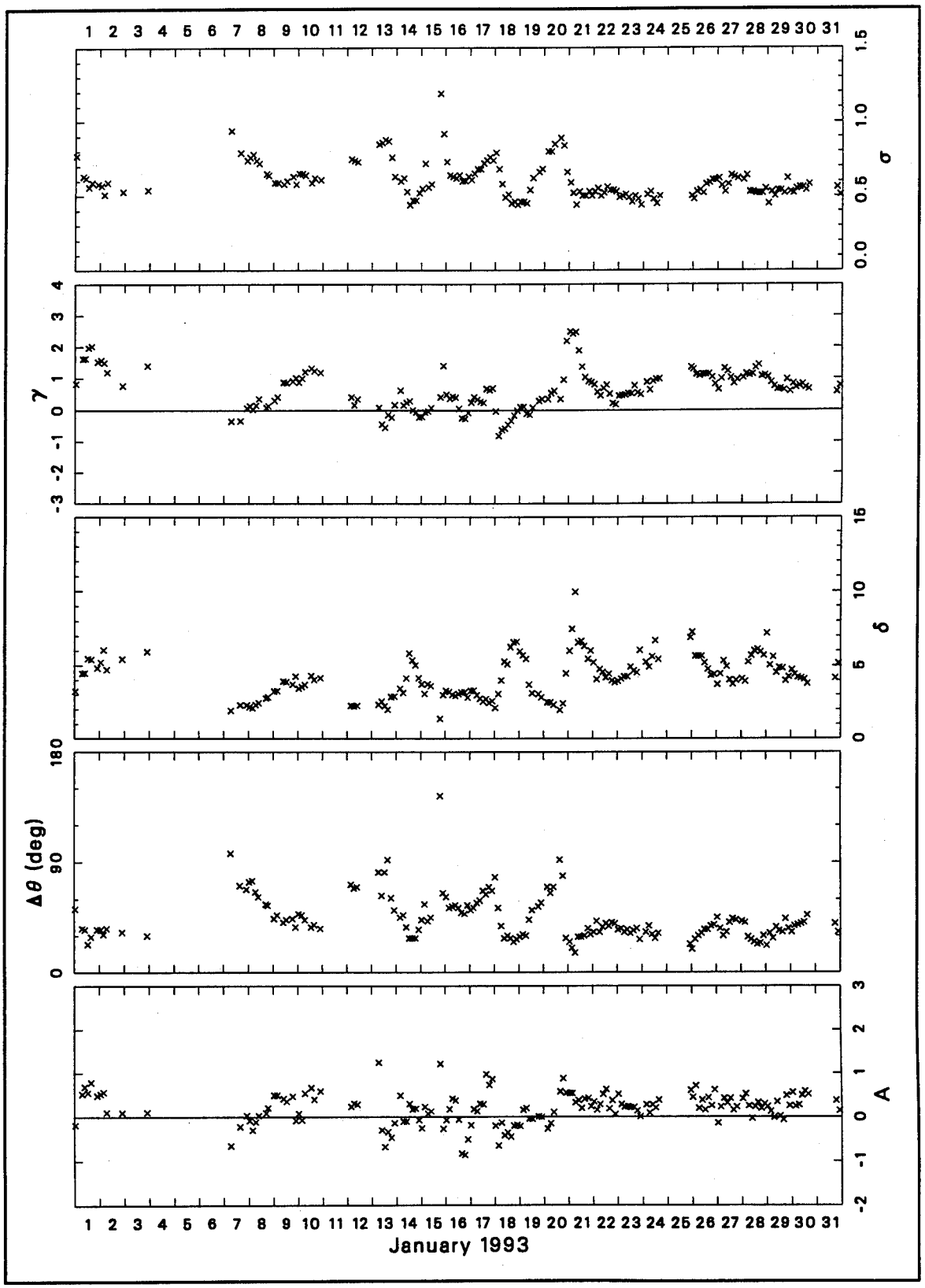

Figure B1. (Concluded)

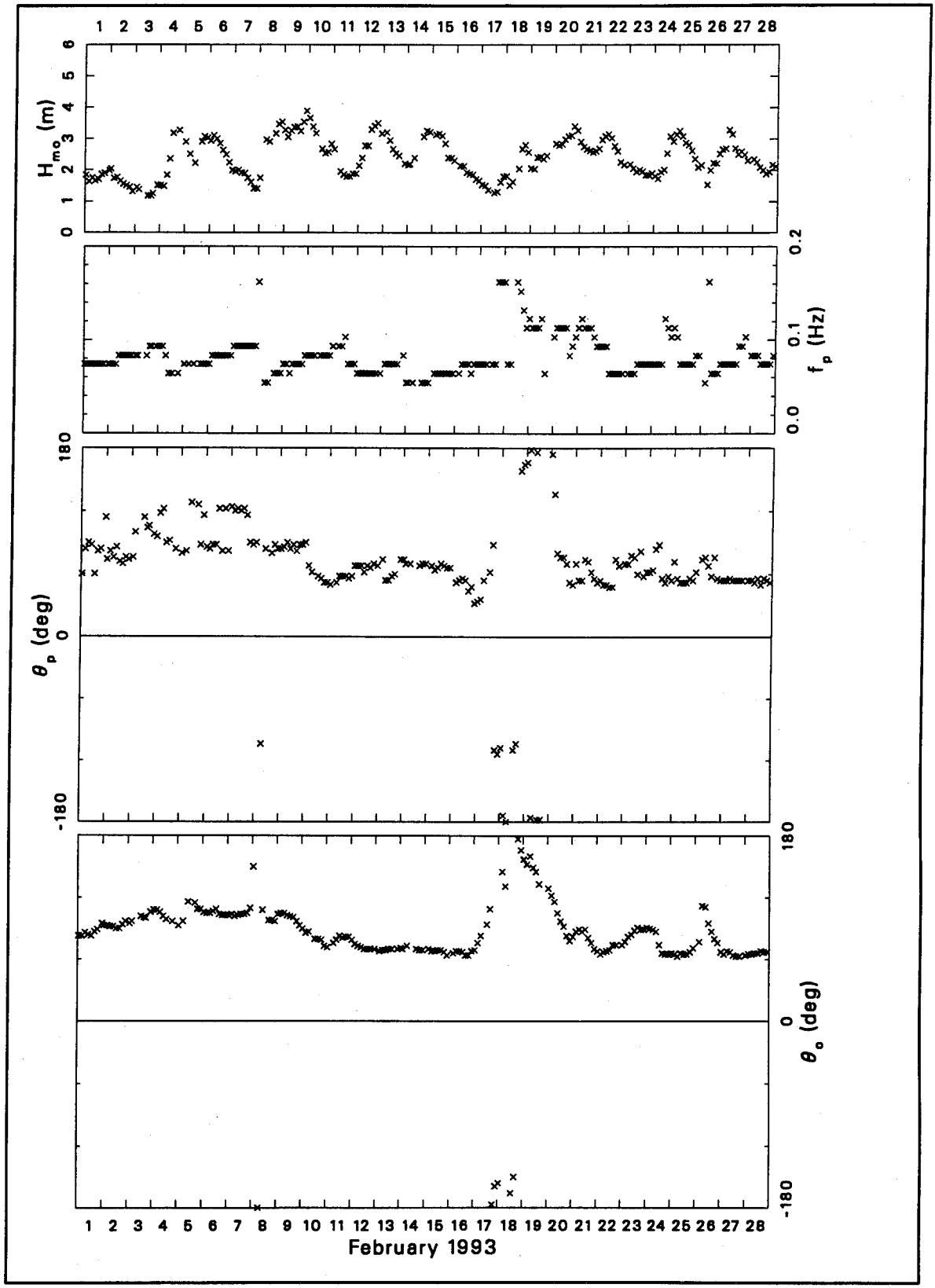

Figure B2. Bulk data for February 1993 (Continued)

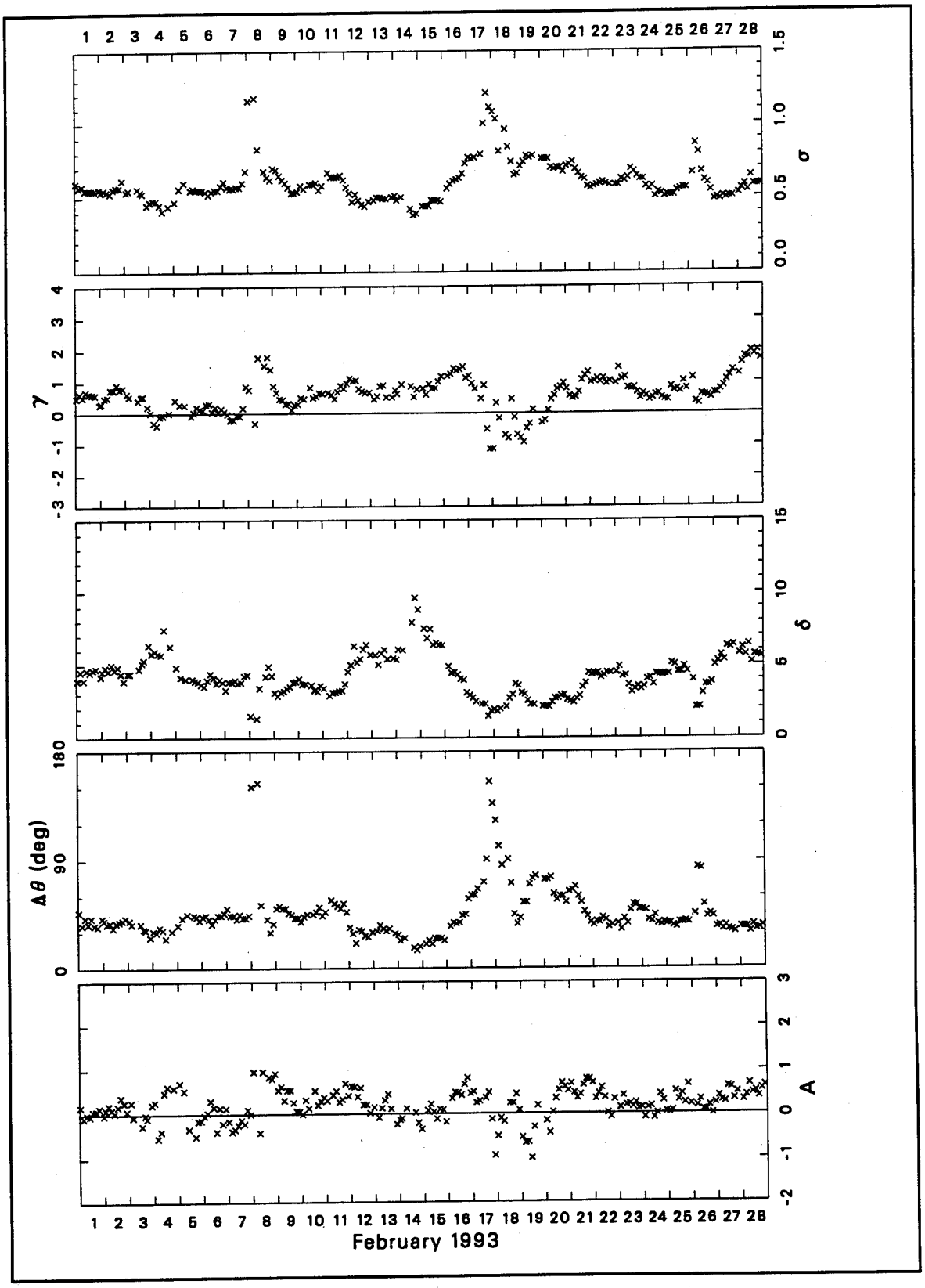

Figure B2. (Concluded)

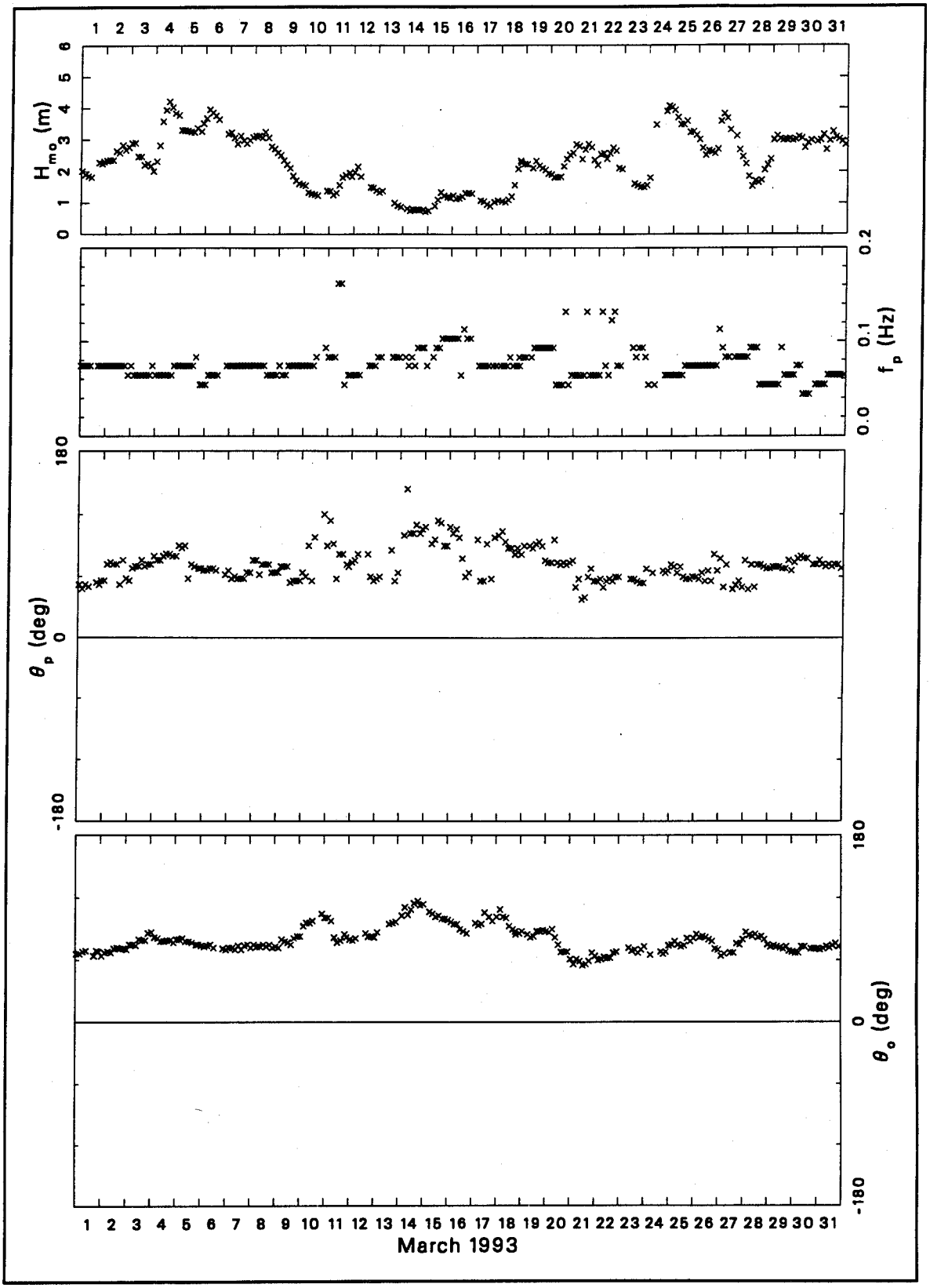

Figure B3. Bulk data for March 1993 (Continued)

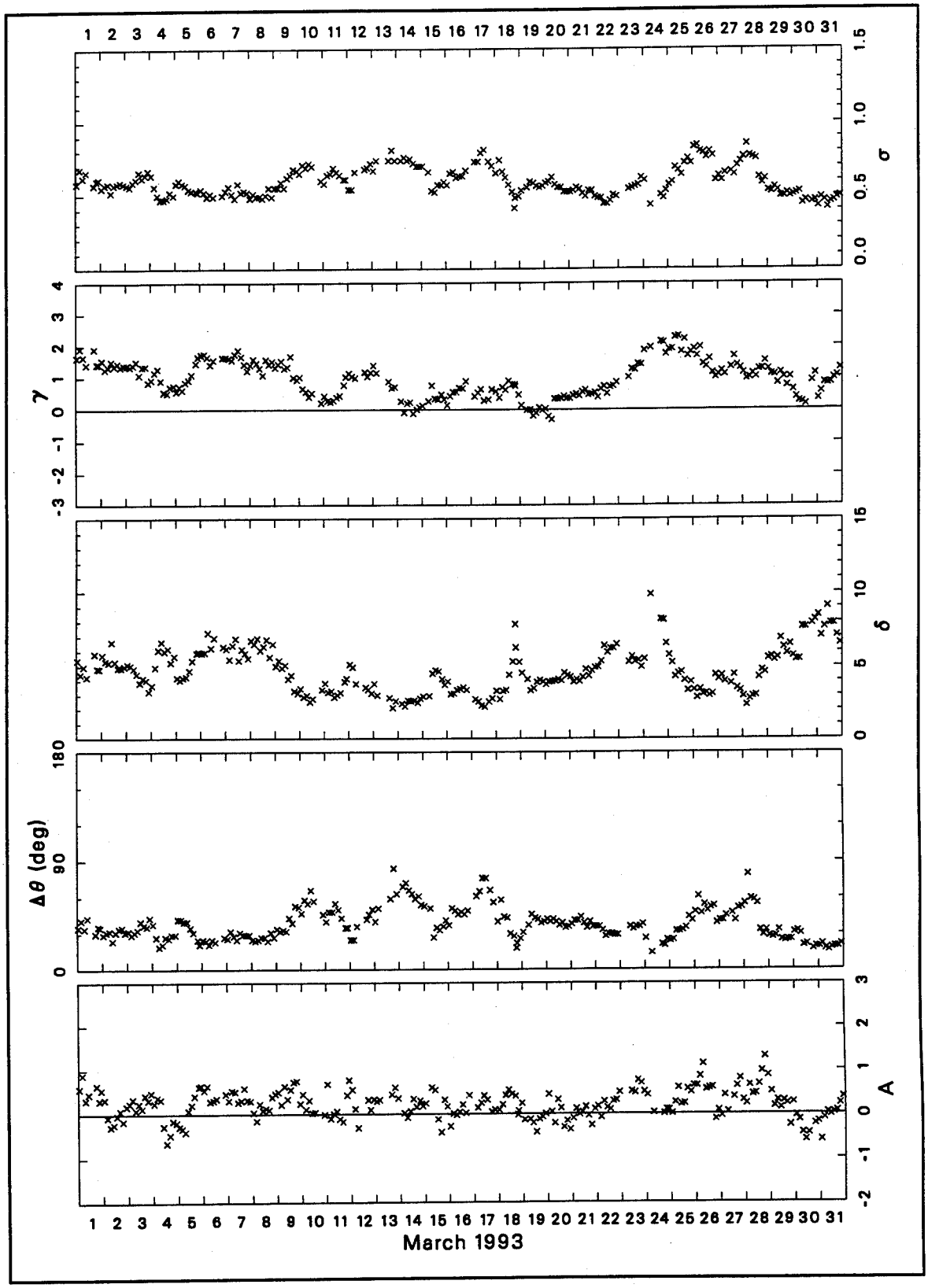

Figure B3. (Concluded)

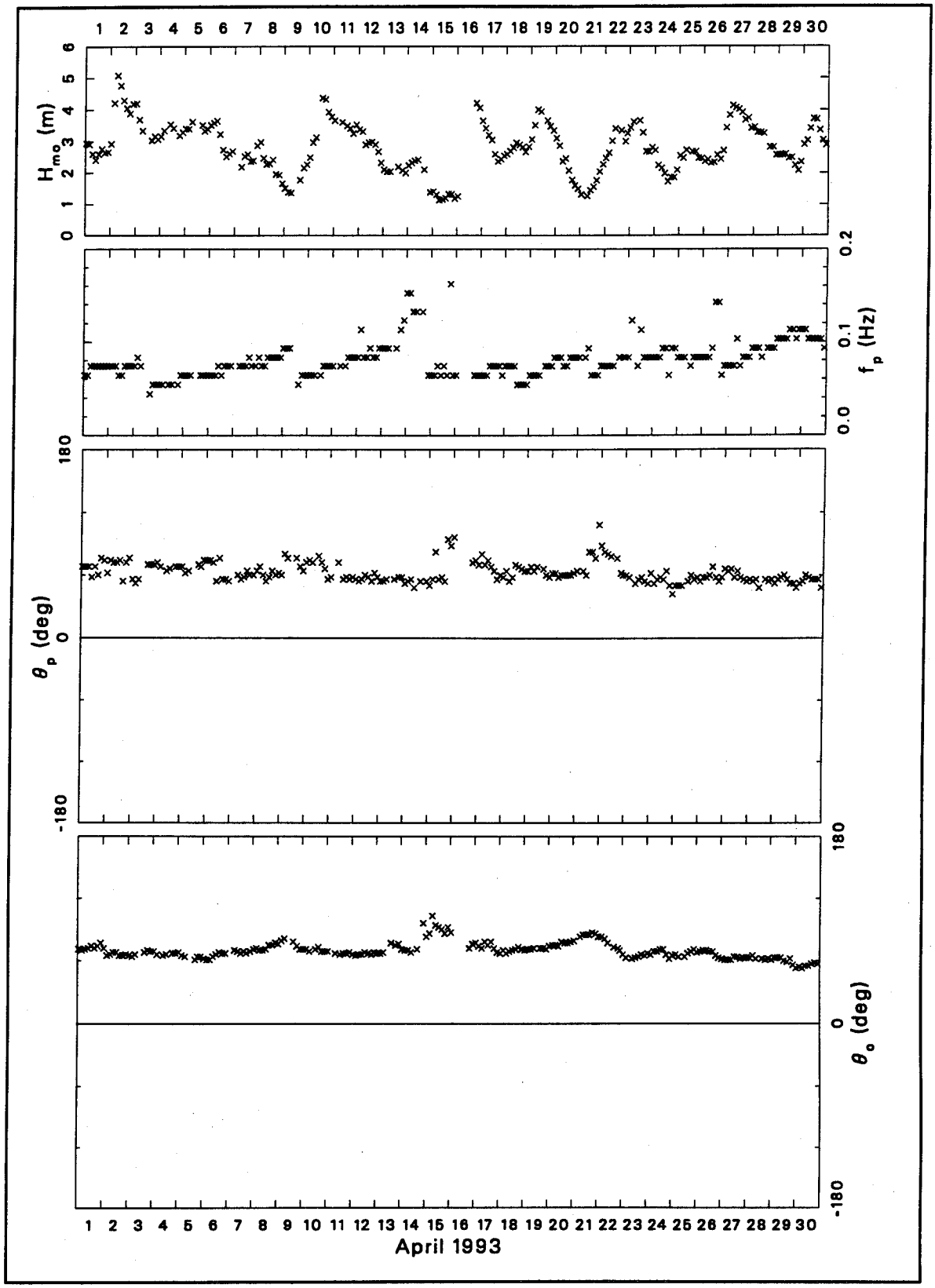

Figure B4. Bulk data for April 1993 (Continued)

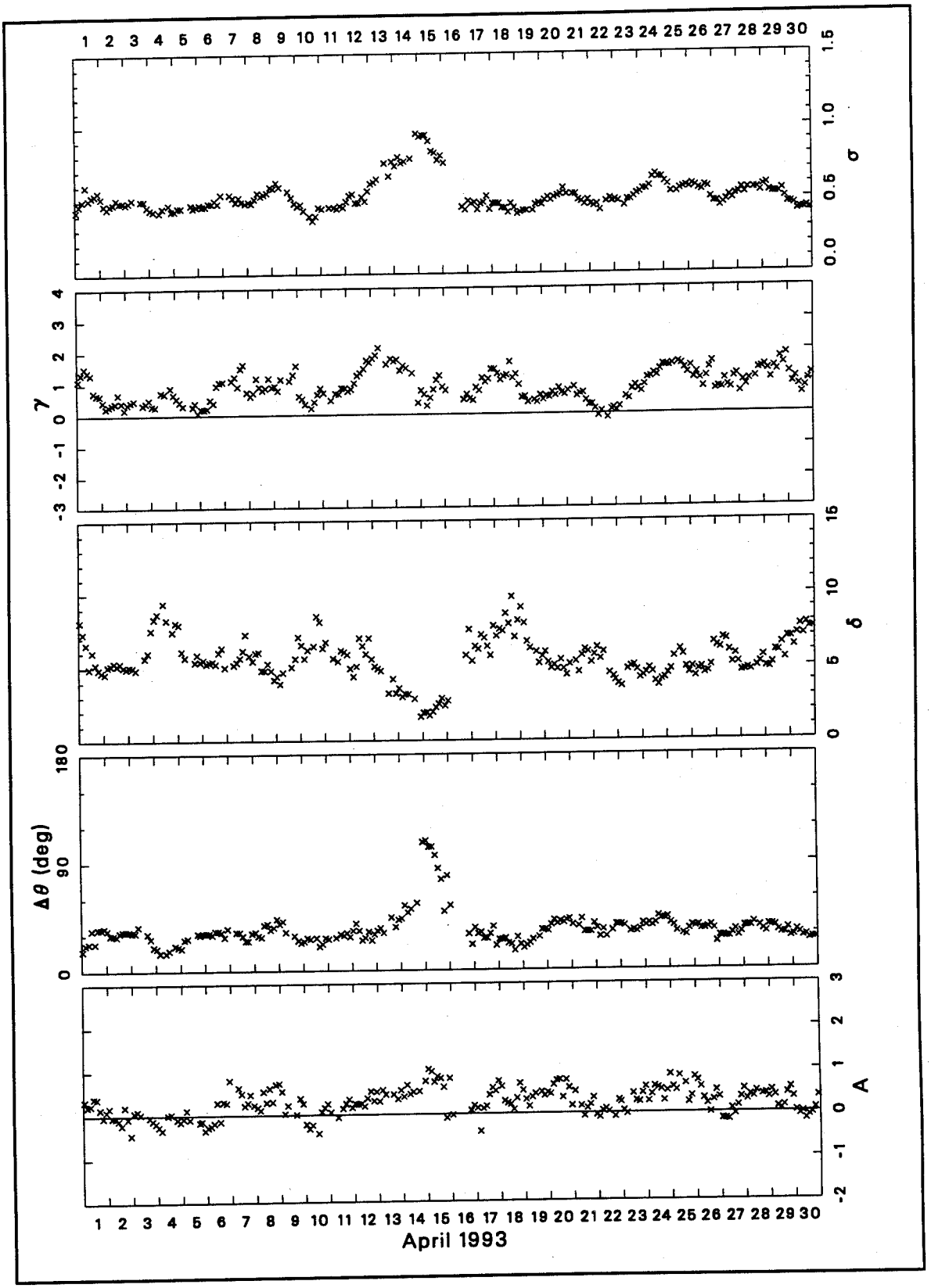

Figure B4. (Concluded)

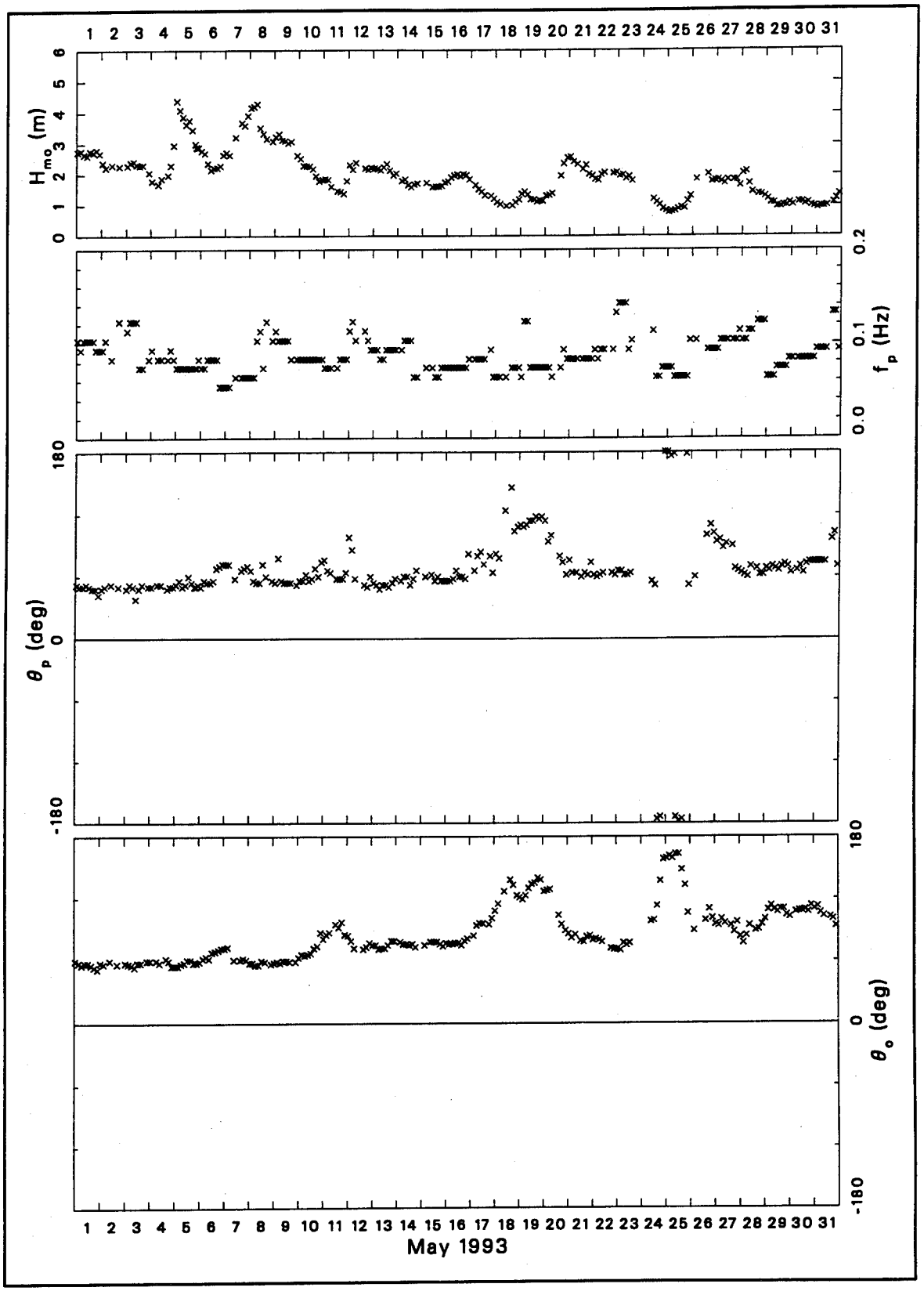

Figure B5. Bulk data for May 1993 (Continued)

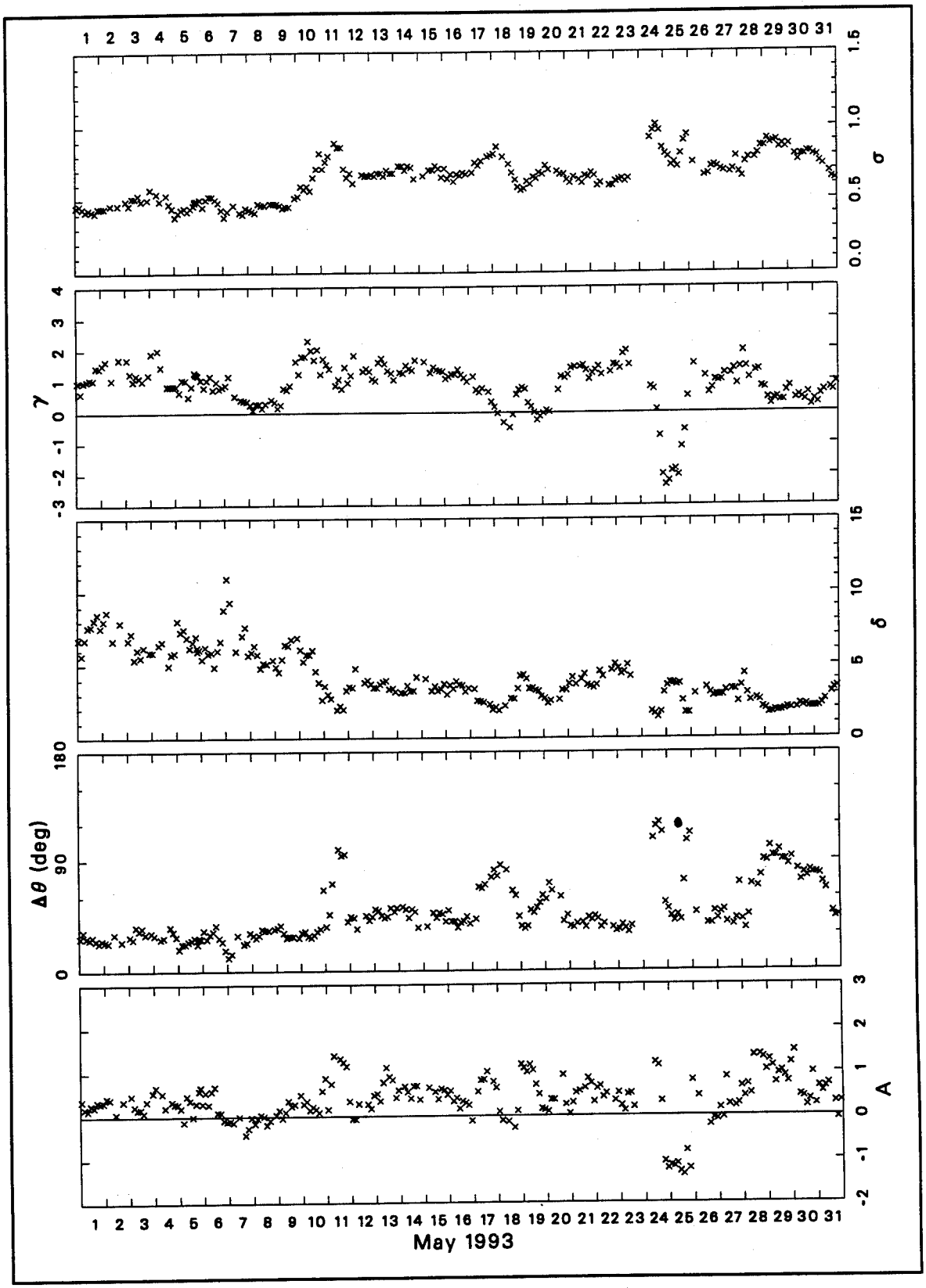

Figure B5. (Concluded)

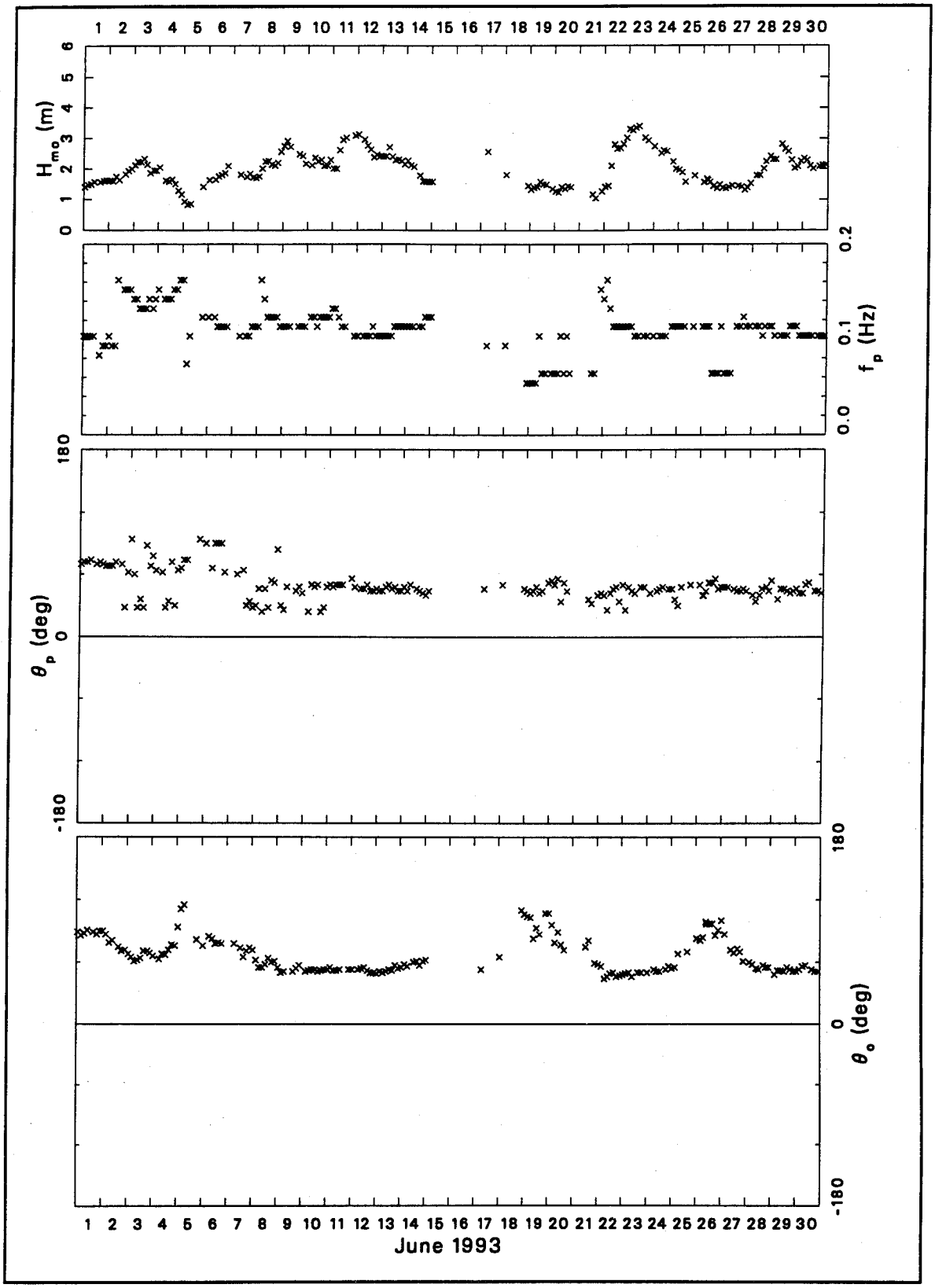

Figure B6. Bulk data for June 1993 (Continued)

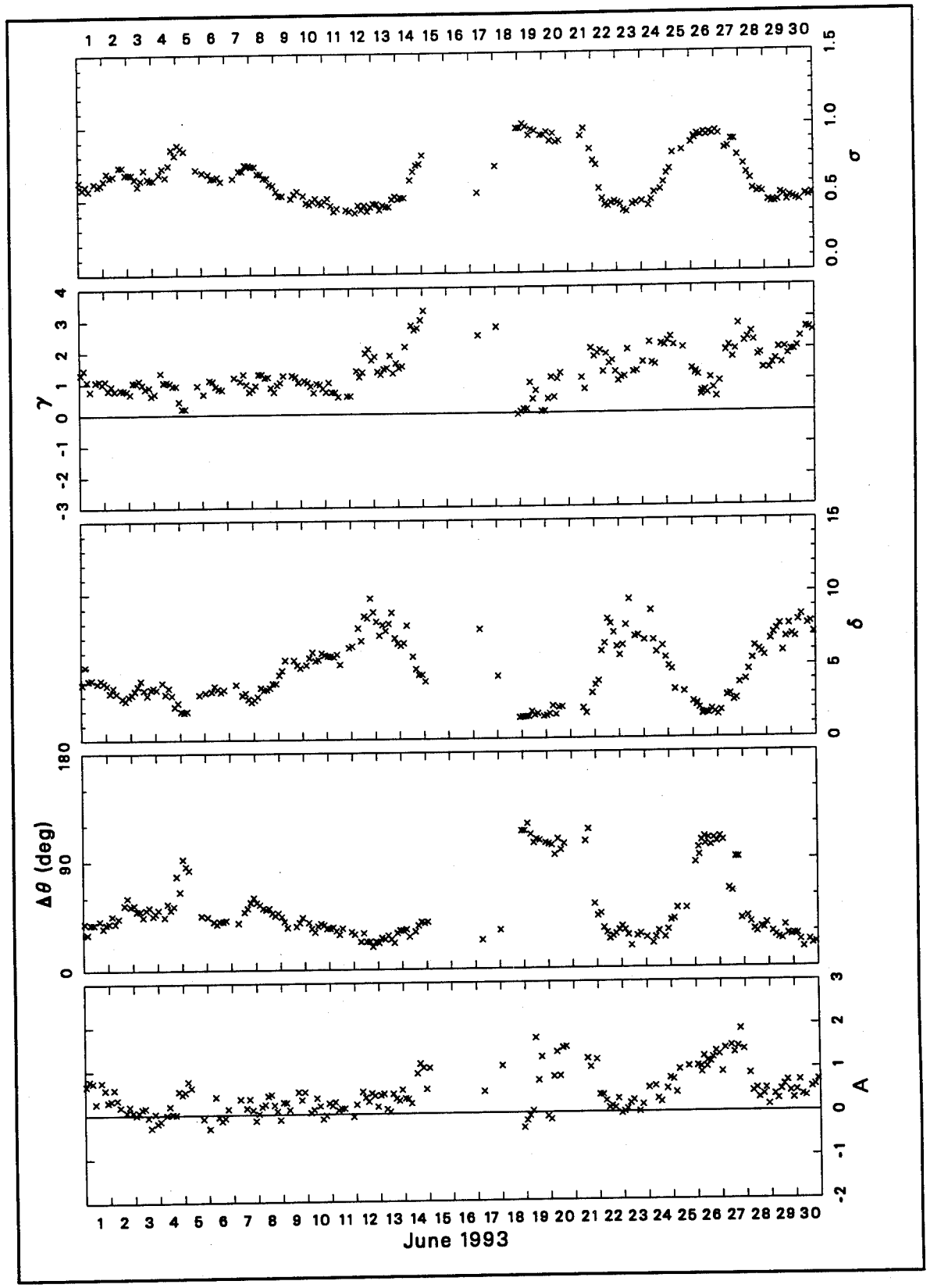

Figure B6. (Concluded)

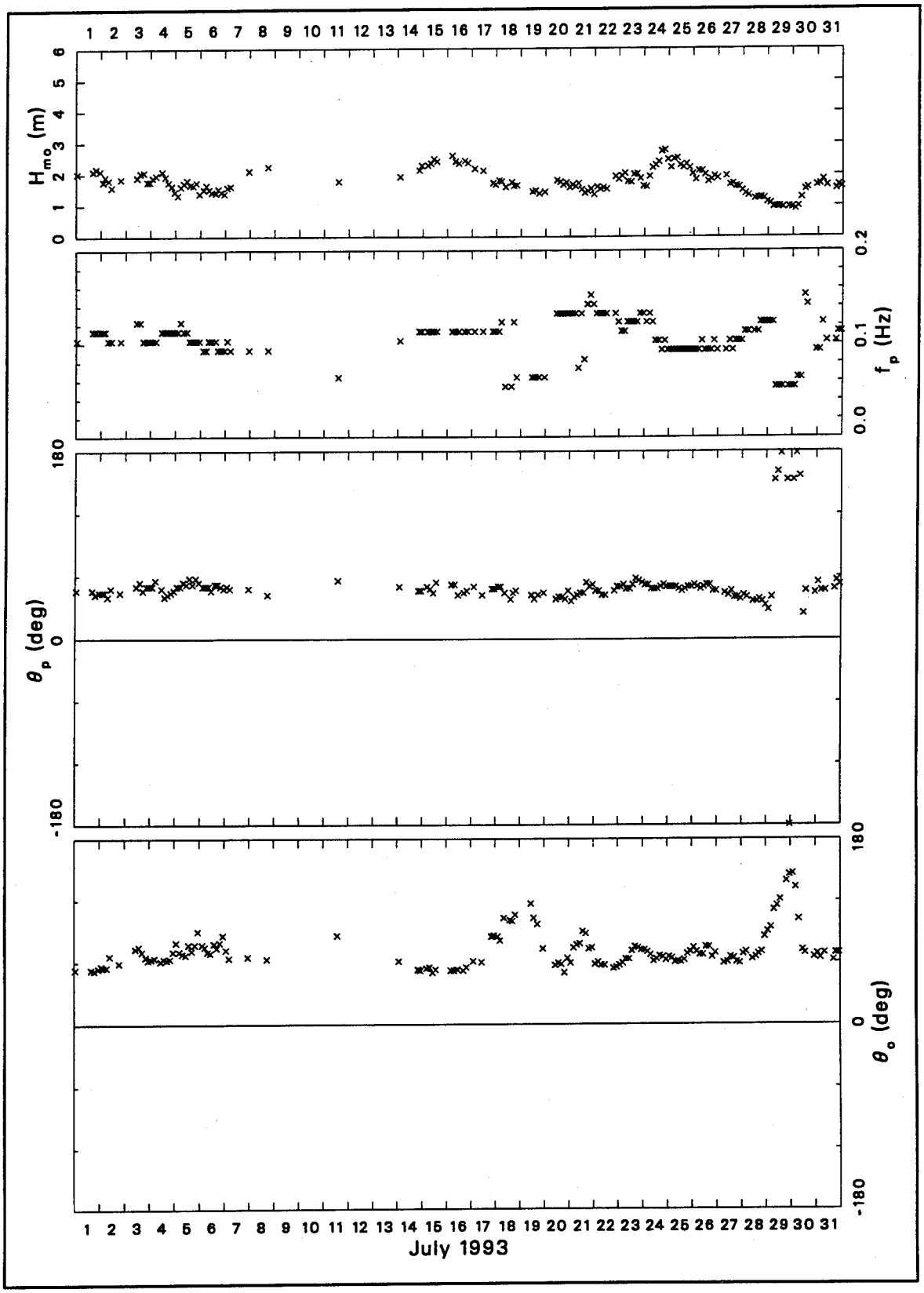

Figure B7. Bulk data for July 1993 (Continued)

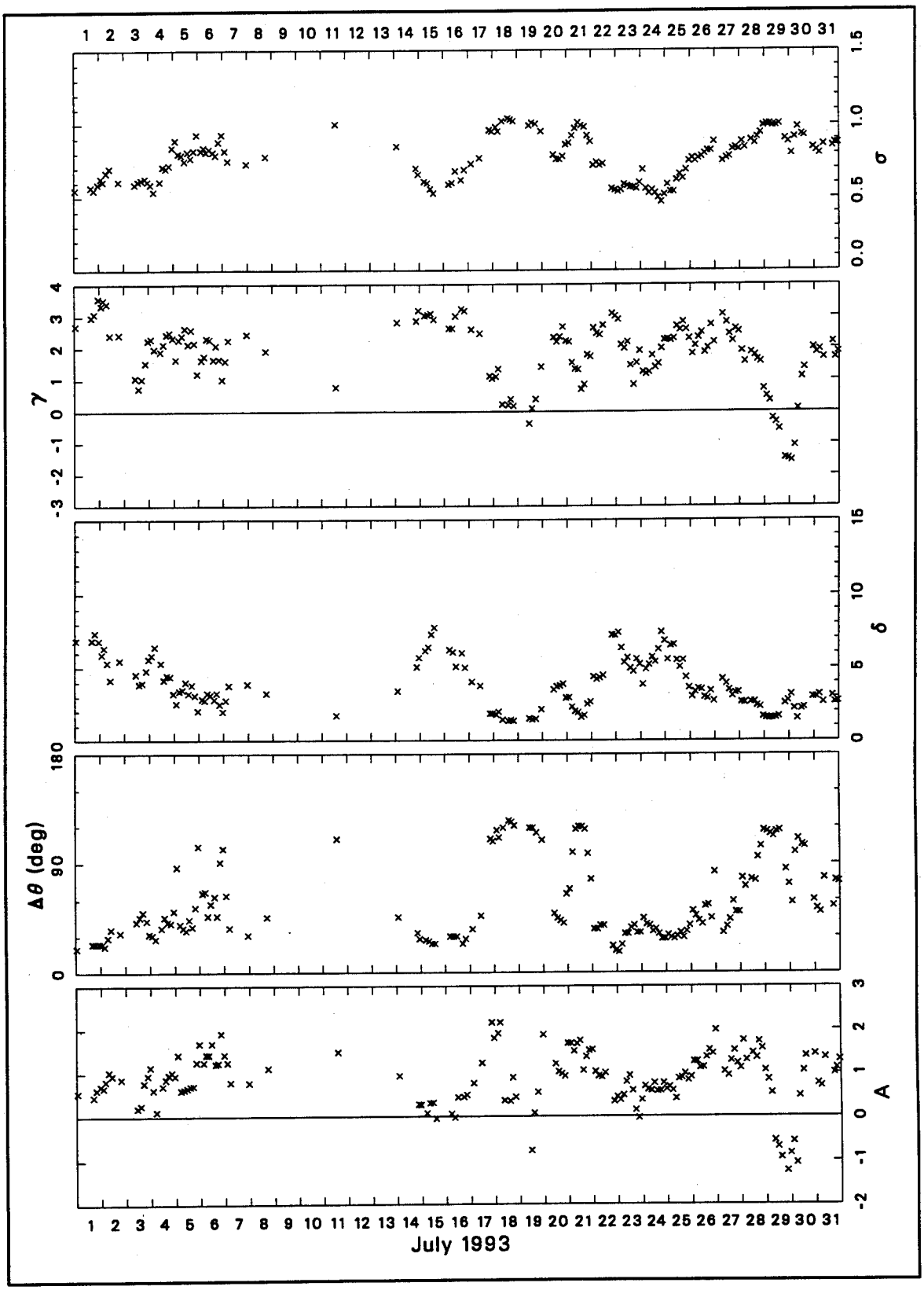

Figure B7. (Concluded)

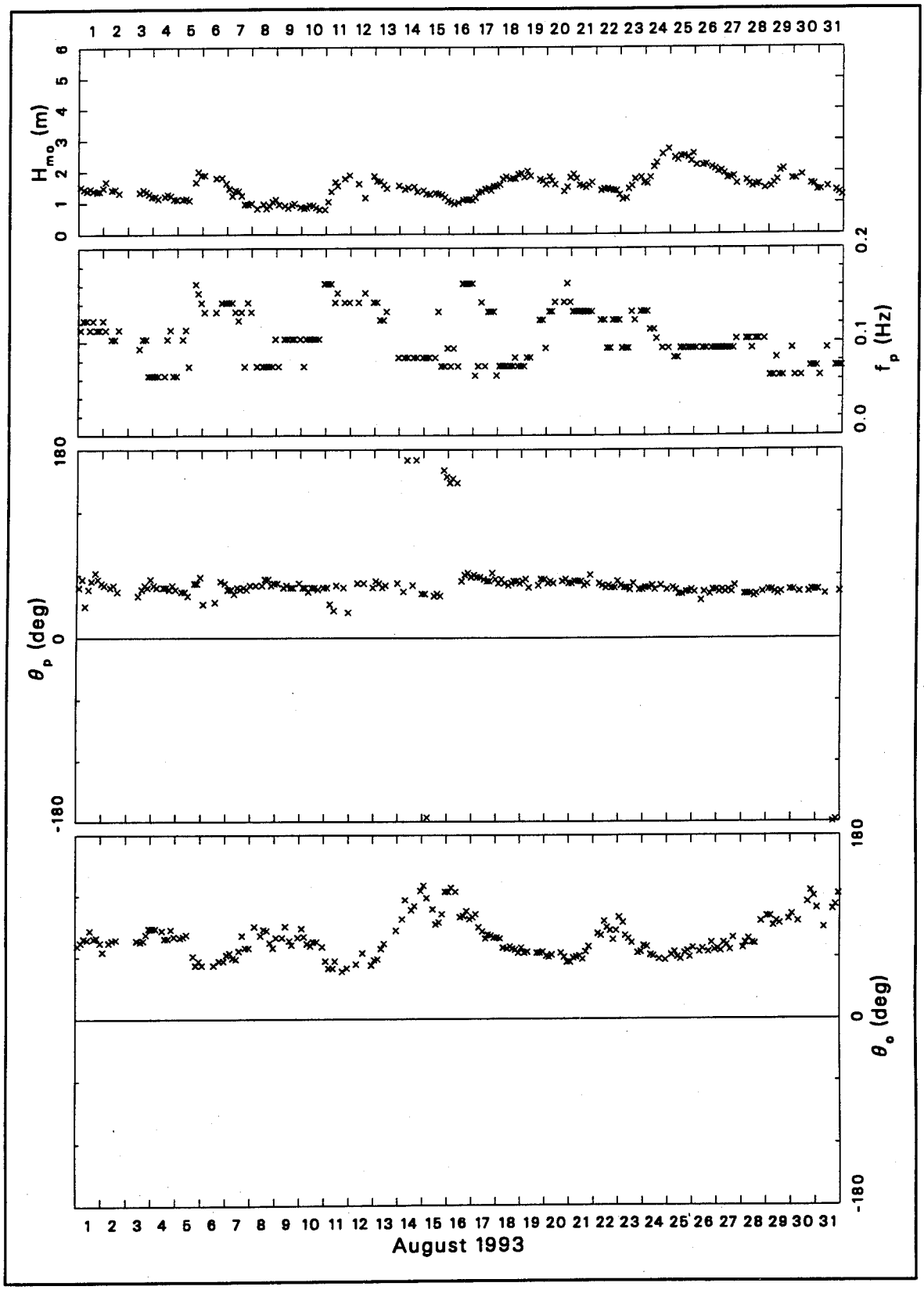

Figure B8. Bulk data for August 1993 (Continued)

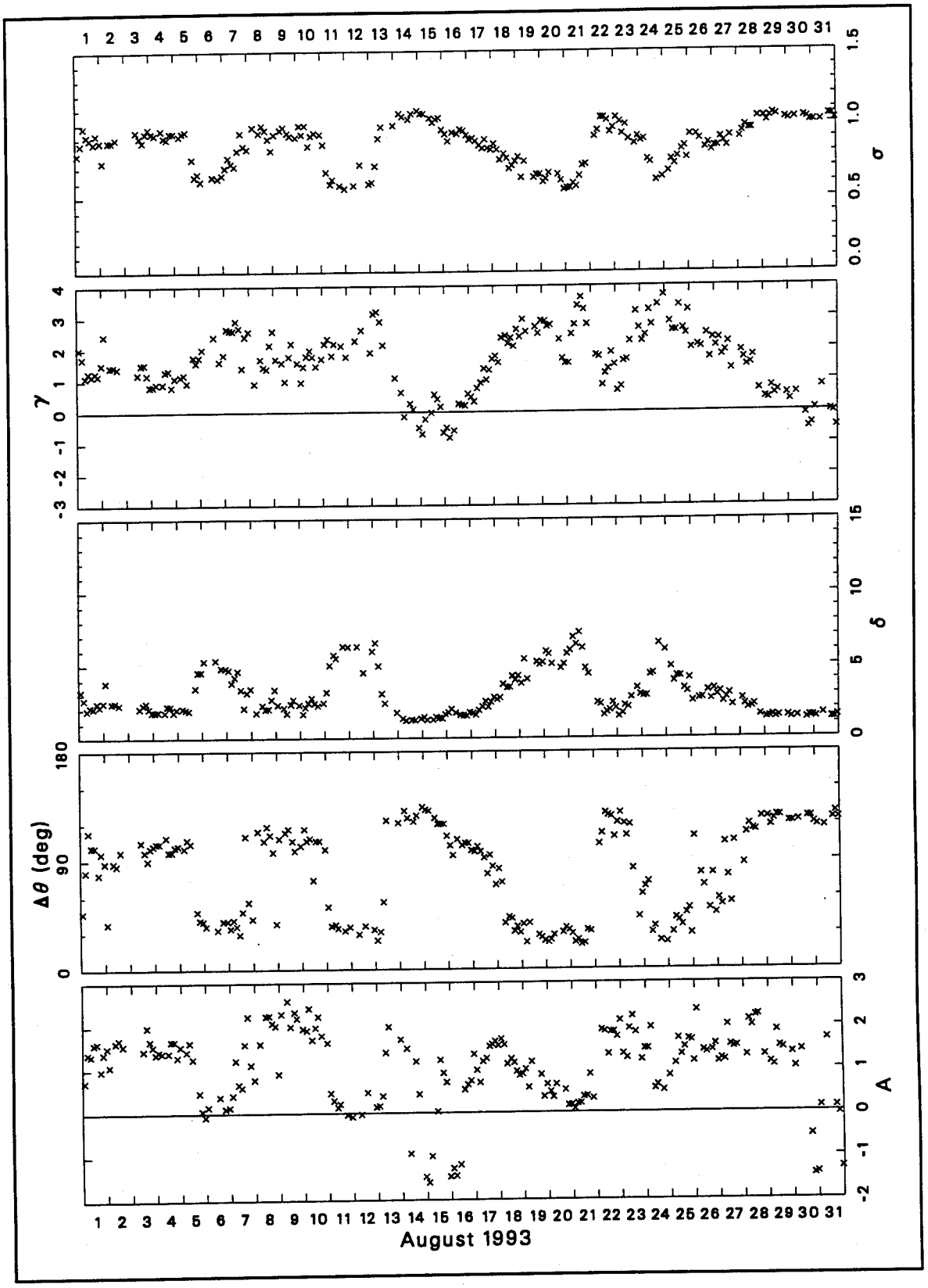

Figure B8. (Concluded)

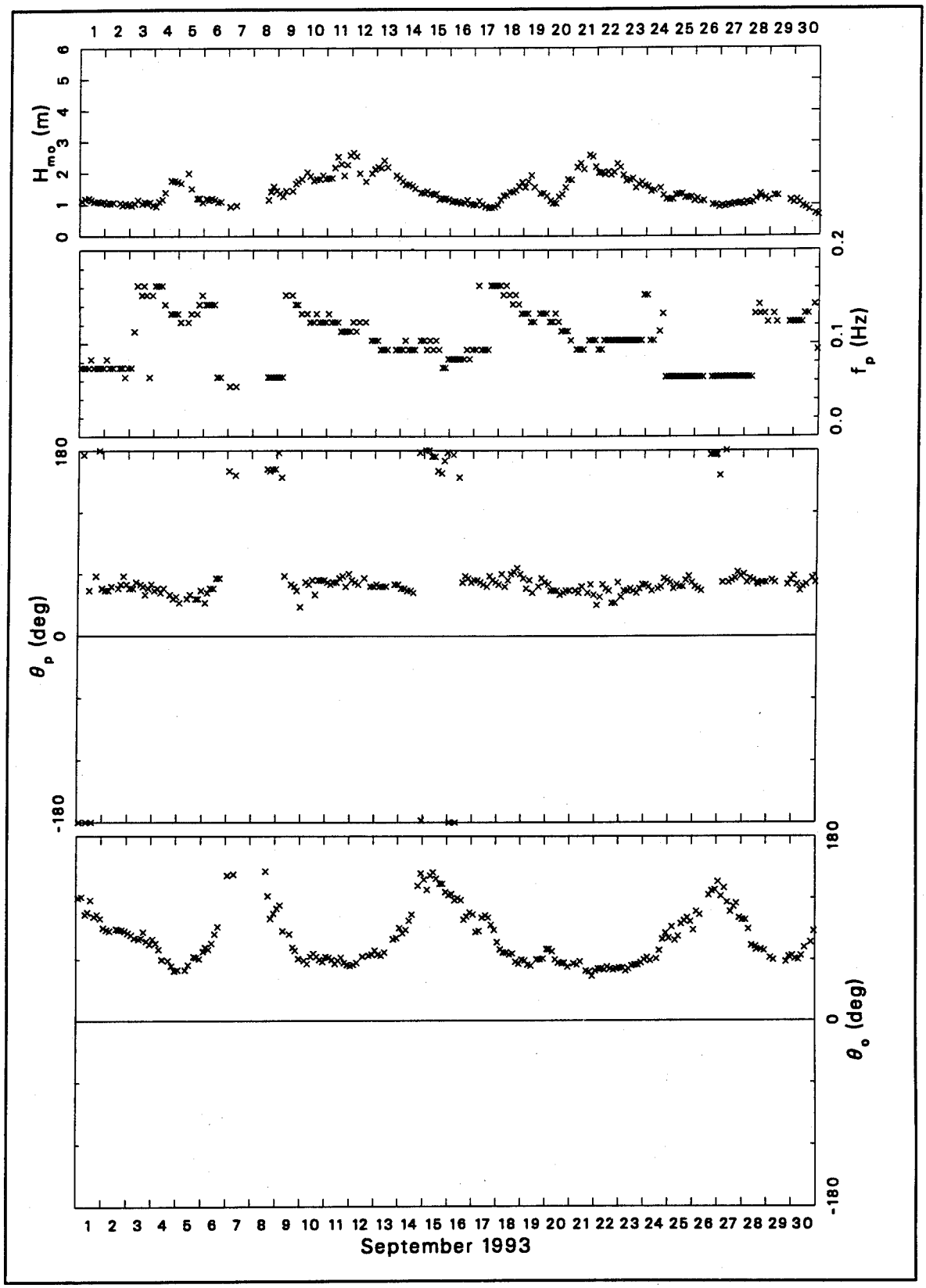

Figure B9. Bulk data for September 1993 (Continued)

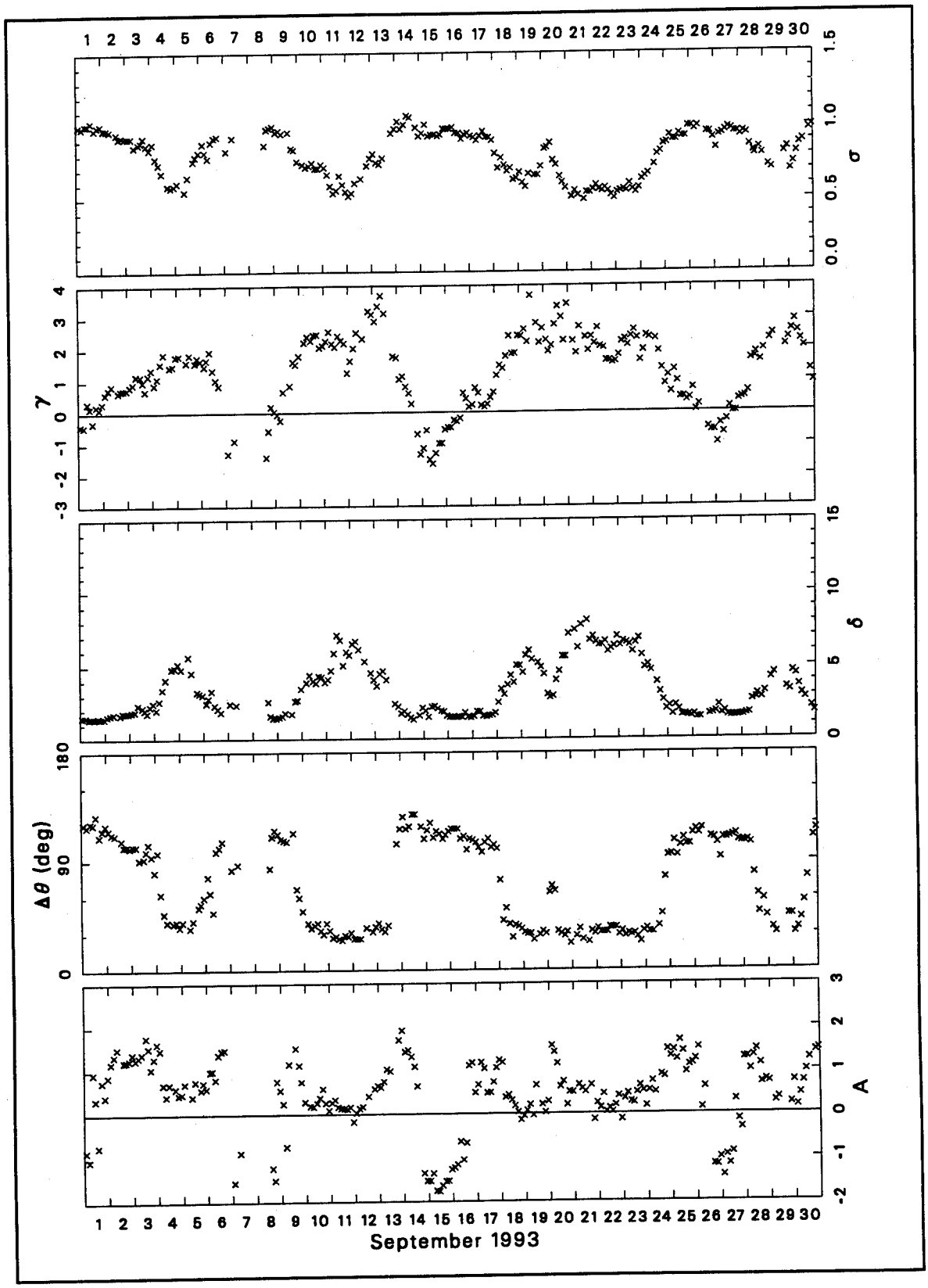

Figure B9. (Concluded)

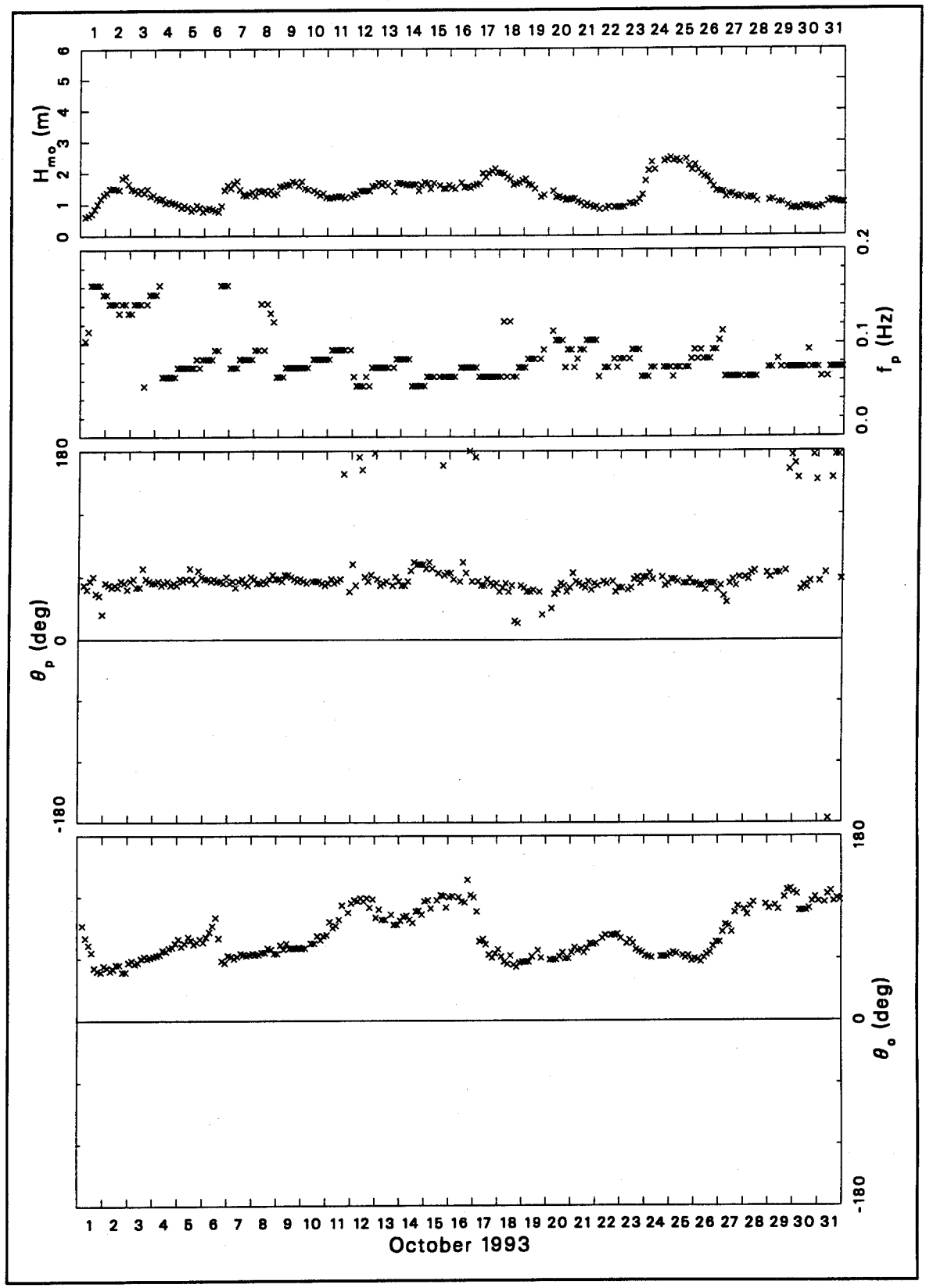

Figure B10. Bulk data for October 1993 (Continued)

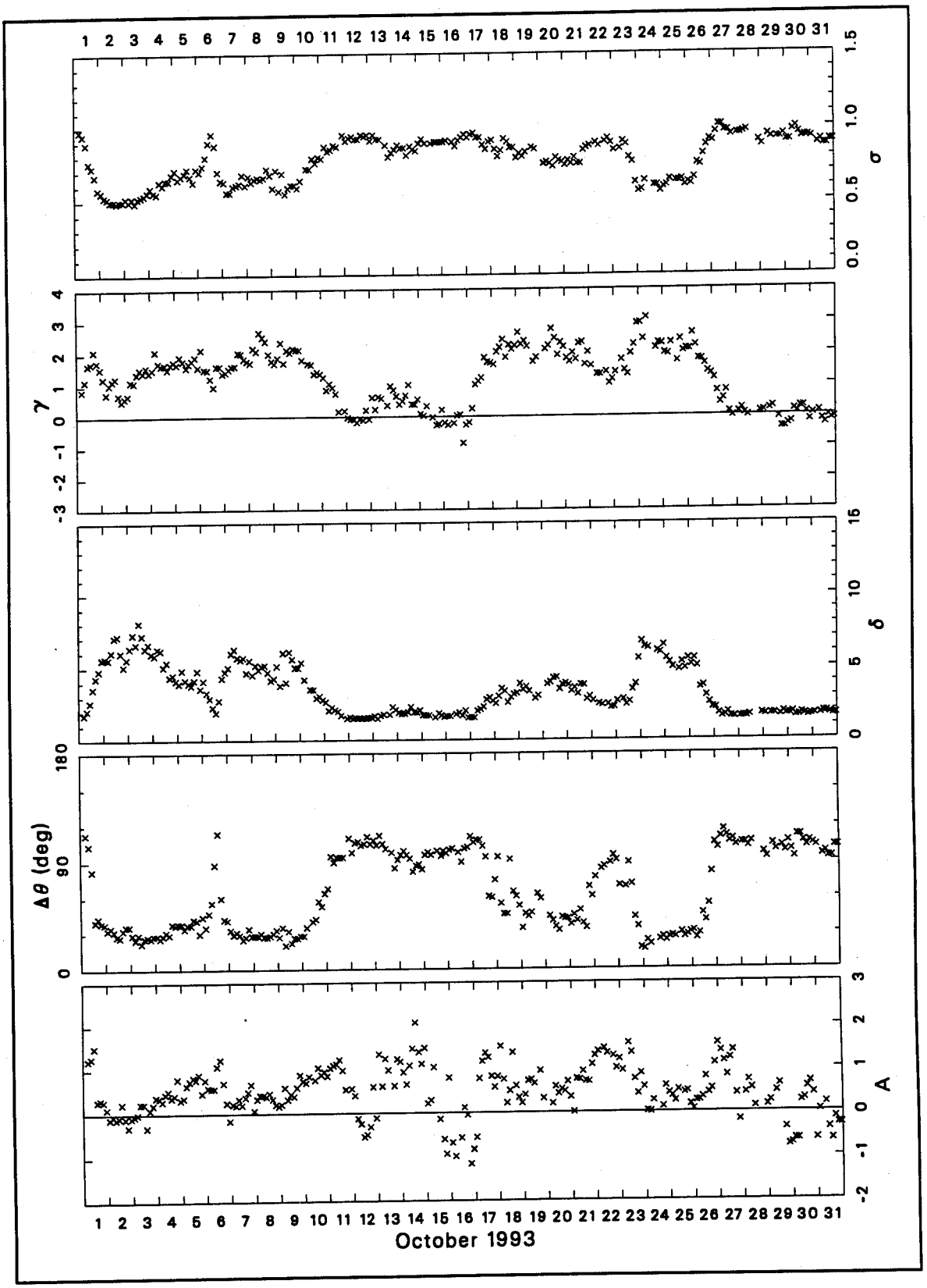

Figure B10. (Concluded)

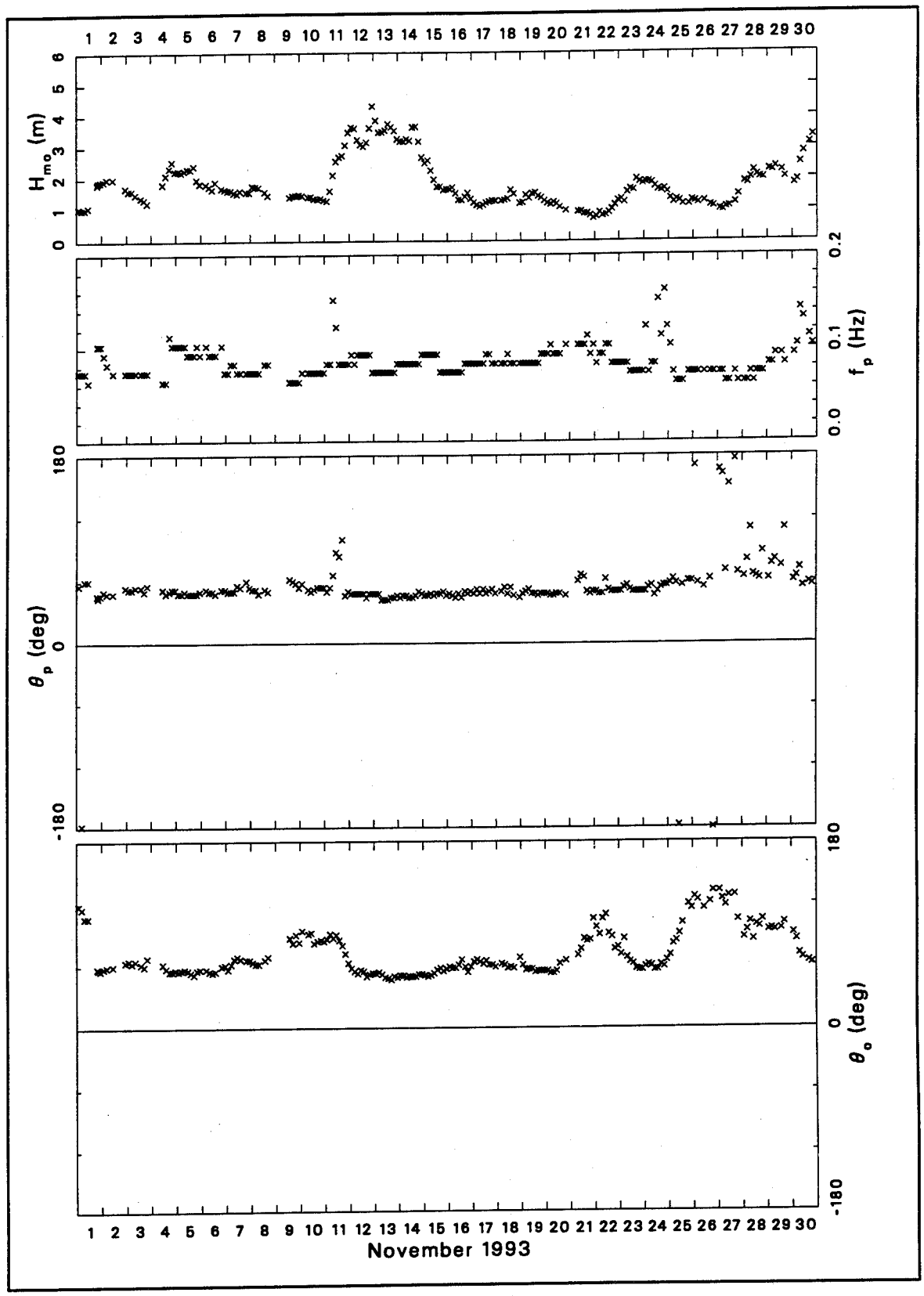

Figure B11. Bulk data for November 1993 (Continued)

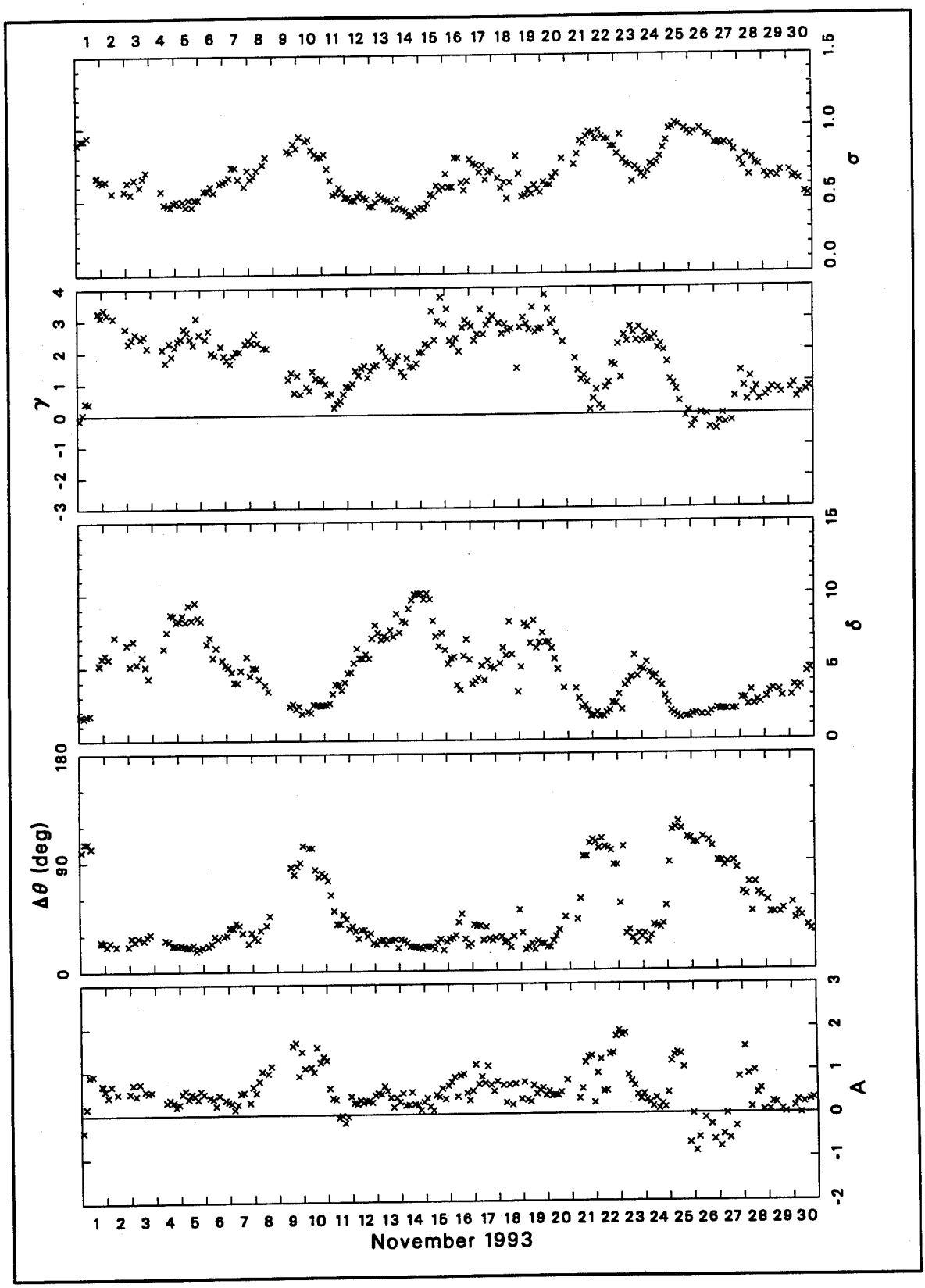

Figure B11. (Concluded)

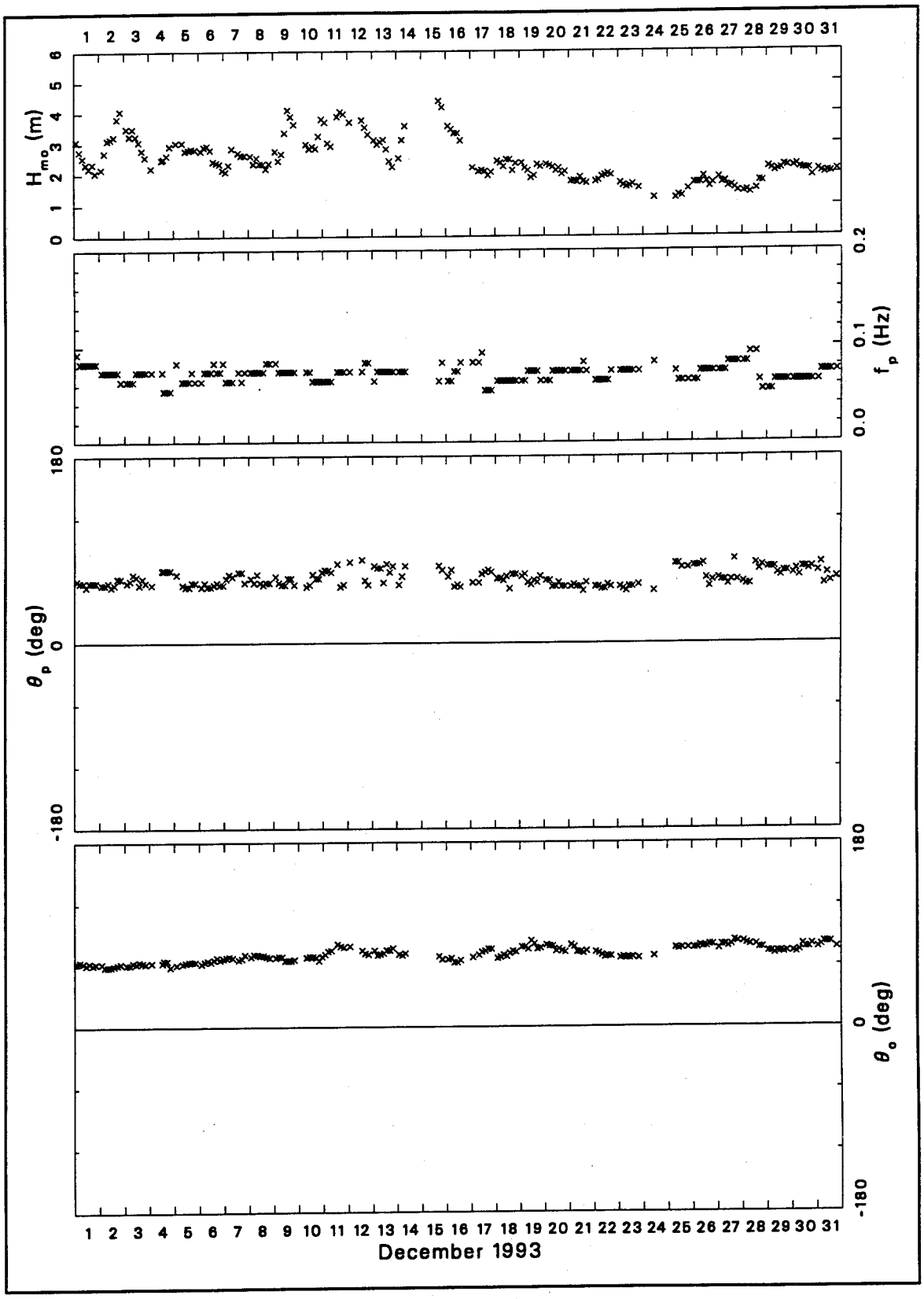

Figure B12. Bulk data for December 1993 (Continued)

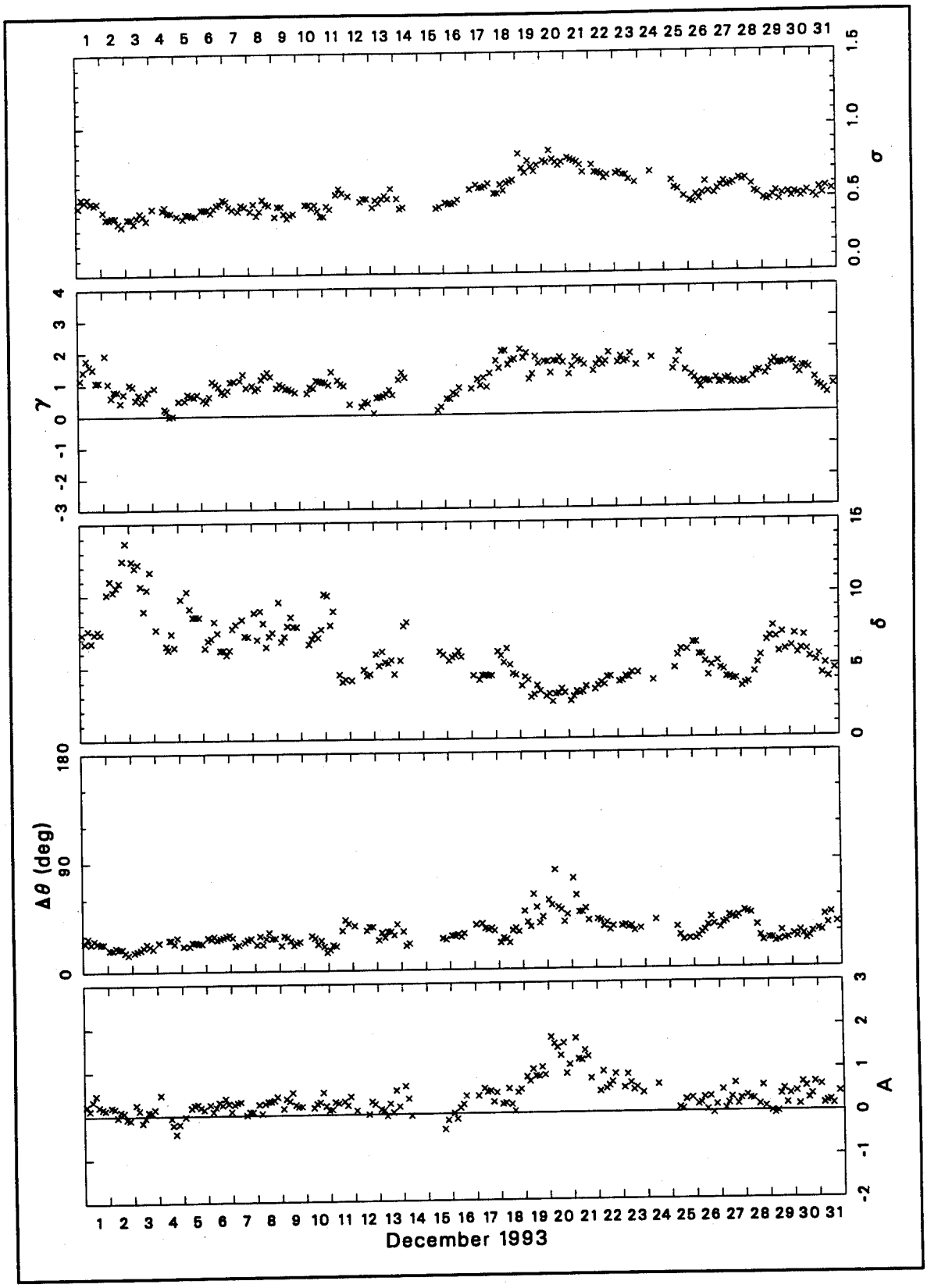

Figure B12. (Concluded)

Appendix C
Listing of FORTRAN Computer Program

```
      program readascii
c
c  Sample FORTRAN program containing statements necessary to read
c  ASCII files of Harvest Platform frequency-direction spectra.
c  This example reads a file called HPyymmddhhmm.ASC, where the
c  string yymmddhhmm is a date/time group entered by the user.
c  In other applications, the I/O statements may need modification
c  to suit a user's system.
c
c  Variable names, units and meanings are:
c
c=====================================================================
c
c      f(nf)..[Hz] frequency at index nf
c  angle(na)..[degrees CCW from true north] direction at index na from
c             which wave energy is arriving
c     sf(nf)..[m^2/Hz] frequency spectral density at f(nf)
c
c ddf(nf,na)..[deg^(-1)] directional distribution function at f(nf)
c             and angle(na), which is the frequency-direction
c             spectral density at f(nf) and angle(na) normalized by
c             sf(nf)
c fds(nf,na)..[m^2/(Hz*deg)] frequency-direction spectrum at f(nf)
c             and angle(na), computed from ddf(nf,na) and sf(nf)
c
c   gpat(nf)..gauge pattern used at f(nf)
c   iter(nf)..# of IMLE iterations for convergence at f(nf)
c   datetime..[character*10] Date and Greenwich Mean Time of
c             beginning of data collection in the order year,
c             month, day, hour, minute, and in the form
c             yymmddhhmm (2-digit year, no blanks in any field)
c
c        Hmo..[m] Energy-based characteristic wave height equal
c             to 4*sigma, where sigma^2 is the variance of sea
c             surface displacement
c         fp..[Hz] frequency at peak of frequency spectrum
c        thp..[deg] direction at peak of directional distribution
c              at f(nf) = fp
c
c     ifimle..algorithm flag: [1]=IMLE estimate, [0]=MLE estimate
c      istot..[sec] duration of data collection
c       sfrq..[Hz] data sampling frequency
c    ifwindo..windowing flag: [0]=no windowing of data segments,
c             [1]=segments windowed (Kaiser-Bessel window)
c    ifdtrnd..detrending flag: [0]=no detrending, [1]=linear trend
c             removed from data segments
```

Figure C1. Listing of FORTRAN Computer Program (Sheet 1 of 3)

```
c       nfft..# of points in each data ensemble
c      nensb..# of half-lapped segments of cross-spectral computations
c      nband..# of raw frequency bands averaged in frequency smoothing
c      idgfr..degrees of freedom in cross-spectral computations
c             (based on contiguous segments only)
c
c       nfrq..number of output frequency bands, equals range of index
c             nf
c      delfs..[Hz] output frequency bandwidth
c       nang..number of output angle bins, equals range of index na
c     delang..[deg] output angle bin width
c
c       dmin..[m] minimum ensemble segment water depth at reference
c             gauge 'rname' during collection
c       dbar..[m] mean water depth at gauge 'rname' during collection
c       dmax..[m] maximum ensemble segment water depth at reference
c             gauge 'rname' during collection
c      rname..[character*5] reference gauge id for depth computations
c
c=======================================================================
c
      character*5         rname
      character*6       gpat(13)
      character*10      indattim,      datetime
      character*80        infile
      dimension           f(13),        sf(13),     iter(13)
      dimension      angle(181),   ddf(13,181),  fds(13,181)
c
c  get file-naming date/time group from user
c
      write(*,'(2x,''Enter date/time group (yymmddhhmm)...'')')
      read(*,'(a10)') indattim                        !date/time string
c
c  define input data file
c
      infile='HP'//indattim(1:10)//'.ASC'
c
c  open, read, and close data file
c
      open(10,file=infile,status='old',form='formatted')
c
      read(10,
     &  '(   a10,   f10.2,   f10.5,  f10.1,     i10,    i10,
     &     f10.5,     i10,/,   i10,    i10,     i10,    i10,
     &       i10,     i10,   f10.5,    i10,/, f10.1,  f10.2,
     &     f10.2,   f10.2,   5x,a5)')
     &  datetime,     Hmo,      fp,    thp,  ifimle,  istot,
     &      sfrq, ifwindo, ifdtrnd,   nfft,   nensb,  nband,
     &     idgfr,    nfrq,   delfs,   nang,  delang,   dmin,
     &      dbar,    dmax,   rname
c
      read(10,'(10f8.1)') (angle(na),na=1,nang)
c
      do 10 nf=1,nfrq
        read(10,
     &    '( i10,   f10.5,   f10.6,    4x,a6,     i10)')
     &         if,   f(nf),  sf(nf), gpat(nf), iter(nf)
        read(10,'(8f10.7)') (ddf(nf,na),na=1,nang)
10    continue
c
      close(10)
c
c  compute frequency-direction spectrum fds(nf,na) from ddf(nf,na)
c  and sf(nf)
c
      do 20 nf=1,nfrq
        do 25 na=1,nang
          fds(nf,na)=sf(nf)*ddf(nf,na)
25      continue
20    continue
```

Figure C1. (Sheet 2 qf 3)

```
c
c  at this point, all relevant variables are defined and arrays
c  are loaded;  subsequent computations or operations can be done
c  at the user's discretion...
c
      end
```

Figure C1. (Sheet 3 of 3)

Appendix D
Listing of Sample Data File

```
9306201553       1.41   0.06396      148.0          1       8192   1.00000          1
         0       1024        15         10        160         13   0.00977        181
       2.0     201.09     201.39     201.72      20201
  -180.0   -178.0   -176.0   -174.0   -172.0   -170.0   -168.0   -166.0   -164.0   -162.0
  -160.0   -158.0   -156.0   -154.0   -152.0   -150.0   -148.0   -146.0   -144.0   -142.0
  -140.0   -138.0   -136.0   -134.0   -132.0   -130.0   -128.0   -126.0   -124.0   -122.0
  -120.0   -118.0   -116.0   -114.0   -112.0   -110.0   -108.0   -106.0   -104.0   -102.0
  -100.0    -98.0    -96.0    -94.0    -92.0    -90.0    -88.0    -86.0    -84.0    -82.0
   -80.0    -78.0    -76.0    -74.0    -72.0    -70.0    -68.0    -66.0    -64.0    -62.0
   -60.0    -58.0    -56.0    -54.0    -52.0    -50.0    -48.0    -46.0    -44.0    -42.0
   -40.0    -38.0    -36.0    -34.0    -32.0    -30.0    -28.0    -26.0    -24.0    -22.0
   -20.0    -18.0    -16.0    -14.0    -12.0    -10.0     -8.0     -6.0     -4.0     -2.0
     0.0      2.0      4.0      6.0      8.0     10.0     12.0     14.0     16.0     18.0
    20.0     22.0     24.0     26.0     28.0     30.0     32.0     34.0     36.0     38.0
    40.0     42.0     44.0     46.0     48.0     50.0     52.0     54.0     56.0     58.0
    60.0     62.0     64.0     66.0     68.0     70.0     72.0     74.0     76.0     78.0
    80.0     82.0     84.0     86.0     88.0     90.0     92.0     94.0     96.0     98.0
   100.0    102.0    104.0    106.0    108.0    110.0    112.0    114.0    116.0    118.0
   120.0    122.0    124.0    126.0    128.0    130.0    132.0    134.0    136.0    138.0
   140.0    142.0    144.0    146.0    148.0    150.0    152.0    154.0    156.0    158.0
   160.0    162.0    164.0    166.0    168.0    170.0    172.0    174.0    176.0    178.0
   180.0
         1   0.04443  0.047077     12346         30
 0.0083301 0.0071353 0.0058383 0.0048283 0.0040424 0.0034256 0.0029394 0.0025534
 0.0022437 0.0019936 0.0017894 0.0016212 0.0014822 0.0013663 0.0012688 0.0011866
 0.0011166 0.0010569 0.0010055 0.0009614 0.0009231 0.0008898 0.0008607 0.0008352
 0.0008127 0.0007928 0.0007749 0.0007588 0.0007444 0.0007311 0.0007188 0.0007073
 0.0006965 0.0006860 0.0006759 0.0006661 0.0006564 0.0006468 0.0006372 0.0006277
 0.0006181 0.0006085 0.0005988 0.0005891 0.0005794 0.0005697 0.0005602 0.0005507
 0.0005415 0.0005324 0.0005237 0.0005152 0.0005071 0.0004995 0.0004922 0.0004855
 0.0004793 0.0004736 0.0004685 0.0004640 0.0004600 0.0004566 0.0004538 0.0004515
 0.0004498 0.0004487 0.0004481 0.0004479 0.0004482 0.0004490 0.0004501 0.0004517
 0.0004535 0.0004556 0.0004579 0.0004604 0.0004631 0.0004658 0.0004686 0.0004714
 0.0004742 0.0004769 0.0004794 0.0004818 0.0004840 0.0004860 0.0004878 0.0004893
 0.0004906 0.0004916 0.0004923 0.0004928 0.0004929 0.0004929 0.0004926 0.0004921
 0.0004914 0.0004906 0.0004896 0.0004886 0.0004875 0.0004864 0.0004854 0.0004844
 0.0004836 0.0004829 0.0004825 0.0004823 0.0004823 0.0004828 0.0004835 0.0004847
 0.0004863 0.0004883 0.0004909 0.0004940 0.0004975 0.0005017 0.0005065 0.0005119
 0.0005179 0.0005245 0.0005318 0.0005397 0.0005483 0.0005576 0.0005676 0.0005783
 0.0005898 0.0006021 0.0006151 0.0006291 0.0006438 0.0006596 0.0006764 0.0006943
 0.0007135 0.0007341 0.0007564 0.0007804 0.0008066 0.0008353 0.0008667 0.0009016
 0.0009404 0.0009841 0.0010334 0.0010893 0.0011535 0.0012277 0.0013140 0.0014151
 0.0015348 0.0016771 0.0018484 0.0020559 0.0023101 0.0026239 0.0030151 0.0035076
 0.0041313 0.0049288 0.0059508 0.0072638 0.0089472 0.0110771 0.0137101 0.0168502
 0.0203764 0.0240000 0.0272396 0.0294971 0.0302649 0.0293797 0.0270476 0.0237665
 0.0201366 0.0166198 0.0135060 0.0108994 0.0092645
         2   0.05420  0.236296     123456         23
 0.0145543 0.0143979 0.0138345 0.0127418 0.0113729 0.0097331 0.0080857 0.0065026
```

Figure D1. Listing of sample data file (Sheet 1 of 5)

```
0.0050840 0.0039146 0.0029408 0.0021838 0.0016246 0.0012116 0.0009124 0.0007034
0.0005589 0.0004616 0.0003975 0.0003585 0.0003361 0.0003258 0.0003256 0.0003332
0.0003477 0.0003650 0.0003834 0.0004043 0.0004248 0.0004430 0.0004581 0.0004697
0.0004774 0.0004795 0.0004767 0.0004691 0.0004567 0.0004398 0.0004193 0.0003951
0.0003684 0.0003401 0.0003103 0.0002799 0.0002502 0.0002212 0.0001936 0.0001680
0.0001449 0.0001244 0.0001066 0.0000915 0.0000790 0.0000691 0.0000616 0.0000563
0.0000530 0.0000517 0.0000523 0.0000551 0.0000601 0.0000676 0.0000782 0.0000920
0.0001097 0.0001314 0.0001575 0.0001876 0.0002216 0.0002586 0.0002975 0.0003372
0.0003759 0.0004119 0.0004436 0.0004695 0.0004878 0.0004980 0.0004993 0.0004915
0.0004752 0.0004511 0.0004207 0.0003860 0.0003491 0.0003113 0.0002752 0.0002416
0.0002125 0.0001880 0.0001686 0.0001545 0.0001459 0.0001424 0.0001445 0.0001516
0.0001646 0.0001836 0.0002090 0.0002418 0.0002813 0.0003276 0.0003812 0.0004401
0.0005032 0.0005695 0.0006359 0.0007013 0.0007624 0.0008187 0.0008659 0.0009029
0.0009281 0.0009409 0.0009433 0.0009319 0.0009059 0.0008736 0.0008343 0.0007895
0.0007419 0.0006979 0.0006611 0.0006310 0.0006136 0.0006147 0.0006351 0.0006826
0.0007649 0.0008845 0.0010549 0.0012922 0.0015956 0.0019714 0.0024290 0.0029429
0.0034897 0.0040533 0.0046022 0.0050826 0.0054415 0.0056611 0.0057279 0.0056375
0.0054183 0.0050681 0.0046309 0.0041795 0.0037338 0.0033393 0.0030155 0.0027809
0.0026622 0.0026471 0.0027587 0.0029747 0.0033539 0.0038654 0.0045444 0.0053704
0.0063317 0.0074094 0.0085529 0.0097020 0.0107877 0.0118118 0.0125691 0.0131386
0.0134514 0.0134681 0.0132504 0.0128366 0.0123204 0.0118949 0.0117480 0.0117989
0.0122184 0.0127762 0.0135605 0.0142096 0.0145501
        3   0.06396  2.305026    123456        30
0.0059076 0.0054330 0.0047348 0.0039825 0.0032441 0.0025550 0.0019599 0.0014675
0.0010764 0.0007804 0.0005634 0.0004085 0.0003011 0.0002279 0.0001783 0.0001454
0.0001242 0.0001108 0.0001032 0.0001001 0.0001000 0.0001024 0.0001065 0.0001119
0.0001181 0.0001245 0.0001306 0.0001361 0.0001406 0.0001438 0.0001456 0.0001458
0.0001444 0.0001413 0.0001369 0.0001311 0.0001242 0.0001163 0.0001078 0.0000988
0.0000895 0.0000802 0.0000710 0.0000622 0.0000538 0.0000461 0.0000391 0.0000328
0.0000274 0.0000227 0.0000189 0.0000157 0.0000131 0.0000112 0.0000097 0.0000087
0.0000081 0.0000079 0.0000082 0.0000088 0.0000101 0.0000121 0.0000150 0.0000194
0.0000256 0.0000341 0.0000457 0.0000608 0.0000799 0.0001031 0.0001298 0.0001592
0.0001894 0.0002184 0.0002436 0.0002627 0.0002734 0.0002748 0.0002664 0.0002493
0.0002253 0.0001969 0.0001668 0.0001375 0.0001110 0.0000883 0.0000699 0.0000557
0.0000451 0.0000377 0.0000327 0.0000298 0.0000286 0.0000287 0.0000303 0.0000331
0.0000373 0.0000429 0.0000499 0.0000584 0.0000683 0.0000793 0.0000914 0.0001041
0.0001171 0.0001300 0.0001423 0.0001536 0.0001633 0.0001713 0.0001770 0.0001804
0.0001811 0.0001793 0.0001751 0.0001685 0.0001597 0.0001494 0.0001378 0.0001255
0.0001130 0.0001008 0.0000893 0.0000789 0.0000699 0.0000625 0.0000569 0.0000530
0.0000512 0.0000514 0.0000542 0.0000601 0.0000702 0.0000860 0.0001102 0.0001460
0.0001990 0.0002756 0.0003855 0.0005383 0.0007476 0.0010242 0.0013792 0.0018226
0.0023546 0.0029665 0.0036322 0.0043297 0.0050153 0.0056407 0.0061699 0.0065634
0.0068494 0.0070768 0.0073629 0.0077941 0.0086389 0.0100376 0.0123231 0.0155868
0.0198237 0.0247184 0.0292992 0.0327087 0.0337923 0.0323937 0.0287369 0.0239756
0.0190912 0.0148499 0.0116156 0.0094049 0.0079868 0.0072040 0.0068988 0.0068246
0.0068686 0.0068652 0.0067686 0.0064891 0.0061827
        4   0.07373  0.767314    123456        30
0.0272793 0.0265745 0.0239338 0.0197760 0.0151783 0.0109395 0.0075034 0.0049688
0.0032183 0.0020746 0.0013482 0.0008963 0.0006181 0.0004467 0.0003404 0.0002744
0.0002337 0.0002093 0.0001959 0.0001900 0.0001893 0.0001922 0.0001975 0.0002041
0.0002113 0.0002183 0.0002242 0.0002288 0.0002317 0.0002326 0.0002313 0.0002279
0.0002224 0.0002149 0.0002058 0.0001951 0.0001831 0.0001702 0.0001567 0.0001428
0.0001288 0.0001150 0.0001016 0.0000889 0.0000771 0.0000663 0.0000566 0.0000481
0.0000407 0.0000345 0.0000294 0.0000253 0.0000222 0.0000198 0.0000183 0.0000174
0.0000172 0.0000178 0.0000190 0.0000211 0.0000242 0.0000285 0.0000342 0.0000414
0.0000503 0.0000610 0.0000734 0.0000874 0.0001025 0.0001184 0.0001342 0.0001492
0.0001628 0.0001742 0.0001828 0.0001881 0.0001897 0.0001877 0.0001822 0.0001735
0.0001621 0.0001486 0.0001339 0.0001186 0.0001035 0.0000892 0.0000763 0.0000650
0.0000555 0.0000478 0.0000420 0.0000379 0.0000354 0.0000345 0.0000352 0.0000375
0.0000418 0.0000485 0.0000579 0.0000707 0.0000875 0.0001087 0.0001349 0.0001660
0.0002018 0.0002416 0.0002840 0.0003274 0.0003697 0.0004088 0.0004424 0.0004684
0.0004851 0.0004914 0.0004869 0.0004720 0.0004477 0.0004159 0.0003790 0.0003395
0.0003000 0.0002629 0.0002298 0.0002020 0.0001801 0.0001644 0.0001550 0.0001520
0.0001556 0.0001664 0.0001853 0.0002140 0.0002541 0.0003076 0.0003769 0.0004638
0.0005698 0.0006955 0.0008408 0.0010034 0.0011807 0.0013682 0.0015592 0.0017479
0.0019275 0.0020891 0.0022256 0.0023327 0.0024070 0.0024492 0.0024645 0.0024627
0.0024579 0.0024715 0.0025266 0.0026469 0.0028698 0.0032272 0.0037611 0.0045085
0.0054995 0.0067395 0.0081880 0.0097754 0.0113754 0.0128474 0.0140468 0.0148733
0.0152699 0.0152534 0.0149061 0.0143749 0.0138507 0.0135669 0.0137872 0.0146988
0.0165165 0.0192201 0.0225100 0.0254923 0.0269860
        5   0.08350  0.508163    123456        30
```

Figure D1. (Sheet 2 of 5)

```
0.0116753 0.0116424 0.0113172 0.0106449 0.0096706 0.0084782 0.0071783 0.0058801
0.0046771 0.0036328 0.0027749 0.0021026 0.0015952 0.0012225 0.0009530 0.0007595
0.0006204 0.0005196 0.0004454 0.0003899 0.0003472 0.0003136 0.0002863 0.0002635
0.0002439 0.0002266 0.0002110 0.0001967 0.0001834 0.0001710 0.0001593 0.0001482
0.0001378 0.0001278 0.0001184 0.0001094 0.0001009 0.0000928 0.0000852 0.0000779
0.0000711 0.0000647 0.0000586 0.0000529 0.0000476 0.0000427 0.0000382 0.0000341
0.0000303 0.0000270 0.0000240 0.0000214 0.0000192 0.0000173 0.0000157 0.0000145
0.0000136 0.0000131 0.0000128 0.0000129 0.0000133 0.0000141 0.0000153 0.0000170
0.0000193 0.0000222 0.0000257 0.0000301 0.0000353 0.0000414 0.0000484 0.0000562
0.0000649 0.0000743 0.0000843 0.0000948 0.0001056 0.0001166 0.0001276 0.0001384
0.0001489 0.0001589 0.0001683 0.0001769 0.0001847 0.0001914 0.0001969 0.0002013
0.0002044 0.0002063 0.0002069 0.0002064 0.0002049 0.0002029 0.0002006 0.0001988
0.0001980 0.0001994 0.0002041 0.0002139 0.0002313 0.0002600 0.0003058 0.0003781
0.0004921 0.0006728 0.0009604 0.0014182 0.0021392 0.0032510 0.0049015 0.0072182
0.0102152 0.0136718 0.0170266 0.0194370 0.0201243 0.0188517 0.0161325 0.0129046
0.0099668 0.0076960 0.0061027 0.0050402 0.0043484 0.0038980 0.0035984 0.0033893
0.0032318 0.0031001 0.0029786 0.0028573 0.0027306 0.0025954 0.0024513 0.0022982
0.0021376 0.0019715 0.0018028 0.0016343 0.0014693 0.0013110 0.0011627 0.0010274
0.0009076 0.0008047 0.0007201 0.0006543 0.0006075 0.0005799 0.0005718 0.0005844
0.0006196 0.0006803 0.0007706 0.0008959 0.0010625 0.0012774 0.0015482 0.0018816
0.0022841 0.0027601 0.0033113 0.0039362 0.0046276 0.0053724 0.0061478 0.0069239
0.0076614 0.0083159 0.0088478 0.0092317 0.0094724 0.0096101 0.0097175 0.0098719
0.0101305 0.0105049 0.0109516 0.0113698 0.0115982
        6   0.09326  1.405236    123456        30
0.0018499 0.0017573 0.0016298 0.0015019 0.0013771 0.0012575 0.0011442 0.0010374
0.0009373 0.0008437 0.0007565 0.0006755 0.0006008 0.0005326 0.0004710 0.0004161
0.0003680 0.0003264 0.0002908 0.0002609 0.0002359 0.0002150 0.0001976 0.0001830
0.0001707 0.0001600 0.0001507 0.0001424 0.0001348 0.0001278 0.0001213 0.0001153
0.0001095 0.0001041 0.0000989 0.0000940 0.0000894 0.0000850 0.0000808 0.0000769
0.0000731 0.0000696 0.0000662 0.0000630 0.0000600 0.0000570 0.0000543 0.0000516
0.0000490 0.0000466 0.0000442 0.0000420 0.0000399 0.0000379 0.0000361 0.0000344
0.0000330 0.0000317 0.0000308 0.0000301 0.0000297 0.0000297 0.0000301 0.0000310
0.0000324 0.0000342 0.0000367 0.0000398 0.0000435 0.0000479 0.0000530 0.0000587
0.0000651 0.0000721 0.0000797 0.0000879 0.0000965 0.0001056 0.0001152 0.0001253
0.0001358 0.0001469 0.0001586 0.0001709 0.0001839 0.0001978 0.0002127 0.0002287
0.0002460 0.0002648 0.0002854 0.0003082 0.0003336 0.0003622 0.0003951 0.0004334
0.0004792 0.0005350 0.0006049 0.0006947 0.0008127 0.0009712 0.0011876 0.0014863
0.0019004 0.0024726 0.0032530 0.0042946 0.0056428 0.0073227 0.0093241 0.0115926
0.0140252 0.0164749 0.0187615 0.0206925 0.0220962 0.0228682 0.0230123 0.0226527
0.0219821 0.0211806 0.0203362 0.0194337 0.0184083 0.0172046 0.0158133 0.0142744
0.0126539 0.0110233 0.0094447 0.0079653 0.0066173 0.0054197 0.0043812 0.0035018
0.0027742 0.0021861 0.0017215 0.0013618 0.0010888 0.0008850 0.0007352 0.0006269
0.0005500 0.0004968 0.0004614 0.0004398 0.0004287 0.0004260 0.0004299 0.0004394
0.0004536 0.0004719 0.0004942 0.0005202 0.0005501 0.0005840 0.0006225 0.0006660
0.0007152 0.0007708 0.0008337 0.0009050 0.0009854 0.0010759 0.0011770 0.0012888
0.0014105 0.0015401 0.0016737 0.0018059 0.0019292 0.0020349 0.0021145 0.0021609
0.0021700 0.0021415 0.0020791 0.0019891 0.0019086
        7   0.10303  1.886664    123456        30
0.0010683 0.0009409 0.0007854 0.0006515 0.0005398 0.0004482 0.0003740 0.0003140
0.0002656 0.0002265 0.0001949 0.0001693 0.0001485 0.0001318 0.0001184 0.0001078
0.0000996 0.0000934 0.0000889 0.0000858 0.0000840 0.0000833 0.0000832 0.0000837
0.0000844 0.0000852 0.0000858 0.0000860 0.0000857 0.0000848 0.0000833 0.0000813
0.0000789 0.0000760 0.0000728 0.0000693 0.0000658 0.0000621 0.0000585 0.0000550
0.0000515 0.0000481 0.0000449 0.0000419 0.0000389 0.0000361 0.0000335 0.0000310
0.0000287 0.0000265 0.0000244 0.0000224 0.0000206 0.0000189 0.0000173 0.0000158
0.0000144 0.0000132 0.0000120 0.0000110 0.0000102 0.0000094 0.0000088 0.0000083
0.0000080 0.0000078 0.0000078 0.0000079 0.0000082 0.0000087 0.0000095 0.0000106
0.0000120 0.0000139 0.0000164 0.0000195 0.0000235 0.0000285 0.0000348 0.0000426
0.0000522 0.0000641 0.0000788 0.0000969 0.0001191 0.0001463 0.0001798 0.0002210
0.0002718 0.0003346 0.0004126 0.0005095 0.0006305 0.0007819 0.0009718 0.0012102
0.0015095 0.0018843 0.0023520 0.0029319 0.0036447 0.0045123 0.0055579 0.0068084
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0.0131041 0.0113872 0.0100706 0.0090635 0.0082796 0.0076482 0.0071158 0.0066420
0.0061973 0.0057595 0.0053135 0.0048501 0.0043671 0.0038693 0.0033675 0.0028772
0.0024152 0.0019964 0.0016312 0.0013236 0.0010725 0.0008724 0.0007157 0.0005946
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0.0002272 0.0002187 0.0002130 0.0002097 0.0002088 0.0002101 0.0002138 0.0002201
0.0002294 0.0002420 0.0002587 0.0002806 0.0003089 0.0003454 0.0003926 0.0004535
0.0005319 0.0006321 0.0007577 0.0009097 0.0010835 0.0012650 0.0014297 0.0015468
0.0015907 0.0015523 0.0014427 0.0012869 0.0011564
        8   0.11279  1.555569    123456        30
```

Figure D1. (Sheet 3 of 5)

```
0.0009730 0.0008916 0.0007863 0.0006884 0.0005999 0.0005215 0.0004529 0.0003932
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0.0000592 0.0000557 0.0000526 0.0000498 0.0000472 0.0000449 0.0000427 0.0000406
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0.0000264 0.0000252 0.0000242 0.0000232 0.0000223 0.0000214 0.0000206 0.0000199
0.0000192 0.0000186 0.0000180 0.0000174 0.0000169 0.0000165 0.0000161 0.0000157
0.0000154 0.0000151 0.0000148 0.0000146 0.0000145 0.0000144 0.0000143 0.0000144
0.0000145 0.0000148 0.0000151 0.0000157 0.0000164 0.0000174 0.0000187 0.0000203
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0.0200875 0.0226019 0.0243710 0.0253645 0.0256928 0.0255043 0.0249235 0.0240181
0.0228111 0.0213102 0.0195438 0.0175812 0.0155333 0.0135237 0.0116584 0.0100032
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0.0013148 0.0011671 0.0010325 0.0009115 0.0008045 0.0007113 0.0006313 0.0005637
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0.0000364 0.0000311 0.0000270 0.0000239 0.0000215 0.0000198 0.0000186 0.0000178
0.0000174 0.0000173 0.0000174 0.0000177 0.0000182 0.0000189 0.0000196 0.0000203
0.0000211 0.0000219 0.0000226 0.0000233 0.0000239 0.0000244 0.0000248 0.0000251
0.0000253 0.0000254 0.0000254 0.0000253 0.0000251 0.0000249 0.0000246 0.0000242
0.0000238 0.0000234 0.0000229 0.0000224 0.0000219 0.0000214 0.0000209 0.0000204
0.0000199 0.0000195 0.0000190 0.0000186 0.0000181 0.0000178 0.0000175 0.0000172
0.0000170 0.0000169 0.0000169 0.0000171 0.0000174 0.0000179 0.0000186 0.0000197
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0.0000713 0.0000892 0.0001127 0.0001437 0.0001844 0.0002377 0.0003073 0.0003977
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0.0001603 0.0001614 0.0001634 0.0001663 0.0001701 0.0001751 0.0001812 0.0001887
0.0001977 0.0002085 0.0002216 0.0002373 0.0002563 0.0002792 0.0003071 0.0003409
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0.0003828 0.0003765 0.0003662 0.0003527 0.0003410
```

Figure D1. (Sheet 4 of 5)

```
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0.0022736 0.0020278 0.0017812 0.0015410 0.0013145 0.0011081 0.0009257 0.0007690
0.0006374 0.0005290 0.0004412 0.0003709 0.0003151 0.0002711 0.0002367 0.0002099
0.0001894 0.0001738 0.0001622 0.0001540 0.0001485 0.0001452 0.0001438 0.0001440
0.0001454 0.0001478 0.0001509 0.0001546 0.0001585 0.0001626 0.0001668 0.0001710
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0.0002226 0.0002310 0.0002396 0.0002481 0.0002541
```

Figure D1. (Sheet 5 of 5)

Appendix E
Notation

Text	Appendix C	
a_0		Normalizing coefficient in maximum likelihood estimate (MLE)
a_r		Normalizing coefficient for r^{th} iteration in iterative maximum likelihood estimator (IMLE)
A		Quartile asymmetry parameter
	`angle(na)`	Element `na` of an array that represents direction coordinates
$C_{ij}(f_n)$		Coincident spectral density between gauges i and j at frequency f_n
d		Water depth
	`datetime`	Ten-character string that contains date and time
	`dbar`	Mean water depth
	`ddf(nf,na)`	Array element representing the directional distribution function at frequency `f(nf)` and direction `angle(na)`
$d\theta$	`delang`	Direction increment
df	`delfs`	Frequency increment
	`dmax`	Maximum segment-averaged water depth in a collection

Text	Appendix C	
	`dmin`	Minimum segment-averaged water depth in a collection
$D(\theta_m)$		Directional distribution function based on $S(\theta_m)$
$D(f_n,\theta_m)$		Directional distribution function at frequency f_n and direction θ_m
$D_0(f_n,\theta_m)$		MLE estimate of directional distribution function at frequency f_n
$D_r(f_n,\theta_m)$		IMLE estimate of directional distribution function at frequency f_n after r^{th} iteration
$D_r'(f_n,\theta_m)$		Intermediate, uncorrected IMLE estimate of directional distribution function at frequency f_n during r^{th} iteration
$\hat{e}_x$		Unit vector in the x-direction
$\hat{e}_y$		Unit vector in the y-direction
	`fds(nf,na)`	Array element representing the frequency-direction spectrum at frequency `f(nf)` and direction `angle(na)`
f_n		n^{th} frequency of a set of N discrete frequencies
	`f(nf)`	Element `nf` of an array that represents frequency
f_p	`fp`	Peak frequency
g		Gravitational acceleration
	`gpat(nf)`	Element `nf` of an array of six-character strings that represent working gauge patterns
hhmm		Mnemonic for time of day
H_{mo}	`Hmo`	Characteristic wave height

Text	Appendix C	
i		Complex notation $\sqrt{-1}$ [in exponent or on main equation line]
		Gauge index [as subscript]
	idgfr	Degrees of freedom in cross-spectral estimation
	ifdtrnd	Flag indicating whether or not data have been detrended
	ifimle	Flag indicating if maximum likelihood or iterative maximum likelihood estimation is used
	ifwindo	Flag indicating whether or not data segments have been windowed
	istot	Total number of seconds duration of a time series
	iter(nf)	Number of iterative maximum likelihood iterations used to compute directional distribution at frequency f(nf)
I		Number of gauges in an array
$I(\theta_m - \theta_{m_{min}})$		Cumulative distribution function
Im[ ]		Imaginary part of complex entity contained in brackets
j		Gauge index
k_n		Magnitude of wave number vector associated with n^{th} discrete frequency
$\overline{k}_n(\theta_m)$		Wave number vector for wave direction θ_m at n^{th} discrete frequency
l		Summation index
m	na	Index associated with discrete direction
m_1		First cosine moment of $D(\theta_m)$

Text	Appendix C	
m_2		Second cosine moment of $D(\theta_m)$
$m_{\min}$		Index of discrete direction at which wave energy is minimum
M	nang	Integer number of discrete directions
$M_{ij}(f_n)$		Element of dimensionless matrix of cross spectra between gauges i and j at frequency f_n
$M_{ij}^{-1}(f_n)$		Element of inverse of $M_{ij}(f_n)$
${}^{r}M_{ij}(f_n)$		Estimate of element of dimensionless matrix of cross spectra between gauges i and j at frequency f_n during r^{th} IMLE iteration
${}^{r}M_{ij}^{-1}(f_n)$		Element of inverse of ${}^{r}M_{ij}(f_n)$
n	nf	Index associated with discrete frequency
n_1		First sine moment of $D(\theta_m)$
n_2		Second sine moment of $D(\theta_m)$
	nband	Number of frequency bands averaged in spectral estimation
	nensb	Number of segments into which a data record is divided during spectral estimation
	nfft	Number of data points in a data segment
N	nfrq	Integer number of discrete frequencies
$Q_{ij}(f_n)$		Quadrature spectral density between gauges i and j at frequency f_n
r		Iteration count for IMLE
	rname	Five-character string denoting reference gauge
R		Upper limit for IMLE iterations

Text	Appendix C	
Re[ ]		Real part of complex entity contained in brackets
	`sf(nf)`	Element `nf` of an array that represents the frequency spectrum
	`sfrq`	Sampling frequency
$S(f_n)$		Frequency spectral density at frequency f_n
$S(\theta_m)$		Direction spectral density at direction θ_m
$S(f_n,\theta_m)$		Frequency-direction spectral density at frequency f_n and direction θ_m
	`thp`	Peak direction of directional distribution at frequency `fp`
T_p		Peak period
x		Horizontal coordinate increasing northward
$\overline{x_i}$		Horizontal position vector of gauge i
$\overline{x_j}$		Horizontal position vector of gauge j
y		Horizontal coordinate increasing westward
yymmdd		Mnemonic for date
β		Exponential convergence rate parameter in IMLE
γ		Convergence rate coefficient in IMLE
		Circular skewness
$\Gamma_{ij}^2(f_n)$		Coherence of signals from gauges i and j at frequency f_n
δ		Circular kurtosis
$\Delta\theta$		Quartile directional spread parameter

Text	Appendix C	
ϵ_r		Convergence check parameter at r^{th} IMLE iteration
θ_0		Mean direction
$\theta_{25\%}$		First quartile direction of cumulative distribution function
$\theta_{50\%}$		Median direction of cumulative distribution function
$\theta_{75\%}$		Third quartile direction of cumulative distribution function
θ_l		l^{th} discrete direction
θ_m		m^{th} direction of a set of M discrete directions
$\theta_{m_{min}}$		Direction of minimum energy
θ_p		Peak direction
$\lambda_r(f_n, \theta_m)$		IMLE correction function at the r^{th} iteration
σ		Circular width parameter
$\phi_{ij}(f_n)$		Cross-spectral phase between gauges i and j at frequency f_n

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	June 1995	Final report

4. TITLE AND SUBTITLE
1993 Annual Index of Wind Wave Directional Spectra Measured at Harvest Platform

5. FUNDING NUMBERS

6. AUTHOR(S)
Charles E. Long

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Engineer Waterways Experiment Station
3909 Halls Ferry Road, Vicksburg, MS 39180-6199

8. PERFORMING ORGANIZATION REPORT NUMBER
Miscellaneous Paper CERC-95-6

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Corps of Engineers
Washington, DC 20314-1000

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 words)***

This report indexes characterizing parameters of and describes a means of access to 2,339 wind wave frequency-direction spectra observed at the Texaco Oil Company Harvest Platform during calendar year 1993. Located at about the 200-m depth contour approximately 20 km west of Point Conception, California, the platform supports a spatial array of six pressure gauges, data from which are processed with an iterative maximum likelihood directional estimator. Nine parameters are defined, listed, and graphed in time series form: characteristic wave height, peak frequency, peak direction, four circular moment parameters, and two parameters derived from the quartile points of direction spectra.

14. SUBJECT TERMS
Deep water
Frequency-direction spectra
Wave climate
Wind waves

15. NUMBER OF PAGES
110

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED		

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