REPORT UAG-100

WORLD DATA CENTER A
for
Solar-Terrestrial Physics

Catalog
of Solar Filament Disappearances
1964-1980

February 1991

NATIONAL GEOPHYSICAL DATA CENTER

WORLD DATA CENTER A

National Academy of Sciences
2101 Constitution Avenue, NW
Washington, DC 20418 USA

World Data Center A consists of the Coordination Office and the following eight Subcenters:

COORDINATION OFFICE
World Data Center A
National Academy of Sciences
2101 Constitution Avenue, NW
Washington, DC 20418 USA
[Telephone: (202) 334-3368]

GLACIOLOGY (Snow and Ice)
World Data Center A: Glaciology (Snow and Ice)
Cooperative Inst. for Research in Environmental Sciences
University of Colorado
Boulder, Colorado 80309 USA
Telephone: (303) 492-5171

MARINE GEOLOGY AND GEOPHYSICS
(Gravity, Magnetics, Bathymetry, Seismic Profiles, Marine Sediment, and Rock Analyses):
World Data Center A for Marine Geology and Geophysics
NOAA, E/GC3
325 Broadway
Boulder, Colorado 80303-3328 USA
Telephone: (303) 497-6487

METEOROLOGY (and Nuclear Radiation)
World Data Center A: Meteorology
National Climatic Data Center
NOAA, E/CC
Federal Building
Asheville, North Carolina 28801 USA
Telephone: (704) 259-0682

OCEANOGRAPHY
World Data Center A: Oceanography
National Oceanographic Data Center
NOAA, E/OC
1825 Connecticut Avenue, NW
Universal Building, Room 406
Washington, DC 20235 USA
Telephone: (202) 673-5594

ROCKETS AND SATELLITES
World Data Center A: Rockets and Satellites
NASA/Goddard Space Flight Center
Code 630.2
Greenbelt, Maryland 20771 USA
Telephone: (301) 286-7354

ROTATION OF THE EARTH
World Data Center A: Rotation of the Earth
U.S. Naval Observatory
Washington, DC 20392-5100 USA
Telephone: (202) 653-1529 or 1527

SEISMOLOGY
World Data Center A: Seismology
U.S. Geological Survey
Branch of Global Seismology and Geomagnetism
Box 25046, Mail Stop 967
Denver Federal Center
Denver, Colorado 80225 USA
Telephone: (303) 236-1500

SOLAR-TERRESTRIAL PHYSICS (Solar and Interplanetary Phenomena, Ionospheric Phenomena, Flare-Associated Events, Geomagnetic Variations, Aurora, Cosmic Rays, Airglow):
World Data Center A for Solar-Terrestrial Physics
NOAA, E/GC2
325 Broadway
Boulder, Colorado 80303-3328 USA
Telephone: (303) 497-6324

SOLID-EARTH GEOPHYSICS (Seismicity, Earthquake Strong Motion, Tsunamis, Gravimetry, Earth Tides, Recent Movements of the Earth's Crust, Magnetic Measurements, Paleomagnetism and Archeomagnetism, Volcanology, Geothermics):
World Data Center A for Solid-Earth Geophysics
NOAA, E/GC1
325 Broadway
Boulder, Colorado 80303-3328 USA
Telephone: (303) 497-6521

World Data Centers conduct international exchange of geophysical observations in accordance with the principles set forth by the International Council of Scientific Unions. WDC-A is established in the United States under the auspices of the National Academy of Sciences. Communications regarding data interchange matters in general and World Data Center A as a whole should be addressed to World Data Center A, Coordination Office (see address above). Inquiries and communications concerning data in specific disciplines should be addressed to the appropriate subcenter listed above.

Catalogue of Solar Filament Disappearances 1964 – 1980

C. S. Wright
Electronics Research Laboratory
Defence Science and Technology Organisation
Salisbury SA 5108
Australia.

Contents

1 Introduction **1**

2 Data Sources **1**

3 Detection and Selection Criteria **2**

4 Characterisation **3**

4.1 Time of Disappearance — *Date, Time* and *Err.* . . . 3

4.2 Positions of Filaments — *Positions* . . . 4

4.3 Projected Width — W . . . 5

4.4 Darkness — D . . . 5

4.5 Magnetic Polarity — P . . . 5

4.6 Length — L . . . 5

4.7 Height — H . . . 5

4.8 Area — A . . . 6

4.9 Orientation of Line-of-Sight — ξ, ϕ and α . . . 6

4.10 Midpoint of Filament — *Midpt* . . . 7

4.11 Comments — *Com* . . . 7

5 Computed Parameters **7**

5.1 Line-of-Sight . . . 7

5.2 Filament Length . . . 9

5.3 Filament Height . . . 10

5.4 Corrections to Computed Length and Height . . . 11

5.4.1 Corrections to Computed Length . . . 11

5.4.2 Corrections to Computed Height . . . 12

5.4.3 Ramifications . . . 12

6 Internal Consistency **13**

6.1 Minimum Size Threshold . . . 13

6.2 Projected Width . . . 14

6.3 Magnetic Polarity 14

6.4 Variation in Data Source 14

7 Completeness **15**

7.1 Detection Near the Limbs 15

7.2 Data Gaps 16

7.3 Filament Disappearance Rate 16

8 Association of DFs with Flares and Active Regions **17**

9 Acknowledgements **18**

10 References **19**

A Calculation of Filament Height **20**

A.1 Contribution to Measured Width Due to Sheet Height 20

A.2 Contribution to Measured Width Due to Sheet Thickness 22

A.3 Expression for Sheet Height 23

B Tabulation of Filament Disappearances 1964–1980 **24**

List of Figures

1 Schematic of filaments viewed in projection against the chromospheric disk. Position measurements "•" are made at the base of the filament sheet at natural points of inflection. The "Projected Width", w, is the mean width measured at right angles to the filament axis. The "Magnetic Polarity" of the southern filament is defined as positive, or "N", whilst that of the northern, "curved" filament is undefined (see text). 4

2 The direction to the Earth in the reference frame of a solar filament. 6

3 A data-flow diagram showing the manipulations performed on the original data to produce the tabulated parameters shown in Appendix B. 8

4 The variation of mean (uncorrected) filament length, $\overline{\ell_{uc}}$, with angular distance from disk center, ϕ, for three ranges of the angle, α between the filament sheet and the line-of-sight to the Earth (• — $0° \leq \alpha < 20°$, × — $20° \leq \alpha < 40°$, ∘ — $40° \leq \alpha < 60°$). 10

5 The variation of mean corrected filament length, $\overline{\ell}$, with angular distance from disk center, ϕ, for three ranges of the angle, α, between the filament sheet and the line-of-sight to the Earth (see Figure 4). The trend in $\overline{\ell}$ as a function of latitude, λ, for filaments near central meridian is also shown (◇) for comparison. 11

6 The variation of mean computed height, $\bar{h}$, for small values of α before (•) and after (○) a correction is applied. 13

7 The variation with longitude in the number of filaments of all sizes. East limb is $-90°$, west limb is $90°$. 16

8 The estimated daily rate of disappearance from the visible solar hemisphere of filaments with corrected areas greater than $10^{\square}$, averaged over yearly intervals, from 1964 to 1980. The estimate is determined from the rate of disappearance between longitudes E45 and W45. 17

9 A superposed epoch showing the distribution of flares of importance 1B and greater surrounding the disappearance of 1030 filaments from 1968 to 1978. The horizontal line shows the number expected by chance and the zero epoch (TOD) is marked by a vertical line. The flares are binned in 3-hour intervals from 5 days before to 5 days after the TOD. 18

10 Diagram for calculating the contribution to the measured width, W_h, due to filament height, h, (see text). ABOZ is the plane of the filament sheet facing the observer on Earth and viewing from the direction of OD extended. $A'B'FO$ is the plane of the solar disk (which is also the plane of the sky) and XOY is the "plane" of the solar surface. 21

List of Tables

1 Filament Numbers Distributed by Length and Year 14

2 Filament Numbers Distributed by Area and Year 15

1 Introduction

Solar filaments are readily detected in Hα observations of the Sun as either extended, dark features seen above the disk, or as bright prominences seen above the limb. They vary enormously in size, from fine, dark features of a few heliographic degrees in length, within active regions for instance, to very large structures exceeding 60 heliographic degrees which overlie the quiet chromosphere or the spotless remnants of active regions. Filaments always lie above *magnetic inversion lines*, which separate regions of opposite magnetic polarity in the photosphere, although not all inversion lines are marked by visible filaments. Therefore they enable the broad features of the large-scale magnetic fields at photospheric and chromospheric levels to be mapped from routine Hα photographs (McIntosh, 1979).

It has long been known that filaments sometimes become unstable and disappear (eg. d'Azambuja and d'Azambuja, 1948). The most dramatic examples of this process take place on time-scales of a few tens of minutes to a few hours. Seen at the limb, this phenomenon is called an "eruptive prominence on the limb", or EPL. Seen against the disk it is called either a "sudden disappearing filament" (SDF) or "disparition brusque" (DB) — see, for example, Bruzek and Durrant (1977).

Like solar flares, DBs are readily detectable by routine, full-disk, Hα observations. However, unlike Hα flares, for which detailed and extensive published lists are available, published information on DBs is seriously incomplete. There may be several reasons for this, but probably the most important is that, until the last decade, DBs were not generally thought to be associated with disturbances to the interplanetary and terrestrial environments. Since Skylab, clear associations have been found between DBs and coronal mass ejections (eg. Munro et al., 1979; Webb and Hundhausen, 1987), solar particle events (eg. Kahler et al., 1986), interplanetary shocks and disturbances (Wright, 1983; Cane et al., 1986; Wright, 1990; Wright and Webb, 1990) and geomagnetic storms (Joselyn and McIntosh, 1981; McNamara and Wright, 1982; Wright and McNamara, 1983).

Like Hα flares, the DB may be treated as the easily observable *proxy* of an energetic solar event. Thus, large lists of carefully classified DBs would provide valuable information, not only about the evolution of the large-scale solar magnetic field, but also about processes which ultimately are of importance in the interplanetary and terrestrial environments.

The primary motivation for compiling this catalogue was to examine the relationship between filament disappearances, interplanetary disturbances and geomagnetic storms. Initially the need was for a large, internally consistent list of events, and completeness was of secondary importance. The first tabulation fulfilled this purpose (Wright and McNamara, 1983), but it was incomplete and did not provide a very satisfactory description of the filaments. The present catalogue is more complete, extends over a greater time-span and contains more information about each event.

It is important to emphasise at this point that the filament disappearances tabulated in this catalogue are, in general, *not associated* with active regions or with flares within active regions (Section 3, Section 8). They predominantly lay over the quiet chromosphere and were generally much larger than active region filaments. Therefore they should not be confused with the small, dark, inversion-line filaments which frequently erupt as part of the flare process (eg. Svestka, 1976) within active regions.

2 Data Sources

Two primary sources of data were used in compiling the catalogue. For the period 1974 to 1980, daily Hα photographic prints (18 cm disk diameter) from the Culgoora Solar Observatory, NSW, Australia were used. For the period 1964 to 1973, daily Hα photographs (12 cm disk diameter) from Boulder, Co, USA were used. Data gaps were partially filled by reference to the daily Hα prints (6 cm diameter) published in *Solar-Geophysical Data* (SGD) from 1967 to 1980. This procedure was particularly useful for the Culgoora time sequence, but was of limited usefulness for the Boulder sequence since most of the photographs in SGD were obtained from Boulder and therefore contained the same gaps.

In addition to the daily Hα photographs, reference was made to the Hα cinematographic films from Culgoora for the period 1974 to 1980 to establish accurate times of disappearance. However scanning the original films is very time consuming. Accurate times were therefore determined only for some of the largest events, and then only in the context of another study (Wright, 1983).

Reference was also made to the *Annotated Atlas of Hα Synoptic Charts* (McIntosh, 1979) which was based on Boulder and Sacramento Peak data and in which filament disappearances were reported. However there is not a one-to-one relationship between disappearances reported in the *Annotated Atlas* and in this catalogue. Some disappearances reported by McIntosh (1979) did not meet the criteria for inclusion here, and other events were found which were not recorded in the *Annotated Atlas.*

3 Detection and Selection Criteria

Filament disappearances were detected by comparing consecutive Hα photographs. Usually the photographs were at approximately daily intervals, but sometimes larger gaps in observations occurred. Disappearances could be readily detected during longer data gaps, especially for large filaments, but the timing of these events is more uncertain and disappearances near the east and west limbs are systematically excluded on these occasions (Section 7.2).

A filament which was visible on one photograph was deemed to have disappeared if it was absent, or a substantial portion of it was absent, from the following photograph on which it should have appeared. Sometimes filaments disappear without trace. In other cases, substantial portions of a filament may remain. The relatively poor time resolution permits the possibility of confusing more-or-less abrupt disappearances with normal day-to-day evolution in the size, shape and darkness of filaments. This effect is likely to be more serious for small rather than for large filaments. The only way to improve the reliability of detection is to improve the time resolution of the Hα photographs (Section 4.1). It follows that many of the disappearances listed in this catalogue may not resemble the classic SDF, or EPL, in which most of the filament erupts within a few tens of minutes. Instead, some recorded events may involve slow dissipation with no eruption of material. For this reason, the events are referred to here as "disappearing filaments", or DFs.

Selection of events to be included within the catalogue was made on the basis of filament size alone. However a difficulty arose in choosing an adequate definition of filament size. The overall length of a filament may be readily measured at most disk locations, but filaments of the same length may differ greatly in height and mass content. Measurement of area is not straightforward since the absorbing material in filaments predominantly occupies thin, vertical sheets with any orientation with respect to an observer on Earth (eg. Tandberg-Hanssen, 1974). Thus, a filament viewed near disk center or "end-on" near the limb may appear as a thin, dark, strip of small area whereas the same filament viewed "side-on" and well away from disk center may appear as a broad, dark band with relatively large area. Hence the apparent area of a filament depends upon its position and its orientation with respect to the observer.

Also, observations of filaments made with high angular resolution show them to be comprised of many individual fibrils which collectively make up the body of the filament (eg. Bruzek and Durrant, 1977). This is very apparent in prominences at the limb where filaments are frequently seen as arcades of loops with (visual) voids beneath. Hence, although the body of the filament may lie within a thin, vertical envelope (called the filament sheet), the envelope does not have uniform height, thickness or density.

It follows that the specification of a lower-limit of filament-size for inclusion within the catalogue is somewhat subjective. Generally, filaments with lengths $\gtrsim$ 10 heliographic degrees were included, although sometimes shorter filaments were included if they were very distinct and their projected widths were $\gtrsim$ 0.5 heliographic degrees. In addition to being subjective, the lower threshold for inclusion may have varied systematically from year to year, since the catalogue was compiled over several years from Hα photographs of various sizes and qualities. Although these difficulties may impose limitations on some uses of the catalogue involving small filaments, size thresholds can be identified above which the catalogue is internally consistent over all years (Section 6.1).

Most of the events listed involve filaments which overlie quiet chromospheric regions, or the spotless remnants

of active regions. Selection was made on the basis of size alone, and the proximity to active regions was not considered. However, many of the low-latitude events may have occurred near active regions, on portions of the same magnetic inversion lines which separate the magnetic polarities within the active regions. Although it is well known that active-region filaments may erupt as part of the flare process in active regions, such filaments are nearly always much smaller than the minimum size threshold considered here. Hence, the events listed in the catalogue are seldom, if ever, associated with Hα flares in active regions. This is further supported by a cross correlation analysis of the filament disappearances and energetic Hα flares (Section 8). On the other hand, many of the listed events may have been accompanied by nearby Hα flare-like brightenings in the quiet chromosphere. Seldom are such brightenings intense and their evolution is usually gradual rather than impulsive (see Kahler et al., 1986 for an example). Thus they often go undetected in observations of the Sun.

4 Characterisation

Each event was parameterised initially by quantities measured from the two Hα photographs bounding the event in time. These were its time, position, projected width and darkness. In addition, the magnetic polarity of the photosphere on each side of the filament was determined from the full-disk magnetograms or the synoptic charts published in SGD. From these measurements, other quantities were computed, so that the final parameterisation of each filament, as presented in the table of Appendix B, consists of both measured and computed quantities. These quantities are described below. Further details relating to the derivation and correction of these quantities are discussed in later sections.

4.1 Time of Disappearance — *Date, Time* and *Err.*

In most cases filament disappearances were not observed in progress, so that accurate times were generally unavailable. However, limits on the times of disappearance were provided by the Hα photographs bounding the events. The dates and times listed in the first two columns of the table are the averages of these times. They represent the "best-estimate" times of disappearance (TOD). For example, a listing of "66 927 234 1158" indicates that a DF occurred on 27 September 1966 at 0234 UT $\pm$ 11 hr 58 min. The column marked "Err" lists the errors, or uncertainties, in the TOD and correspond to half the time interval between the bounding photographs. Thus the timing of filament disappearances in this catalogue differs from the usual "Start"/"End" tabulation that applies to most listings of solar events. Both the TOD and the uncertainty are given in hours and minutes. The date is given in years, months and days.

Between 1974 and 1980, times were determined using Culgoora Hα photographs, supplemented by the photographic record in SGD which consisted mostly of photographs from Boulder. (Daily Culgoora photographs were obtained, on average, around 2200 UT, whilst daily Boulder photographs were obtained, on average, around 1600 UT.) Thus the uncertainty in the TOD is systematically less during this period than it is between 1964 and 1973 when photographs were available from Boulder alone. In addition, the timing of some events was accurately determined from the Culgoora cinematographic Hα patrol film. Those which have accurate beginning *and* end times are qualified with the letter "A" in the "Err" column. Those which have accurate beginnings but uncertain endings are qualified with the letter "B", and those that have accurate endings but uncertain beginnings are qualified with the letter "E".

The durations of gaps in the data are also indicated in these columns (denoted by "GAP" in the last column of the table). Data gaps longer than about 48 hours were tabulated. In these cases, entries under "Date" and "Time" correspond to the last available photograph. The entry under "Err" is the time (in hours and minutes) of the photograph marking the end of the gap, and the following single-digit figure indicates the advance in calendar date spanned by the gap.

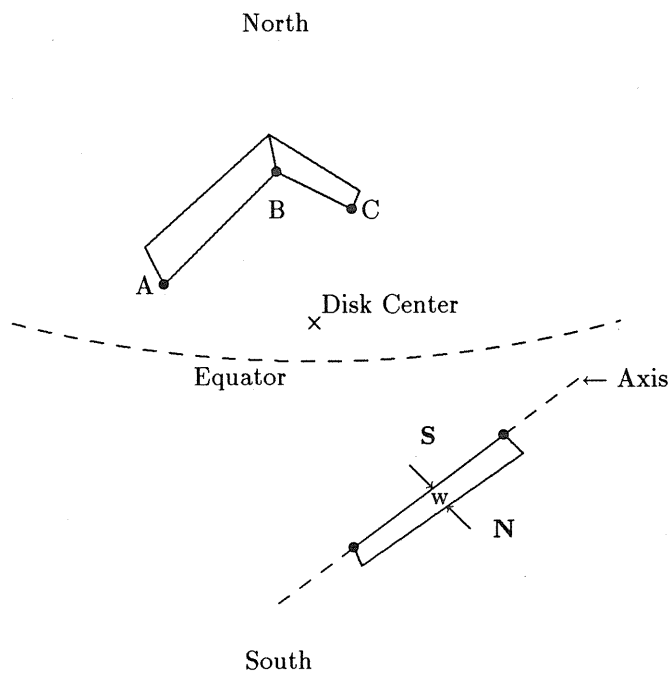


Figure 1: Schematic of filaments viewed in projection against the chromospheric disk. Position measurements "•" are made at the base of the filament sheet at natural points of inflection. The "Projected Width", w, is the mean width measured at right angles to the filament axis. The "Magnetic Polarity" of the southern filament is defined as positive, or "N", whilst that of the northern, "curved" filament is undefined (see text).

4.2 Positions of Filaments — *Positions*

The location of a filament was indicated by tabulating a number of heliographic positions along its length. For most filaments, a reasonable estimate of both their locations and orientations was provided by specifying just two points, corresponding to the heliographic positions of the ends of the filament. If a filament was severely contorted, so that its orientation changed significantly along its length, then three or (at most) four points were tabulated, with intermediate points chosen at natural inflections along the filament. All positions were measured at the base of the filament sheet, where it appeared to join the chromosphere (Figure 1). This procedure is particularly important for filaments near the limb where measurements from the top of the filament sheet would yield significant errors in position (Section 5.4.1).

Two columns of the table are reserved for position measurements. When three or more positions are given for one event, its description spans two lines in the table and intermediate positions along the filament are enclosed in parentheses. The positions given in the table were corrected for the time-difference between the last observation of the filament and the estimated TOD by assuming a latitude-independent rotation rate of 13 degrees per day. The positions are arranged with the eastern-most endpoint to the left.

Uncertainty in the measurement of position is usually only a few heliographic degrees near disk-center. However, near the limb the uncertainty may exceed 10-15 degrees, especially for filaments that lie partly beyond the limb.

4.3 Projected Width — W

The average width of a filament, seen projected onto the solar disk, was determined in heliographic degrees (1 degree = 1.22×10^7 meters). The projected width was measured at right angles to the filament axis, or the curve defining the projection of the base of the filament onto the chromosphere. It represents the average width of an envelope surrounding the body of the filament (Figure 1). In many cases the measurement is quite crude, especially for faint filaments. In the first section of the catalogue to be compiled (spanning the period 1974–1980), the projected width was tabulated only to the nearest 0.6 degrees, which corresponds to 1 mm on an 18 cm disk image. For the latter section (spanning the period 1966–1973), the width was tabulated more accurately to the nearest 0.2 degrees.

4.4 Darkness — D

The darkness of the filament was measured on a scale of 1 (faint) to 3 (dark); similar to the method of assigning brightness to Hα flares. Filaments of darkness level 1 had low contrast and were usually diffuse. Often they had little visible internal structure, through which the background chromosphere was discernible. Filaments of darkness level 3 were compact, usually with clearly visible internal structure. Filaments of darkness level 2 were intermediate. The darkness parameter is very subjective, depending upon the quality and size of the photograph, proximity to the limb (due to limb darkening), as well as upon the orientation of the filament with respect to the line-of-sight from the Earth.

4.5 Magnetic Polarity — P

This parameter indicates the photospheric magnetic polarity astride the filament. It was determined from the full-disk Kitt Peak or Mt Wilson magnetograms in *Solar-Geophysical Data*, or inferred from the synoptic charts if magnetograms were unavailable for an extended period surrounding an event. The polarity is specified as either north "N" or south "S", and indicates the polarity to the west of the filament (Figure 1). Filaments which were oriented east-west have the magnetic polarity on their *southern* side listed. The symbol "U" indicates that the polarity was either unavailable or undefined, as in the case of a greatly curved filament. The symbol "V" indicates that no attempt was made to determine the polarity, which was frequently so for small filaments after 1973. Errors in assigning the polarity are minimal.

4.6 Length — L

The length of a filament was measured in heliographic degrees. For a "straight" filament, which lies approximately on the arc of a great circle, the length is the angular distance between the endpoints. For strongly curved filaments, it is the sum of the angles subtended by the filament segments, or the great circle arcs connecting the tabulated positions along the filament.

Two kinds of errors affect the length measured in this way. First, filaments seldom lie precisely on great circles, so the great-circle length is a lower limit to the integrated length along the actual filament. Errors from this cause should usually be less than about 20%. Secondly, large errors may occur in the measured positions of filaments near the limb, due to projection effects. In some cases, one or both endpoints may lie beyond the limb. The tabulated length includes a correction for projection effects which is described in Section 5.4.1.

4.7 Height — H

The average height of a filament in heliographic degrees was computed from the average projected width in the manner described in Section 5.3. Errors in this parameter may be large if the angle between the line-of-sight and the plane of the filament sheet is small. This applies to all filaments near disk center and also to those

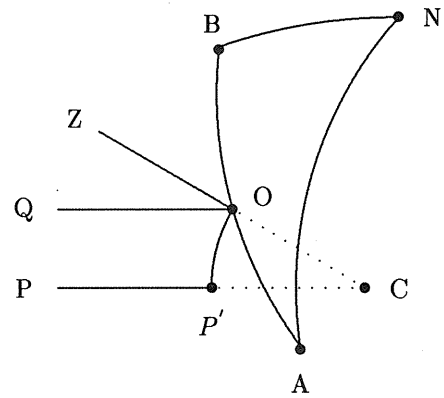


Figure 2: The direction to the Earth in the reference frame of a solar filament.

seen "end-on" at any disk location. In these cases corrections are applied (Section 5.4.2). Additional errors arise from the difficulty in defining and measuring the average projected width and from the unknown thickness of the filament sheet. Also, it was necessary to impose an arbitrary lower limit to the height of 0.3 heliographic degrees (Section 5.4.2).

4.8 Area — A

The calculated area of the filament sheet was determined from the product of the corrected length and corrected height, and is measured in square heliographic degrees. The corrected area is probably the best available measure of filament size.

4.9 Orientation of Line-of-Sight — ξ, ϕ and α

Xi and phi are angles, defined in Figure 2, which describe the orientation in the filament reference frame of the line-of-sight from the observer (on the Earth) to the filament. The angles xi and phi permit the height and area of the filament sheet to be estimated from the measured projected width.

In Figure 2, the filament is assumed to lie along a great circle arc AB. O lies on the solar surface at the midpoint of arc AB. C is the center of the Sun and Z is the zenith above O. Q lies on the line of sight from O to the Earth. P' is the center of the solar disk as seen from the Earth which lies on OP extended. OP' is a great circle arc onto which the line-of-sight, OQ, is projected. In the filament reference frame, the line-of-sight from the Earth to the filament is defined by the "zenith" angle $\widehat{ZOQ} = \phi$ and the "azimuth" angle $\widehat{AOP'} = \xi$. Alpha (not shown) is the angle between the line-of-sight and the plane of the filament sheet.

The calculation of xi, phi and alpha includes the variation of B_0 (heliographic latitude of disk center) with time. Phi and alpha are zero for all filaments at disk center. Phi is 90° for filaments at the limb. Xi and alpha are zero for filaments seen "end-on" at any disk location and are undefined for curved filaments. Xi is also undefined at disk center.

Xi and phi are confined to the range 0–90 degrees. It should be noted that filaments with fixed values of xi and phi may have either of *two* mirror-image, orientations on the disk. This ambiguity can be resolved by examining the tabulated positions.

4.10 Midpoint of Filament — *Midpt*

The midpoint is listed to provide a convenient summary of a filament's location. For the majority of filaments, which are "straight", the midpoint is the center of the great circle arc connecting the two endpoints. However, where three or four positions are required to define the location of a filament, the position of the midpoint is estimated by averaging the latitudes and longitudes over all positions. While this procedure does not yield the centroid of the filament, it is sufficiently accurate for the present purpose.

4.11 Comments — *Com*

Comments are usually restricted to the indication of data gaps.

5 Computed Parameters

All tabulated parameters in Appendix B, except the darkness, projected width and magnetic polarity, have been computed using measurements taken from the original Hα photographs. The *Date, Time, Err* and *Position* entries involve simple manipulations of the measured data (Sections 4.1 and 4.2 above). However, determination of the length, height, area and line-of-sight to the Earth is more involved. In addition, corrections have been applied in some cases to the computed values of length and height.

The manipulations which have been carried out on the original data to produce the entries in Appendix B are summarised in the data-flow diagram (de Marco, 1979), Figure 3. The calculations and corrections involved are described in detail in the following sections.

5.1 Line-of-Sight

Filament positions are specified in heliographic longitude, L, and latitude, λ. The angles ξ and ϕ define the orientation of the line-of-sight, in the filament reference frame, from the observer to the filament sheet. Referring to Figure 2, points A and B with coordinates (L_A, λ_A) and (L_B, λ_B) lie on a great circle on the solar surface and define the endpoints of a filament. $P'(0, B_0)$ marks the center of the disk seen from the Earth at CP extended, and $O(L_O, \lambda_O)$ marks the midpoint of the great-circle arc AB. C lies on PP$'$ extended, at the center of the Sun, and N is the north pole. Z lies on CO extended and marks the zenith with respect to the midpoint of the filament. P$'$O lies within the plane PCO and is therefore a great-circle arc defining the projection of the line-of-sight to the filament, OQ, onto the solar surface.

The angle $\widehat{ZOQ}$, ϕ, is the "zenith" angle of the line-of-sight from the filament to the Earth. Since PP$' \gg$ P$'$C, QO is approximately parallel to PP$'$ and the spherical angle OP$'$ is approximately equal to ϕ. The angle, ξ, between great circles OP$'$ and OA is the "azimuthal" angle of the line-of-sight from the filament to the Earth. The angles ξ and ϕ can be determined in the following manner.

From the Cosine Law of spherical trigonometry (Smart, 1944), the spherical angle BA is given by,

$$BA = \cos^{-1}\left\{\sin\lambda_B \sin\lambda_A + \cos\lambda_B \cos\lambda_A \cos\left(L_A - L_B\right)\right\}. \tag{1}$$

Then, in terms of BA, the angle $\widehat{NBA}$ can be expressed,

$$\widehat{NBA} = \cos^{-1}\left\{\frac{\sin\lambda_A - \cos BA \sin\lambda_B}{\sin BA \cos\lambda_B}\right\}, \tag{2}$$

and the co-latitude of O is given by,

$$\cos NO = \cos\frac{BA}{2}\sin\lambda_B + \sin\frac{BA}{2}\cos\lambda_B \cos\widehat{NBA}, \tag{3}$$

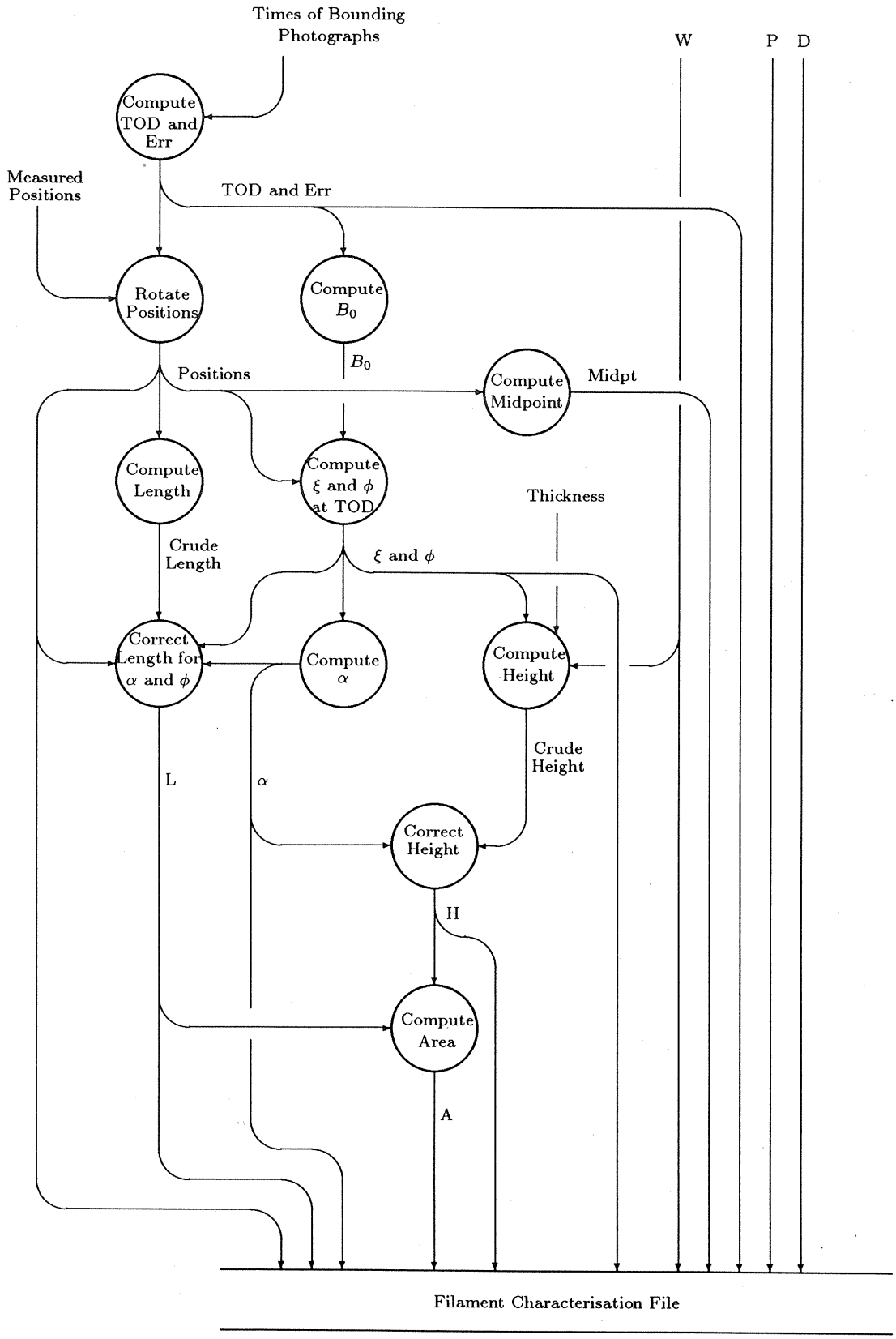


Figure 3: A data-flow diagram showing the manipulations performed on the original data to produce the tabulated parameters shown in Appendix B.

so that,

$$\cos \widehat{BNO} = \frac{\cos \frac{BA}{2} - \sin \lambda_B \cos NO}{\cos \lambda_B \sin NO}. \tag{4}$$

Hence, the latitude and longitude of the midpoint, O, of the arc AB can be determined from the relations,

$$L_O = L_B + \widehat{BNO} \tag{5}$$

and

$$\lambda_O = \frac{\pi}{2} - NO, \tag{6}$$

and therefore, ϕ, which is approximately equal to $P'O$, is given by,

$$\phi = \cos^{-1} \left\{ \sin \lambda_{P'} \sin \lambda_O + \cos \lambda_{P'} \cos \lambda_O \cos L_O \right\}. \tag{7}$$

Also,

$$P'A = \cos^{-1} \left\{ \sin \lambda_{P'} \sin \lambda_A + \cos \lambda_{P'} \cos \lambda_A \cos L_A \right\}, \tag{8}$$

so that ξ, the angle $\widehat{AOP'}$, is given by,

$$\xi = \cos^{-1} \left(\frac{\cos P'A - \cos \phi \cos \frac{BA}{2}}{\cos \phi \sin \frac{BA}{2}} \right). \tag{9}$$

For any filament arc AB, the angles defining the line-of-sight in the reference frame of the filament sheet can be computed by sequentially evaluating the Equations 1 through 9. In principle, an analytical expression for ξ and ϕ could be determined from these equations in terms of λ_A, L_A, λ_B, L_B and $\lambda_{P'}$. However, with a computer, it is simpler to evaluate Equations 1 through 9, arriving eventually at the numerical values of ξ and ϕ for each filament. In this algorithm the heliographic latitude of disk center was modelled by the expression,

$$B_0 \simeq -7.25 \sin (d + 23), \tag{10}$$

where B_0 is in degrees and d is the number of days into the year.

Finally, it can be shown that the angle α between the line-of-sight and the filament sheet, in terms of ξ and ϕ, is given by,

$$\alpha = \cos^{-1} \left(\sin^2 \phi \cos^2 \xi + \cos^2 \phi \right)^{1/2}. \tag{11}$$

5.2 Filament Length

The uncorrected length of the filament is the arc length AB in Figure 2, which may be determined from,

$$\ell_{AB} = \cos^{-1} \left\{ \sin \lambda_B \sin \lambda_A + \cos \lambda_B \cos \lambda_A \cos (L_A - L_B) \right\}. \tag{12}$$

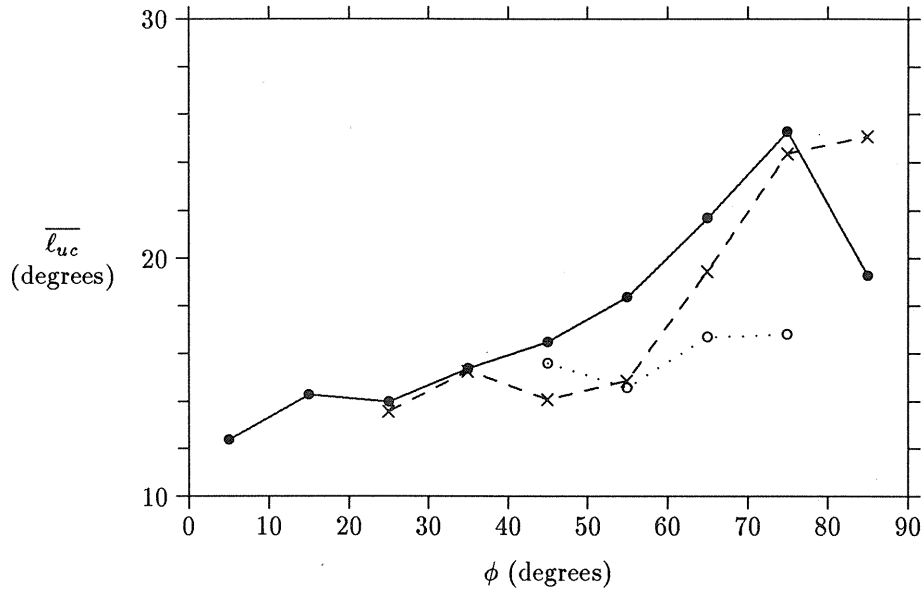


Figure 4: The variation of mean (uncorrected) filament length, $\overline{\ell_{uc}}$, with angular distance from disk center, ϕ, for three ranges of the angle, α between the filament sheet and the line-of-sight to the Earth (• — $0° \leq \alpha < 20°$, × — $20° \leq \alpha < 40°$, o — $40° \leq \alpha < 60°$).

5.3 Filament Height

Assuming a filament to be a thin, vertical sheet with thickness t, its height, h, can be determined from the measured value of the projected width, W, by the following formula (Appendix A),

$$h = \frac{\sqrt{1-\sin^2\phi\cos^2\xi}}{\sin\phi\sin\xi}\left(W - t\cos\phi\sqrt{\frac{1-\sin^2\phi\sin^2\xi}{\cos^2\phi+\sin^4\phi\sin^2\xi\cos^2\xi}}\right). \tag{13}$$

This expression assumes a flat solar surface. However, it is a good approximation for filaments at all heliographic positions, even close to the limb, providing $\ell \gg h$.

By rearranging Equation 13, it is clear that the projected width, W, as measured from the Hα photographs, consists of components due to both the height and the thickness of the filament sheet, with the magnitude of each component depending upon the viewing angle. Thus, determination of the filament height effectively involves the removal of the component of projected width arising from the thickness of the filament sheet.

A major source of error in the computed height stems from uncertainties in the measurement of projected width and, ultimately, from the unknown physical form of the filament. Modelling filaments as uniform, flat, vertical sheets is clearly a gross simplification. In addition, determination of the height from Equation 13 requires knowledge of the filament sheet thickness, which is unknown and cannot be measured from the Hα photographs. Thus, a constant thickness of 0.6° was chosen for all filaments. Some justification for choosing this value was that it appeared representative of the projected widths of filaments viewed near disk center, since on these occasions the sheet thickness of an ideal filament is equivalent to the projected width. Also, Bruzek and Durrant (1977) quote typical filament sheet thicknesses of 4 – 15 Mm, which are equivalent to 0.34° – 1.23°. An additional reason for settling on this value was that 0.6° was the minimum value assigned to the projected width for the period 1974 – 1980.

While the derived values for filament height in Appendix B agree favourably with the range 15 – 100 Mm (1.2° – 8.2°) quoted by Bruzek and Durrant (1977), the assumption of constant sheet thickness leads to extreme estimates of filament height under some conditions. Methods used to compensate for these extreme estimates are discussed in Section 5.4.2.

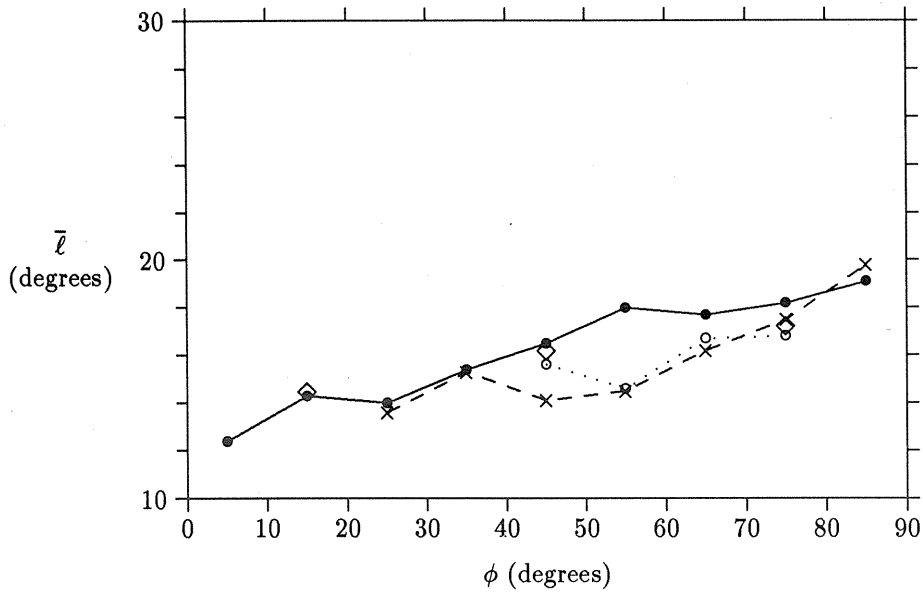


Figure 5: The variation of mean corrected filament length, $\bar{\ell}$, with angular distance from disk center, ϕ, for three ranges of the angle, α, between the filament sheet and the line-of-sight to the Earth (see Figure 4). The trend in $\bar{\ell}$ as a function of latitude, λ, for filaments near central meridian is also shown ($\diamond$) for comparison.

5.4 Corrections to Computed Length and Height

The physical form of filaments imposes severe restrictions upon the definitions of parameters such as "length" and "height". This is compounded by the variety of orientations that filaments may have with respect to an observer on Earth. Ignoring difficulties associated with the physical form of a filament, the two main factors which contribute to errors in length and height (and therefore area) are limb proximity, specified by the angle ϕ, and the orientation of the line-of-sight with respect to the filament sheet, specified by the angle α.

5.4.1 Corrections to Computed Length

The length computed in Section 5.2 contains errors due to the uncertainties in the measurement of the filament endpoints. These mainly arise from "viewing" effects and are most serious near the limb, especially when the angle, α, between the line-of-sight and the filament sheet is small (filament viewed end-on). Under these circumstances it may be difficult to determine the position on the chromospheric image of the base of the filament sheet. If the position measurement is erroneously made from the projection of the top of the filament sheet, then the recorded position will be closer to the limb than it should be, resulting in an erroneously large value of ℓ.

Figure 4 shows a plot of mean uncorrected length, $\bar{\ell}$, as a function of ϕ for three ranges of α. For values of α less than 40°, there is a marked increase in $\bar{\ell}$ near the limb ($\phi > 60°$), most probably due to the effect described above. However, filaments very close to the limb and for which $\alpha < 20°$ show a decrease in $\bar{\ell}$, due to "occulting" of many filaments by the limb. Occulting is not so severe for filaments viewed in broadside for which $\alpha \sim 90°$.

The occulting effect is more pronounced near the east limb than it is near the west limb for the following reason. Filaments which are partially occulted by the east limb on a particular photograph can be readily detected on a later photograph since they appear nearer to central meridian. The disappearance of a filament that is partially occulted by the east limb can therefore be readily detected. However its length, as measured from the earlier photograph, will be underestimated. On the other hand, it often cannot be decided if filaments near the west limb have erupted or have merely become prominences which are indistinguishable because of the poor contrast of limb features on Hα disk photographs. Filaments whose disappearance are detected near the west limb usually have been parameterised from photographs on which they were well away from the limb and

therefore not strongly occulted. It follows that the class of DF events detected near the west limb will have greater average length than their eastern counterparts.

In addition to the viewing and occulting effects, there appears to be a general increase in $\bar{\ell}$ with ϕ for all ranges of α. This is probably an artifact of a genuine increase in $\bar{\ell}$ with *latitude* which is apparent when filaments are sorted into latitude bands. This trend is shown in Figure 5. It is not possible to accurately compensate for viewing and occulting effects. However, it is reasonable to apply a statistical correction for the increase in $\bar{\ell}$ when α is small, whilst preserving the general increase of $\bar{\ell}$ with ϕ, due to the latitudinal gradient in $\bar{\ell}$. This was accomplished by dividing the apparent lengths of all filaments in the range defined by $\phi > 50°, \alpha < 40°$ by 0.34ϕ, where ϕ is in degrees. The correction was not applied for $\phi > 80°$ in the eastern hemisphere since, in this regime, $\bar{\ell}$ is significantly reduced due to severe occulting. Figure 5 shows the dependence of $\bar{\ell}$ upon ϕ for the three ranges of α after this correction has been applied. Superimposed on these plots is the latitudinal trend of $\bar{\ell}$ computed from the uncorrected lengths of filaments near central meridian, for which viewing and occulting errors are negligible and for which $|\lambda|$ is approximately equivalent to ϕ.

5.4.2 Corrections to Computed Height

The assumption of constant filament sheet thickness of 0.6° leads to very small values of the computed heights for some filaments. Even *negative* values can arise when the second term in parentheses in Equation 13 is greater than the measured projected width. To cope with these conditions, an arbitrary minimum height of 0.3° was imposed on the relatively few filaments in this class.

Under other conditions, Equation 13 may lead to unrealistically large computed heights. This mainly arises for filaments seen near disk center, and "end-on" at other disk locations, which implies that the angle, α, between the line-of-sight and the filament sheet is small. Under these conditions, the measured value of projected width should arise mainly from the sheet thickness, with only a small component from the sheet height. However, if the measured value of the projected width is much larger than 0.6° (the assumed sheet thickness), then a very large sheet height is implied.

Figure 6 shows that this is indeed the case. The mean calculated height is nearly constant at 1.5 degrees when $\alpha > 12$ degrees, but increases rapidly as $\alpha \rightarrow 0$. Figure 6 also shows the dependence of $\bar{h}$ upon α after a correction factor of 0.0875α (α in degrees) has been applied to the computed height of each filament in the sample for which $\alpha < 9°$. The form of this factor was chosen to preserve the nearly constant value of the mean corrected height over all values of α.

5.4.3 Ramifications

The corrections described above attempt to remove statistical bias introduced during detection and specification of filaments within certain viewing-angle regimes. Consequently, the tabulated values of length, height and area are likely to be less accurate inside than outside of those regimes. This is important if the sizes of individual filaments wish to be compared, although it is probably of lesser importance to studies of a statistical nature.

Values of length were altered only in the regime where $\phi > 50°$ and $\alpha < 40°$, which relates to filaments seen roughly "end-on" at more than 50° from disk center. Values of height were altered only in the regime where $\alpha < 9°$, which relates to all filaments within 9° of disk center and those seen nearly "end-on" at any other location. Recorded areas are affected by corrections to either length or height.

The tabulated values of α and ϕ in Appendix B permit identification of those filaments with corrected values of length, height and area.

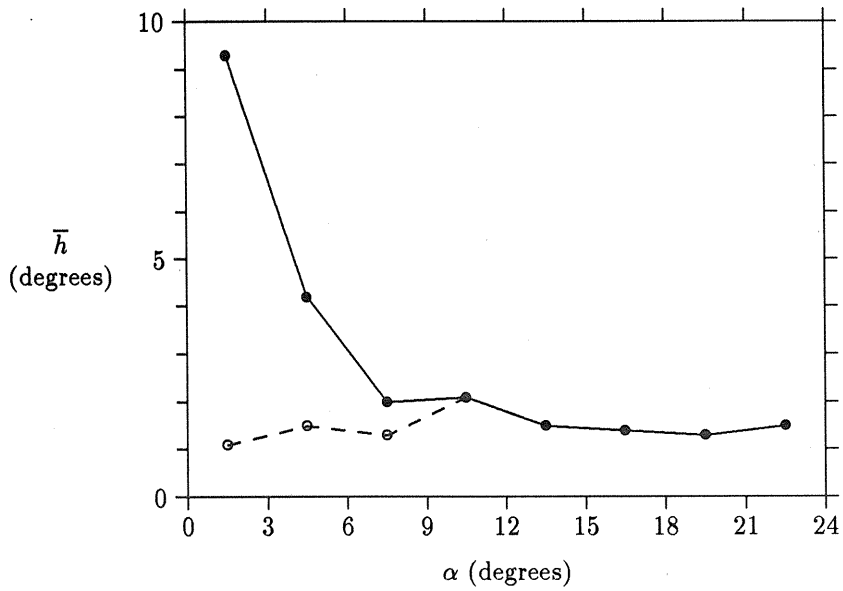


Figure 6: The variation of mean computed height, $\bar{h}$, for small values of α before (•) and after (o) a correction is applied.

6 Internal Consistency

The catalogue was compiled over a period of several years, from several kinds of Hα records of varying quality. Entries for the period 1974 through 1980 were compiled first over a period of about one year. Later the catalogue was extended backwards in time to 1964. During this extension, some improvements were made in the measurement and tabulation procedures and additional information about each event was recorded. These changes then forced a revision of the 1974–1980 entries, but due to the effort involved, it was not possible to completely revise the entries for all events. Some minor discrepancies therefore exist between the two time periods 1964–1973 and 1974–1980. These, and other inconsistencies, are described below.

6.1 Minimum Size Threshold

Of major concern is the possible variation over time of the minimum size threshold governing inclusion of events within the catalogue. Since the number of filaments increases with decreasing size, a variation in this size threshold would produce large errors in the estimated rate of disappearance of filaments over time.

This problem can be readily addressed by dividing the data into sequential time intervals and examining the size distribution of filaments within each time interval. Tables 1 and 2 show the number distribution of "straight" filaments vs corrected length and area for each year. There is clearly a large year-to-year fluctuation in the apparent number of disappearances of very small filaments. Also, most of the yearly distributions display well-defined peaks, in the length range $10° < \ell \leq 15°$ and in the area range $0^{\square} < A \leq 10^{\square}$, but with some variation from year to year.[1] The peak, or *turn-over* point for a particular year (bold numbers in Tables 1 and 2), defines a size threshold below which events are likely to be excluded from the catalogue for that year. Year-to-year consistency in the number of disappearances can reasonably be assured by confining attention to filaments with lengths (or areas) above the highest turn-over point for any year.

It is clear from these distributions that estimates of the rate of disappearances should be restricted to filaments with corrected lengths $\gtrsim 15°$, or areas $\gtrsim 10^{\square}$.

[1] The $\square$ superscript indicates "square degrees".

Table 1: Filament Numbers Distributed by Length and Year

Year	Number in Length Range										Total
	0-5°	5-10°	10-15°	15-20°	20-25°	25-30°	30-35°	35-40°	40-45°	> 45°	
1965	3	**15**	14	7	9	0	2	0	0	0	50
1966	10	**36**	24	11	6	5	1	0	2	1	96
1967	7	35	**51**	36	15	13	7	5	1	3	173
1968	4	29	**46**	28	21	15	8	1	0	0	152
1969	1	13	**36**	29	16	10	4	3	0	2	114
1970	0	11	**21**	20	15	5	2	3	0	1	78
1971	0	10	**25**	16	13	7	1	1	0	2	75
1972	4	12	**23**	22	12	13	2	3	0	1	92
1973	0	10	**17**	5	6	2	2	2	0	0	44
1974	10	**25**	23	12	7	4	0	0	1	0	82
1975	5	**33**	17	13	6	4	0	0	1	0	79
1976	4	17	**24**	11	5	1	1	0	0	1	64
1977	1	15	**26**	13	9	6	2	1	2	0	75
1978	2	38	**39**	28	11	8	6	3	0	0	135
1979	4	40	**46**	26	14	8	5	1	0	0	144
1980	1	32	**36**	27	10	8	5	3	1	2	125

6.2 Projected Width

The average projected width of filaments in the period 1974 through 1980 were measured in relatively coarse units of 0.6 heliographic degrees (which corresponded to 1 mm on a solar image of 18 cm diameter). This was refined to 0.2 heliographic degrees for the period from 1964 through 1973. The coarse width measurement influences the computed heights and is therefore reflected in the calculated areas of filaments. Larger errors are therefore expected in the calculated height and area of events in the 1974–1980 period.

The minimum projected width of 0.6 degrees assigned to the filaments in the period 1974–1980 also probably accounts for the lower turn-over points in the area distributions for these years (Table 2), because the heights (and therefore the areas) of thin filaments will be systematically underestimated.

The inconsistency in measured width is probably of little importance for most statistical studies. However it is clearly of great importance in assessing the relative sizes of individual events.

6.3 Magnetic Polarity

The magnetic polarity, as defined in Section 4.5, was recorded for all events during the period 1964 through 1973, except when it was not possible to do so because of breaks in the magnetogram records. Such breaks were more common during the early years. Magnetic polarity was not recorded at all during the initial compilation of 1974–1980. During the subsequent revision, polarity was recorded only for relatively large filaments. The qualifying letter "V" indicates events whose polarities were not assessed during revision.

6.4 Variation in Data Source

Several minor inconsistencies arose from the use of four kinds of primary data (Section 2) in the compilation. The most important are the differences in timing and time resolution described in Section 4.1. The record of events is more complete after 1973, when Hα photographs from *Solar-Geophysical Data* as well as Culgoora were available. Other variations, such as the accuracy of extracting position and projected width from the different primary data sources, are expected to be insignificant.

Table 2: Filament Numbers Distributed by Area and Year

Year	Number in Area Range										Total
	0-5□	5-10□	10-15□	15-20□	20-25□	25-30□	30-35□	35-40□	40-45□	> 45□	
1965	9	**16**	5	6	6	1	1	0	2	5	50
1966	**37**	20	12	7	2	1	2	2	2	12	96
1967	**38**	36	18	13	11	6	7	4	4	39	173
1968	24	**43**	25	13	5	8	6	3	4	23	152
1969	16	**29**	13	7	7	9	5	4	3	25	114
1970	10	**19**	9	3	8	2	2	3	3	22	78
1971	7	**18**	7	8	6	8	2	0	1	22	75
1972	10	**23**	10	8	11	9	5	0	1	22	92
1973	**9**	7	2	5	2	3	2	2	4	9	44
1974	**36**	18	9	6	2	2	0	3	1	5	82
1975	**27**	21	6	10	5	4	0	1	0	8	79
1976	**26**	10	12	1	3	3	2	1	1	5	64
1977	**23**	17	8	9	3	2	3	0	2	9	75
1978	**29**	26	11	9	8	7	7	8	7	27	135
1979	**37**	17	13	20	11	12	4	7	3	22	144
1980	**23**	17	14	9	17	10	6	4	3	22	125

7 Completeness

The main factors controlling completeness were the continuity and quality of the primary data sources. Some disappearances may have been overlooked on poor quality Hα records, and many small events were consciously ignored. It is unlikely that many large events were missed during periods for which records were available; providing they occurred within about 60° of disk center. However there is no doubt that many events were overlooked near the limbs, (particularly the west limb), and during large data gaps.

7.1 Detection Near the Limbs

In addition to limb darkening, which reduces the detection of events near the limbs generally, data gaps (Section 7.2) also contribute to a deficit in the recorded number of events near the east and west limbs. Furthermore, there is a subtle, systematic difference between the east and west limbs in the probability of detecting filament disappearances using photographs obtained at daily intervals.

Some disappearances near the east limb may have been overlooked due to the difficulty in estimating the filament size. Nonetheless, if a filament is observed on or near the east limb in one photograph and it is absent from the next, there is no doubt that it constitutes an event. It is more difficult to detect true disappearances near the west limb because it is frequently unclear whether a filament has erupted, passed over the limb, or has become an indistinguishable prominence. Since events were not recorded if there was doubt about their authenticity, fewer detections were recorded near the west limb than near the east limb (see also Section 5.4.1).

Figure 7 shows the number of filaments (both curved and "straight") of all sizes in 15° ranges of longitude (lunes). The midpoint, corrected for rotation, was used to assign filaments to appropriate lunes. The distribution of events is approximately flat within 45° of central meridian, but falls steeply towards the east and west limbs. The east/west asymmetry appears as a 129:85 ratio in the number of events within 30° of the respective limbs. (The fact that there are fewer events within 15° of the east limb than within 15° of the west limb is a consequence of the rotation correction, which transfers many events from a given lune into the adjoining western lune.)

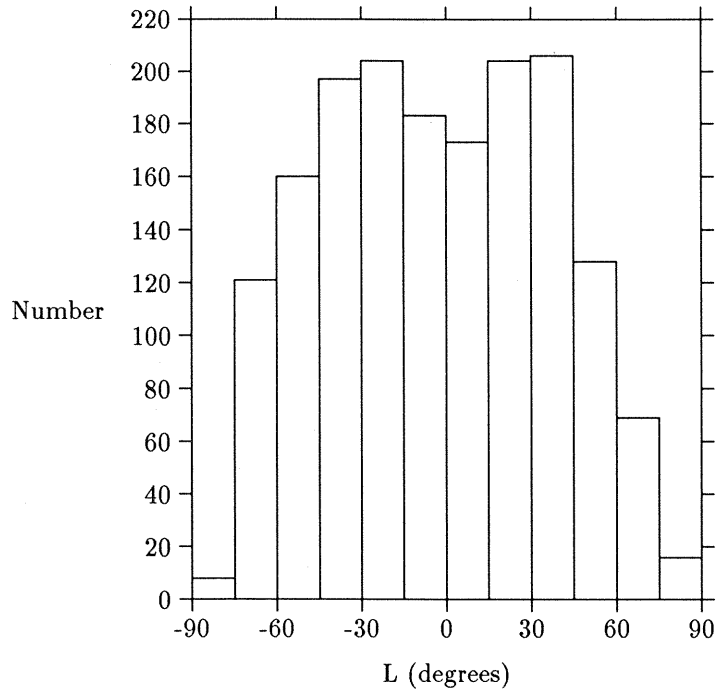


Figure 7: The variation with longitude in the number of filaments of all sizes. East limb is $-90°$, west limb is $90°$.

7.2 Data Gaps

Many filaments may have disappeared during gaps in the photographic record. Gaps $\gtrsim$ 48 hours were usually recorded, but efforts were not made to recover events which occurred within these gaps. The number of events missed under these circumstances is independent of longitude and is simply proportional to the duration of the data gap.

In contrast, most events that occurred in data gaps of less than about 48 hours could be recovered from the photographic record, albeit with increased uncertainty in their times of disappearance. The exceptions include:

1. Events whose locations near the west limb precluded detection on subsequent photographs.
2. Filaments which appeared on the disk from beyond the east limb during the data gap, and which disappeared before they could be detected on subsequent photographs.
3. Filaments which both formed and disappeared on the disk at any location during the data gap.

The events at 1 and 2 above contribute to the deficit near the limbs. The events at 3 contribute to an overall deficit in the number of observed disappearances which is independent of longitude and which is assumed to be small.

7.3 Filament Disappearance Rate

It is easier to estimate the absolute rate of disappearance than it is to separately estimate the proportions of events that were undetected because of data gaps and the limb effects described above. This can be done by considering only those filaments that disappeared from centrally located lunes. In this domain, few events will be missed during data gaps of $\lesssim$ 48 hours, and the number of events missed during longer gaps is simply proportional to the duration of the gaps (Section 7.2). Hence, after correcting for the longer data gaps, the only error in the

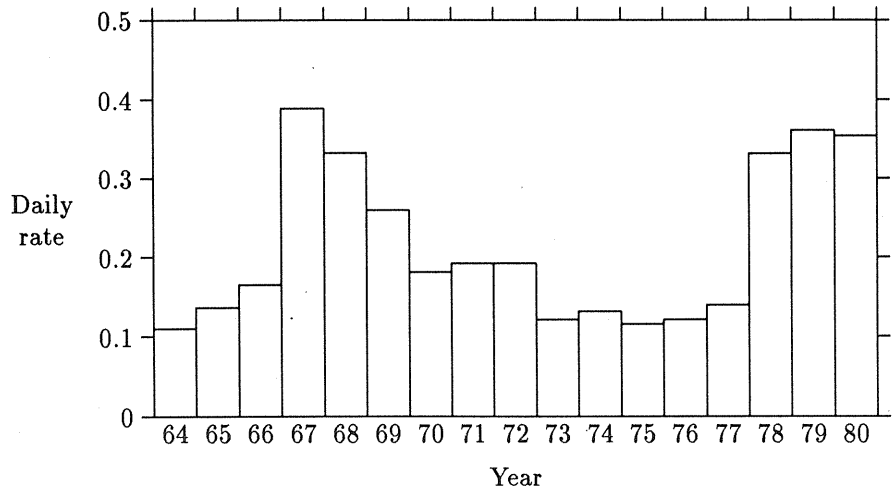


Figure 8: The estimated daily rate of disappearance from the visible solar hemisphere of filaments with corrected areas greater than $10^{\square}$, averaged over yearly intervals, from 1964 to 1980. The estimate is determined from the rate of disappearance between longitudes E45 and W45.

number of events located in the central lunes is due to those few events that were overlooked while scanning the photographs, and to those unseen near the poles because of limb darkening.

The average daily disappearance rate of filaments from the disk, uncorrected for data gaps longer than 2 days, is simply $2N/t$, where N is the total number of disappearances between longitudes E45 and W45 (Figure 7) during some sufficiently large time interval t days. After correcting for data gaps, the mean daily rate of disappearance $\bar{q}_t$ over the entire disk is given by,

$$\begin{aligned} \bar{q}_t &= 2\frac{N}{t} + 2\frac{N\tau}{t\,(t-\tau)} \\ &= \frac{2N}{t-\tau} \end{aligned} \tag{14}$$

where τ is the summed durations of gaps longer than two days within the time interval t. t must be long compared with typical data gaps. Implicit in this estimate is the assumption that the number of filaments that both form and disappear in a time $\lesssim 2$ days is small.

Figure 8 shows the estimated daily rate of disappearance from the visible solar hemisphere of filaments with corrected areas greater than $10^{\square}$, averaged over yearly intervals ($t = 1$ year), from 1964 to 1980. The estimated rate of disappearance from the entire Sun is double this rate.

8 Association of DFs with Flares and Active Regions

It is important to emphasise that the DF events in this catalogue are, in general, not associated with active regions or with flares within active regions. Although some were close to active regions, often on common inversion lines, they predominantly lay over the quiet chromosphere and were generally much larger than active region filaments. Therefore they should not be confused with the small, dark, inversion-line filaments which frequently erupt as part of the flare process (eg. Svestka, 1976) within active regions.

Figure 9 shows the number of flares of importance 1B and greater that occurred within each 3-hour time interval, from five days before to five days after a DF, summed over all 1030 DF events during the period 1968 to 1978. The flares were from the *Solar-Geophysical Data* group reports and occurred, almost entirely, within active regions. A causal connection between the flares and the DFs would appear as a broad excess above the number expected by chance near zero delay. This is not observed in Figure 9, nor does such an excess appear

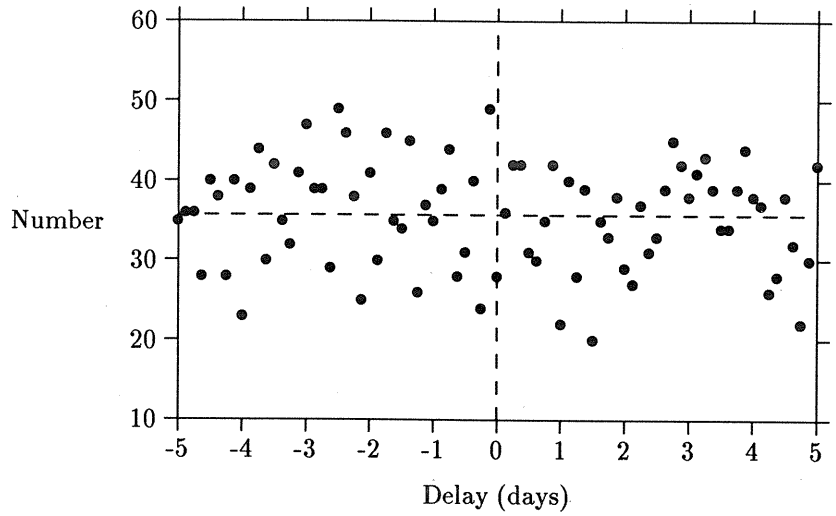


Figure 9: A superposed epoch showing the distribution of flares of importance 1B and greater surrounding the disappearance of 1030 filaments from 1968 to 1978. The horizontal line shows the number expected by chance and the zero epoch (TOD) is marked by a vertical line. The flares are binned in 3-hour intervals from 5 days before to 5 days after the TOD.

when the flare and filament size thresholds are varied, or when the integration interval is varied between 3-hours and 1-day. Assuming the delay between the postulated flare/filament interaction to be short ($\lesssim$ 3 hours), most genuine interactions should be clustered within ± 12 hours of zero delay, which corresponds to the approximate uncertainty in the TOD of filaments. A consideration of the scatter about the chance level (after the data have been integrated over 24 hours) indicates that a total of about 40 genuine interactions in this delay range should lead to a pronounced (3σ) peak. It is therefore very unlikely that there are more than about 40 *genuine* interactions of this kind in the 1030 events considered here. Therefore any association between the DFs in this catalogue and flares in active regions is very weak.

9 Acknowledgements

Assistance in the early compilation of this catalogue was provided by Mr Peter Davies and Mrs Wendy Place at IPS Radio and Space Services, Sydney, Australia. I am greatly indebted for the support of the Space Physics Division of the Geophysics Laboratory, Hanscom AFB, MA., under contract AF19628-87-K-0033. I am also indebted to Mr Pat McIntosh, Space Environment Laboratories, Boulder, Co., USA, for providing Hα photographs for the period 1964–1973. Helpful discussions with Peggy Shea and Don Smart at GL(AFSC), are acknowledged. David Webb at Boston College and Richard Thompson at IPS, Sydney, kindly provided critical comments on the manuscript.

10 References

Azambuja, M., and Azambuja, Mme. L. D., Solar prominences and their evolution, *Ann. Obs. Paris, Meudon*, **6**, Fasc. VII, 1948.

Bruzek, A., and Durrant, C. J., *Illustrated Glossary for Solar and Solar-Terrestrial Physics*, D. Reidel, Dordrecht, 1977.

Cane, H. V., Kahler, S. W., and Sheeley, N. R. Jr., Interplanetary shocks preceded by solar filament eruptions, *J. Geophys. Res.*, **91**, 13321–13329, 1986.

Joselyn, J. A., and McIntosh, P. S., Disappearing solar filaments: A useful predictor of geomagnetic activity, *J. Geophys. Res.*, **86**, 4555–4564, 1981.

DeMarco, T., *Structured analysis and system specification*, Prentice Hall, 1979.

Kahler, S. W., Cliver, E. W., Cane, H. V., McGuire, R. E., Stone, R. G., and Sheeley, N. R. Jr., Solar filament eruptions and energetic particle events, *Ap. J.*, **302**, 504–510, 1986.

McIntosh, P. S., Annotated atlas of Hα synoptic charts for solar cycle 20 (1964–1974) Carrington solar rotations 1487–1616, *Report UAG-70*, NOAA Space Environment Laboratory, Boulder, CO, February 1979.

McNamara, L. F., and Wright, C. S., Disappearing solar filaments and geomagnetic activity, *Nature*, **299**, 537–538, 1982.

Munro, R. H., Gosling, J. T., Hildner, E., MacQueen, R. M., Poland, A. I., and Ross, C. L., The association of coronal mass ejection transients with other forms of solar activity, *Solar Phys.*, **61**, 201–215, 1979.

Smart, W. M., *A Textbook of Spherical Astronomy*, Cambridge University Press, 1944.

Svestka, Z., *Solar Flares*, D. Reidel, Dordrecht, 1976.

Tandberg-Hanssen, E., *Solar Prominences*, D. Reidel, Dordrecht, 1974.

Webb, D. F. and Hundhausen, A.J., Activity associated with the solar origin of coronal mass ejections, *Solar Phys.*, **108**, 383–401, 1987.

Wright, C. S., Disappearing solar filaments and interplanetary shock waves, *Proc. Astron. Soc. Aust.*, **5**, 202–204, 1983.

Wright, C. S., A comparison of the signatures of disappearing filaments and flares in the interplanetary medium at 1 AU, and their relationship to geomagnetic disturbances, to appear in *Solar-Terrestrial Predictions: Proceedings of a workshop at Leura, Australia, October, 1989*, eds. R. J. Thompson, D. J. Cole, P. J. Wilkinson, G. Heckman and M. A. Shea, US Department of Commerce, Boulder, Co., 1990.

Wright, C. S., and McNamara, L. F., The relationships between disappearing solar filaments, coronal mass ejections and geomagnetic activity, *Solar Phys.*, **87**, 401–417, 1983.

Wright, C. S. and Webb D. F., The signatures of disappearing filaments in the interplanetary medium at 1 AU, to appear in *Solar-Terrestrial Predictions: Proceedings of a workshop at Leura, Australia, October, 1989*, eds. R. J. Thompson, D. J. Cole, P. J. Wilkinson, G. Heckman and M. A. Shea, US Department of Commerce, Boulder, Co., 1990.

A Calculation of Filament Height

It is necessary to derive an expression for the height of a filament in terms of the angles ξ and ϕ, and the measurement of projected width, W. The projected width consists of components due to the filament sheet height, h, and thickness, t. Therefore the individual contributions of height and thickness to the measured width must be calculated before h can be determined. The following derivation assumes the filament to be an infinitely long rectangular slab on a flat solar surface (inset Figure 10). It is sufficiently accurate at all disk locations; even near the limb, providing $\ell \gg h$.

A.1 Contribution to Measured Width Due to Sheet Height

An expression for the component of the measured width, W_h, due to the sheet height, can be derived from Figure 10, which is constructed in the following way. O lies on the solar surface at the base of the of the filament sheet. Let D lie at an arbitrary location on the line of sight to the Earth from O. OX extended is the base of the filament sheet on the surface of the Sun. X$'$O is the projection of XO into the plane perpendicular to DO at O – the plane of the solar disk. In this plane, construct OA$'$ $\perp$ X$'$O so that $\widehat{X'OA'} = \pi/2$. The line-of-sight to A$'$ intersects the facing plane of the filament sheet at A, so that AA$'$ $\perp$ OA$'$. Construct AB $\perp$ OX at B and extend it to the point F where it intersects the plane B$'$OA$'$. FB$'$A$'$ is the projection of FBA in the plane of the solar disk, so that F, B$'$ and A$'$ are colinear. Also, the plane of the filament sheet intersects the solar disk in the line FO. Construct AZ || BO in the plane ABO such that OZ $\perp$ BO at O. In the plane ABO, construct OE $\perp$ FO to meet AB at E. Construct OY $\perp$ XO and ZO. Plane XOY is the plane of the solar surface. Thus $\widehat{FOY} = \widehat{EOY} = \pi/2$. Since $\widehat{EOF} = \pi/2 = \widehat{DOF}$, then the plane EDO is perpendicular to the plane of the filament sheet and contains OY. Now, if D is positioned on the line-of-sight such that ED || OY, then $\widehat{DEO} = \pi/2$. Finally, construct DC $\perp$ plane XOY at C, join C to O and C to B.

In this construction, X$'$B$'$O is the projection of the base of the filament onto the plane of the solar disk and is referred to in the text as the "filament axis". Also, A may be considered to lie at the top of the filament, so that $AB = h$ is the filament height. OA$'$ corresponds to the portion of the *projected width*, measured perpendicular to the filament axis on the solar disk, due to the filament height, AB. Hence, $OA' = W_h$. Furthermore, OC is the perpendicular projection of the line-of-sight, OD, onto the plane of the solar surface, so that the *azimuthal angle* $\xi = \widehat{XOC}$ and the *zenith angle* $\phi = \widehat{ZOD}$. It is necessary to determine the value of AB in terms of ϕ, ξ and W_h.

Since ED || CB || OY, then $\widehat{CBO} = \pi/2$. Also $\widehat{BOC} = \xi$, and since DC || AB || OZ, then $\widehat{ZOD} = \widehat{ODC} = \widehat{FBB'} = \phi$. Therefore,

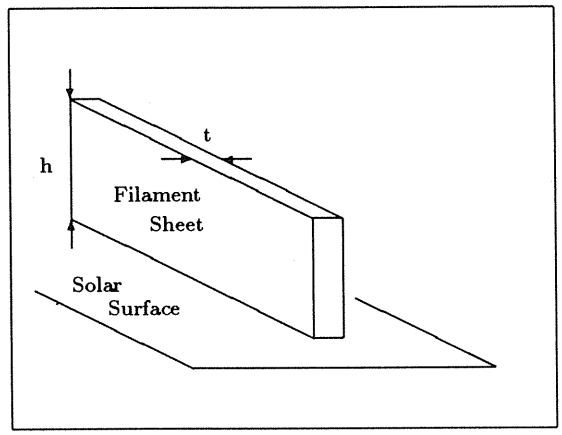
$$\begin{aligned}
OC &= OD \sin\phi, && (15)\\
CD &= OD \cos\phi, && (16)\\
OB &= OC \cos\xi, \\
&= OD \sin\phi \cos\xi, && (17)\\
\tan\widehat{EOB} &= EB/OB, \\
&= CD/OB, \\
&= \frac{\cos\phi}{\sin\phi\cos\xi}. && (18)
\end{aligned}$$

Since $\widehat{EOF} = \pi/2$, then $\widehat{BOF} = \pi/2 - \widehat{EOB}$. Therefore $\widehat{BFO} = \widehat{EOB}$. Also,

$$\begin{aligned}
\cos\widehat{B'BO} &= \cos\widehat{DOB}, \\
&= OB/OD, \\
&= \sin\phi\cos\xi, && (19)
\end{aligned}$$

after substituting for OB from Equation 17, and since B, B$'$, O and D are coplanar and BB$'$ || DO. Also, A$'$B$'$ is the projection of AB onto the solar disk, and since AB || OZ,

$$A'B' = h\sin\phi. \qquad (20)$$



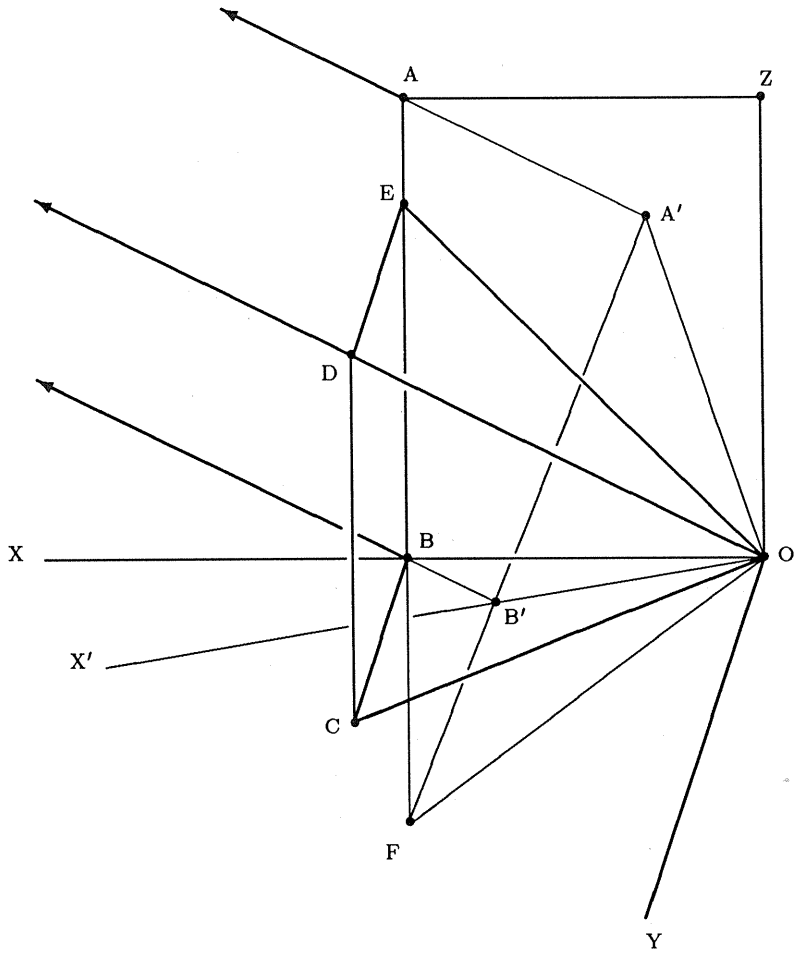


Figure 10: Diagram for calculating the contribution to the measured width, W_h, due to filament height, h, (see text). ABOZ is the plane of the filament sheet facing the observer on Earth and viewing from the direction of OD extended. A′B′FO is the plane of the solar disk (which is also the plane of the sky) and XOY is the "plane" of the solar surface.

Furthermore,

$$\begin{aligned} B'O &= OB \sin \widehat{B'BO}, \\ &= OB\sqrt{1-\sin^2\phi\cos^2\xi}, \end{aligned} \tag{21}$$

$$\begin{aligned} BB' &= OB \cos \widehat{B'BO}, \\ &= OB \sin\phi\cos\xi, \end{aligned} \tag{22}$$

from Equation 19. Hence,

$$\begin{aligned} B'F &= BB' \tan\phi, \\ &= OB \sin\phi\cos\xi\tan\phi, \end{aligned} \tag{23}$$

from Equation 22. Also,

$$\begin{aligned} OF &= \frac{OB}{\sin \widehat{BFO}}, \\ &= \frac{OB}{\sin \widehat{EOB}}. \end{aligned}$$

Therefore, from Equation 18,

$$OF = \frac{OB\sqrt{\cos^2\phi+\sin^2\phi\cos^2\xi}}{\cos\phi}. \tag{24}$$

Now, from the cosine law,

$$\cos \widehat{FB'O} = \frac{B'F^2+B'O^2-OF^2}{2.B'F.B'O},$$

so that,

$$\begin{aligned} \cos \widehat{A'B'O} &= -\cos \widehat{FB'O}, \\ &= \frac{OF^2-B'F^2-B'O^2}{2.B'F.B'O}, \end{aligned}$$

which becomes,

$$\cos \widehat{A'B'O} = \frac{\cos\xi\cos\phi}{\sqrt{1-\sin^2\phi\cos^2\xi}}, \tag{25}$$

after substituting from Equations 21, 23 and 24 and evaluating. Finally,

$$\begin{aligned} W_h &= OA', \\ &= A'B' \sin \widehat{A'B'O}, \\ &= \frac{h\sin\phi\sin\xi}{\sqrt{1-\sin^2\phi\cos^2\xi}}, \end{aligned} \tag{26}$$

after substituting from Equations 20 and 25 and evaluating.

This expression can be tested for certain limiting viewing angles:

$$\begin{array}{lllllll} \phi & = & \pi/2 & \Longrightarrow & W_h & = & h, \\ \phi & = & 0 & \Longrightarrow & W_h & = & 0, \\ \xi & = & \pi/2 & \Longrightarrow & W_h & = & h\sin\phi, \\ \xi & = & 0 & \Longrightarrow & W_h & = & 0, \end{array}$$

which correspond respectively to filaments viewed at the limb, at disk center, broadside on the disk, and end-on.

A.2 Contribution to Measured Width Due to Sheet Thickness

The contribution to the measured width, W_t, due to the sheet thickness, t, can be derived in a similar way,

$$W_t = \frac{t\cos\phi\sqrt{1-\sin^2\phi\sin^2\xi}}{\sqrt{\cos^2\phi+\sin^4\phi\sin^2\xi\cos^2\xi}}. \tag{27}$$

This expression can also be tested for certain limiting viewing angles:

$$\begin{array}{rclcrcl} \phi & = & \pi/2 & \Longrightarrow & W_t & = & 0, \\ \phi & = & 0 & \Longrightarrow & W_t & = & t, \\ \xi & = & \pi/2 & \Longrightarrow & W_t & = & t\cos\phi, \\ \xi & = & 0 & \Longrightarrow & W_t & = & t, \end{array}$$

which correspond respectively to filaments viewed at the limb, at disk center, broadside on the disk, and end-on.

A.3 Expression for Sheet Height

The total projected width,

$$W = W_h + W_t, \tag{28}$$

so that, from Equations 26, 27 and 28,

$$h = \frac{\sqrt{1-\sin^2\phi\cos^2\xi}}{\sin\phi\sin\xi}\left(W - t\cos\phi\sqrt{\frac{1-\sin^2\phi\cos^2\xi}{\cos^2\phi+\sin^4\phi\sin^2\xi\cos^2\xi}}\right). \tag{29}$$

B Tabulation of Filament Disappearances 1964–1980

The following table lists all DF events detected between 26 October 1964 and 31 December 1980. The tabulation has 50 lines per page. Note that leading zeros are suppressed. A summary of the columnar entries from left to right is provided by the following list. A full description of the format is described in Section 4.

Date: Estimated date of disappearance in year, month, day format.

Time: Estimated time of disappearance in hours and minutes (or start of data gap).

Err: Uncertainty in time of disappearance in hours and minutes (or end of data gap).

$\sim$ An unlabelled column indicating the number of day transitions spanned by data gaps.

Position: The locations of filament end-points and points of inflection (in parentheses).

W: The projected width in heliographic degrees.

D: The darkness on a scale of 1 (faint) to 3 (dark).

P: The photospheric magnetic polarity west of the filament, or south of the filament in the case of filaments parallel to the equator. N = north polarity, S = south polarity and U = polarity undetermined.

L: The computed length in heliographic degrees.

H: The computed height in heliographic degrees.

A: The computed area of the filament sheet in square heliographic degrees.

ξ: The azimuthal angle of the line-of-sight in degrees.

ϕ: The zenith angle of the line-of-sight in degrees.

α: The angle between the line-of-sight and the filament sheet in degrees.

Midpt: The calculated mid-point of the base of the filament sheet.

Com: Comments, usually restricted to the indication of data gaps.

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
641027	0633	1202	S22E26	S15E12	1.0	1	S	15	1.7	25	22	30	11	S19E19	
641028	1942	1849 2													GAP
641102	0643	1152	N08E24	N04E20	0.8	1	S	6	0.7	4	42	22	15	N06E22	
641103	1959	1956 2													GAP
641104	1958	2359	N35E03	N28W10	0.6	2	N	13	0.3	4	66	28	25	N32W04	
641108	1934	2101 2													GAP
641109	2018	2444	S43W21	S43W33	1.0	1	N	9	0.8	7	55	53	41	S43W27	
641110	2101	1837 2													GAP
641114	0635	1157	N35W48	N43W52	0.8	2	S	8	0.5	4	43	58	35	N39W50	
641117	1840	1816 2													GAP
641118	1828	2348	S25E34	S20E22	1.0	2	N	12	1.4	17	15	37	9	S23E28	
641121	0644	1158	S00E14	S06E14	0.8	1	S	6	0.7	4	70	15	14	S03E14	
641121	0644	1158	N50E39	N52E26	1.8	2	N	8	1.8	15	63	56	48	N51E33	
641122	0637	1156	N26E01	N18W03	0.6	2	S	9	0.3	3	28	20	9	N22W01	
641125	1846	1855 2													GAP
641201	1845	1817 5													GAP
641207	1812	1834 3													GAP
641215	1835	1831 2													GAP
641216	1833	2358	S45W27	S45W31	2.0	2	N	3	2.3	6	51	51	37	S45W29	
641217	1831	1852 2													GAP
641218	1842	2411	N18E48	N12E47	1.0	1	S	6	0.8	5	66	50	44	N15E47	
641221	1837	1835 2													GAP
641224	2005	1836 2													GAP
641226	1836	1832 2													GAP
641229	0706	1234	N50E83	N45E53	1.0	2	S	21	0.3	6	5	77	5	N48E67	
641230	1844	1954 3													GAP
650105	0645	1203	N37E63	N25E60	1.8	2	N	12	1.7	21	59	68	53	N31E61	
650105	1847	2207 3													GAP
650111	2131	2029 2													GAP
650113	2029	1914 2													GAP
650114	1952	2323	S22E29	S16E24	2.0	3	S	8	3.2	25	25	30	12	S19E26	
650119	1845	1844 3													GAP
650122	1844	1845 2													GAP
650131	1848	1934 2													GAP
650204	0624	1237	N30E63	(N26E53)											
				N19E53	0.8	1	N	14	0.5	7	--	62	--	N25E56	
650206	1619	1633 5													GAP
650214	1905	1834 2													GAP
650217	0637	1203	S22W08	(S24W12)											
			(S25W17)	S25W19	0.4	1	N	11	0.3	3	--	22	--	S24W14	
650221	0641	1153	N30E21	(N43E39)											
			(N53E42)	N45E04	0.8	2	U	49	0.6	27	--	59	--	N43E26	
650222	0638	1156	N07E18	N09E13	0.8	2	N	5	0.7	3	66	22	20	N08E16	
650222	1833	1844 2													GAP
650225	2108	1839 2													GAP
650226	1953	2245	N40E08	(N40W12)											
				N27W25	1.0	2	S	32	0.9	28	--	47	--	N36W10	
650301	0547	1256	N08E14	N20E11	1.0	2	N	12	1.1	13	45	25	17	N14E13	
650301	1843	1830 3													GAP
650306	0643	1217	N05W47	N20W62	0.6	2	N	22	0.3	7	29	57	24	N13W54	

Date	Time	Err		Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
650308	1828	1825	4													GAP
650315	1846	1516	2													GAP
650320	0323	1211		S33E73	S48E73	1.0	2	U	15	0.9	13	84	72	71	S40E73	
650327	0330	1150		N18E14	N18E08	1.6	1	S	6	2.5	14	66	27	25	N18E11	
650328	0537	1417		S18E20	S04E07	0.6	2	S	19	0.3	6	31	14	7	S11E13	
650403	0307	1151		S19W60	S01W77	1.0	1	S	21	0.8	17	44	68	40	S10W69	
650406	1452	1825	2													GAP
650407	1638	2547		N55E41	N55E16	2.0	2	N	14	1.9	28	59	66	52	N56E29	
650407	1638	2547		N31E22	N21E12	0.4	1	S	13	0.3	4	13	36	8	N26E17	
650411	1536	1845	2													GAP
650421	1719	1508	2													GAP
650428	0445	1235		N25E21	N28W18	2.0	1	U	35	2.7	95	88	33	33	N28E02	
650429	0404	1044		N13W26	N05W31	0.8	2	S	9	0.6	6	83	32	32	N09W29	
650503	1830	1447	2													GAP
650509	0240	1208		N52E34	N42E15	0.8	1	N	15	0.6	10	23	55	19	N47E24	
650510	0241	1153		N60E34	N55W06	1.0	2	S	22	0.8	18	62	63	52	N59E13	
650515	1438	1423	2													GAP
650530	0215	1215		N38E33	(N28E29)											
				(N25E23)	N31E17	0.8	2	U	25	0.6	15	--	39	--	N30E26	
650607	0257	1158		N40W25	N32W29	1.6	2	S	9	1.9	17	63	44	38	N36W27	
650609	1429	1415	2													GAP
650610	1422	2353		N50W21	N53W31	2.8	3	S	7	3.4	23	32	56	26	N52W26	
650610	1422	2353		N39W38	N37W47	1.2	2	N	7	1.1	8	50	54	38	N38W43	
650621	0215	1203		S40E83	S42E61	1.6	2	U	17	1.5	25	20	78	20	S42E72	
650623	0253	1306		N35E03	N36W06	1.0	3	N	7	0.9	7	80	34	33	N36W01	
650701	0152	1202		N50E73	N38E36	2.0	3	S	23	2.8	64	1	63	1	N46E53	
650702	0157	1203		S33W30	(S40W33)											
				(S45W47)	S45W60	0.6	2	N	26	0.3	8	--	58	--	S41W43	
650702	1400	1421	2													GAP
650706	0211	1219		N47W15	N40W27	1.6	1	S	11	1.8	20	82	45	44	N44W21	
650707	0234	1203		N39W08	N32W20	0.8	2	N	12	0.6	7	80	35	34	N36W14	
650709	0203	1201		S25E83	S27E58	1.6	2	S	23	1.5	34	17	74	16	S27E71	
650709	0203	1201		N10W19	N07W25	0.4	2	N	7	0.3	2	38	22	13	N09W22	
650710	0223	1220		N09E02	N05W01	0.6	2	S	5	0.3	1	28	3	1	N07E00	
650713	0232	1160		S38E16	S19E12	0.4	1	N	19	0.3	6	14	35	8	S29E14	
650714	1426	1428	2													GAP
650720	1500	1509	3													GAP
650725	0217	1211		N42W09	N50W39	1.6	2	N	22	2.0	43	36	46	25	N47W23	
650727	1806	2326	2													GAP
650801	0240	1208		N17E35	N09E32	0.6	1	N	9	0.3	3	61	34	29	N13E33	
650805	1427	2046	3													GAP
650819	2027	1428	2													GAP
650824	0343	1302		N43E83	N40E44	1.8	3	S	22	2.0	43	8	66	7	N43E63	
650901	1703	2342	2													GAP
650905	1650	1638	2													GAP
650906	1644	2354		N45E17	N48W03	1.0	2	N	14	0.8	12	89	40	40	N47E07	
650908	0410	1132		N55E84	N55E54	0.6	2	N	12	0.3	4	14	72	13	N56E69	
650908	0410	1132		N54E84	N52E46	1.0	2	S	16	0.7	12	12	69	11	N55E65	
650909	0310	1129		S21E14	S21E11	1.6	2	N	3	2.2	6	65	31	28	S21E12	
650909	1439	2143	2													GAP

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
650914	0452	1039	N29E24	N06E00	0.6	2	N	32	0.3	10	3	15	1	N18E11	
650922	0304	1154	N39E44	N27E21	2.6	1	S	23	7.2	164	2	40	1	N34E32	
650924	0330	1135	N30W09	N28W27	1.0	2	S	16	1.1	18	56	28	23	N29W18	
650930	0323	1146	N35W16	N25W31	1.0	2	N	16	1.0	16	79	32	31	N30W24	
651003	0315	1200	N08E33	N12E30	1.2	1	N	5	1.3	6	57	31	26	N10E32	
651016	0351	1230	N35W02	N19W09	0.2	1	S	17	0.3	5	36	22	13	N27W06	
651017	0451	1230	N33E45	N29E38	1.6	1	S	7	3.3	24	9	46	6	N31E41	
651018	0422	1102	N33E74	N33E64	1.2	2	N	6	0.9	5	7	69	7	N33E69	
651018	0422	1102	N72E34	N62E06	1.6	1	S	12	1.9	23	26	63	23	N68E17	
651021	0258	1213	N58W23	N58W62	2.2	2	N	20	2.3	47	41	63	36	N60W43	
651026	0320	1208	N47E33	N48E25	1.2	2	N	5	1.1	6	61	49	41	N48E29	
651031	0334	1155	N20E16	N31E13	0.6	2	N	11	0.3	3	50	25	19	N26E15	
651102	0340	1146	S22W46	S28W58	0.6	3	S	12	0.3	4	6	58	5	S25W52	
651109	0346	1221	N48W55	N53W77	0.8	2	N	12	0.4	4	3	72	3	N51W65	
651114	1531	1957	3												GAP
651128	0319	1229	N26W39	N17W43	0.8	1	N	10	0.5	5	89	45	45	N22W41	
651130	0359	1241	S23W64	S22W75	1.0	2	N	8	0.9	8	15	72	14	S23W70	
651208	1557	1548	4												GAP
651212	1548	1510	2												GAP
651214	1510	1810	4												GAP
651221	1525	1654	3												GAP
651229	1631	1623	3												GAP
660108	1533	2402	N51E47	N50E20	1.0	1	S	13	0.8	11	48	62	41	N51E33	
660107	1531	1535	2												GAP
660110	0334	1159	N03E36	N07E29	0.8	1	S	8	0.6	5	45	34	23	N05E33	
660111	1609	2436	N39E10	N30W02	0.6	2	S	13	0.3	4	42	39	25	N35E04	
660110	1533	1645	2												GAP
660117	2027	2027	2												GAP
660120	1450	1530	2												GAP
660123	0413	1244	N19W15	N13W29	1.8	3	S	15	2.9	43	67	31	28	N16W22	
660130	1638	1528	2												GAP
660202	0352	1224	N55E48	N55E13	2.6	2	N	20	2.6	52	57	67	51	N56E31	
660202	0352	1224	N41E32	N31E29	0.8	2	S	10	0.5	5	27	51	21	N36E30	
660203	0346	1131	N33E84	N28E60	0.6	2	U	21	0.3	6	1	78	1	N31E72	
660207	0435	1258	N35W30	N21W35	0.2	1	S	15	0.3	4	65	47	42	N28W33	
660207	0435	1258	N40E22	N30E10	0.2	1	N	14	0.3	4	22	44	15	N35E16	
660208	1537	1814	2												GAP
660213	0341	1154	N20E74	N05E55	1.0	1	S	18	0.8	14	26	67	24	N13E64	
660216	0345	1145	N27E16	N24E14	0.6	2	N	4	0.3	1	5	35	3	N26E15	
660217	0328	1158	N22E18	N20E10	1.0	2	S	8	1.2	9	47	31	22	N21E14	
660220	0360	1130	N40W02	N38W09	1.2	2	S	6	1.1	6	77	46	44	N39W06	
660224	1556	2057	3												GAP
660303	0513	1023	N34E45	N27E39	0.4	2	S	8	0.3	2	18	55	15	N31E42	
660305	0419	1153	S43E62	S50E54	1.8	1	S	9	1.7	15	71	63	57	S47E58	
660306	0516	1304	S35W53	S48W84	1.2	2	S	22	1.5	34	20	68	18	S43W67	
660309	0647	1413	N50W08	N35W17	1.4	3	S	16	1.7	28	40	51	30	N43W13	
660309	0647	1413	N28E27	N28E20	1.0	2	N	6	0.9	5	54	42	33	N28E24	
660310	0213	1413	S45E02	S43W10	1.0	1	S	9	0.9	8	84	37	37	S44W04	
660316	0503	1338	N17E32	N13E30	1.0	2	N	4	1.0	4	30	38	18	N15E31	
660318	0338	1142	S41E84	S41E64	1.0	2	N	10	0.4	4	5	73	5	S41E74	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
660322	0608	0927	N28E55	N26E45	0.8	1	N	8	0.6	5	15	59	13	N27E50	
660330	0309	1211	N18E63	N13E63	1.0	1	N	5	0.9	4	75	66	62	N16E63	
660407	0607	1454	N38W11	N37W21	0.6	2	S	8	0.3	2	75	46	44	N38W16	
660415	0325	1117	N32E44	N32E34	0.6	1	N	8	0.3	2	38	53	29	N32E39	
660423	0408	1218	N48W15	N39W17	1.2	3	S	9	1.7	15	30	51	23	N44W16	
660423	0408	1218	S32E52	S32E37	1.0	2	S	12	1.1	14	23	50	17	S32E45	
660429	0245	1203	N14E73	(N10E63)											
			(N12E63)	N16E63	0.6	1	U	13	0.4	5	--	67	--	N13E65	
660507	0234	1209	N21E03	N25E00	0.6	1	N	5	0.3	1	38	27	16	N23E02	
660509	1338	1500	2												GAP
660515	0227	1139	N45W17	N37W24	0.6	2	N	10	0.3	3	62	48	41	N41W21	
660520	0222	1140	S33W23	S31W26	0.6	2	N	3	0.3	1	85	38	38	S32W25	
660524	0214	1212	N39E15	(N42E24)											
			(N33E33)	N22E14	0.4	2	U	39	0.3	12	--	44	--	N34E21	
660524	0214	1212	S51E53	S45E37	0.6	1	S	10	0.3	3	6	60	5	S48E45	
660528	0217	1141	N57E62	N48E36	2.6	2	S	13	3.3	44	6	67	6	N53E48	
660531	0352	1306	N30E46	N20E20	1.0	2	N	26	1.4	35	12	41	8	N26E32	
660603	0218	1206	N30W27	N34W28	1.6	2	S	4	3.5	14	32	42	21	N32W27	
660604	0205	1141	N33E24	N33E04	0.6	1	N	17	0.3	5	66	36	32	N33E14	
660605	0137	1151	N32E19	N28E14	1.0	3	N	6	1.6	10	17	34	9	N30E16	
660612	0130	1203	N32E26	N17E18	1.6	2	N	17	3.1	52	19	32	10	N25E22	
660616	0606	1454	N27E34	N20E24	0.4	2	S	12	0.3	3	3	36	2	N24E29	
660618	0158	1151	N30W05	N23W17	0.6	2	N	13	0.3	4	81	28	28	N27W11	
660622	0528	1533	N38E05	(N43E22)											
				N28E04	0.8	3	U	35	0.7	24	--	39	--	N36E10	
660624	0131	1208	N32W12	(N28W18)											
			(N29W26)	N37W26	0.4	2	U	22	0.3	6	--	35	--	N32W20	
660624	0131	1208	N15W23	N21W27	0.4	1	N	7	0.3	2	27	29	13	N18W25	
660627	0642	4010	N17W31	N10W37	0.8	2	S	9	0.8	7	66	35	32	N14W34	
660625	1432	2252	3												GAP
660629	1038	1145	N37E74	N37E57	1.0	1	N	10	0.9	9	13	69	12	N37E66	
660701	0400	1016	N20E06	N21E03	1.0	2	N	3	1.2	4	85	18	18	N21E05	
660703	0148	1221	N26W36	N30W36	2.0	2	N	4	2.9	12	60	42	35	N28W36	
660704	0146	1137	N50E54	N54W46	1.0	2	S	56	0.8	46	88	60	60	N63E07	
660705	0210	1248	N04W62	N03W69	1.0	1	N	6	1.1	7	6	65	5	N04W66	
660707	0204	1227	N44W19	N40W27	0.2	1	N	7	0.3	2	90	44	44	N42W23	
660708	0230	1159	N22W11	(N22W16)											
				N20W19	0.2	1	N	8	0.3	2	--	24	--	N21W15	
660708	0230	1159	N26W00	N25W16	0.2	1	S	14	0.3	4	74	24	23	N26W08	
660712	0251	1304	N28E20	N24E08	0.6	3	N	11	0.3	3	36	26	15	N26E14	
660714	0144	1218	N04E53	N00E47	0.2	1	S	7	0.3	2	37	50	27	N02E50	
660722	0219	1215	S21W28	S42W37	1.4	1	S	22	2.9	64	26	48	19	S32W32	
660723	0335	1301	N41W18	N43W45	2.2	2	N	20	2.9	59	39	47	27	N43W31	
660723	0335	1301	N31E34	N20E11	0.8	3	N	23	0.8	19	13	30	6	N26E22	
660724	0327	1051	N32W02	N28W11	0.8	2	S	9	0.6	6	78	26	25	N30W07	
660724	0327	1051	N54E49	N45E22	0.6	1	S	18	0.3	6	18	54	14	N50E34	
660727	0238	1218	N38E21	N30E21	0.6	2	N	8	0.3	2	39	35	21	N34E21	
660729	0246	1225	N55E63	N43E21	1.8	2	S	26	3.1	82	15	56	12	N51E39	
660803	0359	1117	N27W15	N34W18	0.8	2	S	7	0.9	7	15	29	7	N31W16	
660805	0231	1150	N25E50	N17E42	0.6	2	N	11	0.3	3	35	47	25	N21E46	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
660813	0211	1137	N30W21	N20W26	0.8	2	N	11	0.6	7	79	29	28	N25W24	
660813	0211	1137	N49E54	N44E39	1.0	3	N	10	1.0	10	4	56	3	N47E46	
660815	0146	1205	N19E47	N09E43	1.6	2	S	11	1.6	17	64	45	39	N14E45	
660818	1516	1410 2													GAP
660821	1404	2125 2													GAP
660822	1745	2741	N62E52	N55E12	2.8	3	S	18	4.4	80	34	58	28	N60E30	
660824	1018	1253	S07E43	S03E40	0.6	1	N	5	0.3	1	37	43	24	S05E41	
660826	0308	1135	N28W56	(N38W47)											
				N36W56	0.6	2	U	20	0.3	6	--	55	--	N34W53	
660829	0351	1054	N20E64	N20E58	0.8	2	S	5	0.4	2	3	60	3	N20E61	
660831	0245	1205	N25E18	N20E04	0.6	2	N	14	0.3	4	33	19	10	N23E11	
660902	0302	1208	N32W18	N24W27	0.8	2	S	11	0.6	7	85	30	30	N28W23	
660907	0251	1141	N26W48	N27W56	0.6	2	N	7	0.3	2	4	53	3	N27W52	
660912	0155	1223	N25E48	N20E42	0.8	2	S	8	0.5	4	30	46	21	N23E45	
660920	0232	1122	N38E54	S01E30	3.0	2	N	45	3.9	175	50	41	30	N19E41	
660921	0208	1214	N50E33	N35E00	1.0	2	S	28	1.3	38	34	39	21	N44E14	
660927	0234	1158	N31E44	N21E22	0.8	2	N	22	0.8	17	1	37	1	N26E33	
660928	0252	1221	N45W42	N38W51	2.2	3	N	10	2.4	23	73	54	51	N42W47	
660929	0431	1318	N30E03	N21W08	0.8	2	N	13	1.1	15	56	19	16	N26W03	
660930	0508	1119	N50W32	N43W47	1.2	3	N	12	1.1	13	71	53	49	N47W40	
661006	0336	1106	N36E64	N29E14	0.6	2	N	42	0.3	13	20	45	14	N35E38	
661012	0310	1132	N30W56	N25W96	2.0	2	N	27	3.0	80	10	75	10	N29W76	
661012	0310	1132	N34E45	N33E38	1.0	2	N	6	1.3	8	16	47	12	N34E41	
661021	0446	1324	N09W17	N40W22	1.0	2	N	31	2.4	76	39	27	17	N25W19	
661022	0606	1157	N32E69	N26E64	0.8	2	N	7	0.6	5	47	67	42	N29E66	
661105	0333	1157	N27E14	N20E06	0.6	2	S	10	0.3	3	19	22	7	N24E10	
661106	0330	1160	N49E29	N35W06	1.6	2	N	30	2.3	67	46	40	28	N43E10	
661107	1854	2725	N36E62	N33E36	1.2	2	N	17	1.2	21	15	55	12	N35E49	
661106	1529	2219 2													GAP
661112	0341	1215	N26E83	N23E73	1.0	1	N	10	0.9	8	16	78	16	N25E78	
661117	0328	1141	S47E74	S47E35	1.0	1	N	19	0.8	15	30	70	28	S49E55	
661118	0329	1220	N39E73	N33E50	1.0	2	S	15	0.8	11	2	66	2	N37E61	
661120	0415	1212	N35W47	N27W65	1.8	2	S	17	1.9	32	45	60	38	N31W56	
661121	1902	1557 3													GAP
661123	0530	3427	S20W22	(S33W17)											
				S31W29	0.6	2	U	24	0.3	7	--	37	--	S28W23	
661123	0530	3427	S39E23	S42E16	0.6	1	S	6	0.3	2	88	46	46	S41E20	
661124	1557	1604 2													GAP
661125	1600	2404	S19W30	S19W37	0.8	2	S	7	0.7	4	28	39	17	S19W34	
661128	0349	1144	N20W17	N25W21	0.8	2	N	6	0.9	6	7	28	3	N23W19	
661204	0501	1135	N39E84	N22E59	0.8	2	N	19	0.6	12	29	73	28	N31E70	
661206	0559	1229	N06E62	N05E51	0.4	2	U	9	0.3	3	2	57	2	N06E56	
661206	1828	1722 2													GAP
661209	0443	1121	N02E79	N02E59	1.6	2	N	14	1.3	18	1	69	1	N02E69	
661217	0412	1148	S50W14	S56W26	0.8	1	S	9	0.5	5	26	55	21	S53W20	
661218	0445	1245	N34W41	N27W46	1.6	3	N	8	1.6	13	88	52	52	N31W44	
661220	0401	1160	N20E35	N28E30	0.4	2	S	9	0.3	3	85	41	41	N24E33	
661223	1606	1837 4													GAP
670102	0556	1349	N07E73	N20E71	0.8	2	S	13	0.7	9	89	73	73	N14E72	
670108	0423	1138	N60W31	N60W96	1.2	3	S	21	1.1	22	26	82	26	N64W63	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
670110	0740	1135	N30W26	N21W38	0.8	2	S	14	0.5	7	79	43	42	N26W32	
670111	0516	1002	S43W33	S26W51	1.6	3	N	22	1.6	37	78	50	49	S35W43	
670112	0355	1237	N68E83	N43E06	3.0	3	N	34	5.5	188	17	69	16	N61E30	
670114	0350	1132	N40E62	N40E31	2.0	3	S	19	2.1	41	35	62	30	N41E47	
670119	0339	1210	N29W59	N15W70	2.2	3	S	17	2.2	38	69	69	61	N22W65	
670121	1554	2217 2													GAP
670124	1626	1532 2													GAP
670128	0408	1113	N35E64	N30E34	0.6	2	N	21	0.3	6	19	60	16	N33E49	
670129	0722	1600	N30W06	N26W39	0.6	3	S	29	0.3	9	62	41	35	N29W23	
670130	0750	0827	N40W26	N37W45	0.8	3	N	15	0.5	8	57	56	44	N39W36	
670201	0411	1208	N47E83	N33E19	2.4	3	N	37	3.8	142	19	66	17	N45E47	
670201	0411	1208	S56W24	S34W97	0.6	3	N	53	0.4	19	42	72	40	S51W69	
670205	0352	1207	S26E83	S23E53	0.4	3	S	20	0.3	6	2	67	2	S25E68	
670205	0352	1207	N24W17	N28W27	0.6	3	S	10	0.3	3	29	39	18	N26W22	
670205	0352	1207	S23E18	(S25E13)											
			(S23E20)	S17E09	0.4	3	N	24	0.3	7	--	22	--	S22E15	
670206	0427	1228	N20E83	N20E63	0.2	1	S	19	0.3	6	12	76	12	N20E73	
670209	0415	1151	N65E24	N65W11	3.0	1	S	15	3.0	43	83	73	72	N66E06	
670212	0355	1132	N40W26	N30W56	2.6	3	N	26	2.8	75	61	58	48	N36W42	
670213	0318	1153	N57W00	N48W22	1.6	2	S	16	1.5	24	69	61	55	N53W12	
670214	0458	1348	N33E14	N19W22	0.6	2	S	35	0.3	11	75	34	33	N27W05	
670216	0442	1059	S52E34	S52E10	1.4	2	S	15	1.4	21	61	49	41	S53E22	
670217	0321	1140	S36E14	S29E05	0.6	1	S	10	0.3	3	27	27	12	S33E09	
670218	0321	1220	N29E11	(N27E23)											
				N13E10	0.4	2	U	29	0.3	9	--	35	--	N23E15	
670219	0549	1408	N09E42	N19E32	1.0	3	N	14	0.8	11	73	42	40	N14E37	
670219	0549	1408	S20E22	S10E22	0.8	2	S	10	0.6	6	72	23	22	S15E22	
670219	1956	2024 2													GAP
670220	2010	2414	N27W47	N15W55	2.0	1	S	14	2.2	31	82	57	56	N21W51	
670224	0342	1134	S26W41	(S32W39)											
				S31W46	0.6	2	U	12	0.3	4	--	46	--	S30W42	
670225	1541	2220 2													GAP
670226	1901	2720	N05E54	N05E35	1.2	3	N	16	1.9	32	15	46	11	N05E45	
670228	0714	0854	S27E85	S10E75	1.0	2	N	19	0.9	18	65	78	62	S19E80	
670305	0414	1154	S04W04	S00W21	2.0	1	N	17	7.0	122	10	14	2	S02W13	
670309	0328	1228	N48E48	N38E21	3.0	3	N	18	5.2	96	23	59	20	N44E33	
670310	1722	1508 2													GAP
670311	1615	2253	S35W02	S25W07	0.4	1	S	11	0.3	3	35	23	13	S30W05	
670311	1615	2253	S44W14	S27W18	0.4	2	S	17	0.3	5	42	32	21	S36W16	
670311	1615	2253	S35W21	S33W25	0.6	3	S	4	0.3	1	77	34	33	S34W23	
670314	0408	1230	S42W48	S50W87	1.8	2	S	23	2.6	61	4	69	4	S48W66	
670315	0340	1101	N38W26	N31W30	2.0	3	S	8	2.3	18	63	49	42	N35W28	
670318	0420	1303	N53E10	N53W04	0.8	2	N	8	0.6	5	87	60	60	N53E03	
670321	0724	1539	S48W69	S50W98	1.0	2	S	13	0.5	7	6	80	6	S50W83	
670324	0317	1160	S32W06	S33W15	1.0	2	S	8	1.1	8	59	27	23	S33W10	
670328	0311	1139	S60E34	S53E02	4.0	2	N	18	5.4	100	46	52	35	S58E16	
670328	1451	2053 4													GAP
670404	0442	1006	N60W05	N60W60	3.0	2	N	27	3.0	79	56	74	53	N63W32	
670407	0810	0827	N13E06	N10W05	0.6	2	N	11	0.3	3	73	18	17	N12E00	
670409	0420	1226	S29E83	S27E53	0.6	2	U	19	0.3	6	1	68	1	S29E68	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
670410	0624	1338	N20E34	N10E25	0.2	2	N	13	0.3	4	15	36	9	N15E29	
670410	2002	1629 2													GAP
670411	1816	2214	S35E78	S35E63	1.0	2	S	12	0.4	4	6	71	6	S35E70	
670417	0641	1628	S31E49	S24E41	0.8	2	S	10	0.5	5	26	48	19	S28E45	
670417	0641	1628	S33E42	S28E29	0.8	2	N	12	0.7	8	6	42	4	S31E35	
670419	0229	1229	N01W37	N25W42	0.8	3	N	24	0.6	14	56	43	34	N13W39	
670421	0300	1154	N40E59	N30E22	1.8	3	N	28	2.9	82	21	56	17	N36E39	
670424	0259	1156	S65E44	S63E14	4.0	2	N	11	4.5	49	49	63	42	S65E28	
670428	0247	1156	S10W01	S04W29	0.4	1	N	28	0.3	9	21	15	5	S07W15	
670429	0311	1227	S40W25	S23W56	3.0	3	S	31	3.9	122	60	48	40	S32W42	
670429	0311	1227	S40E19	S31W02	1.6	3	N	19	2.9	56	47	32	23	S36E08	
670430	0312	1134	S33E34	S27E19	1.6	3	S	14	3.9	56	16	36	9	S30E26	
670430	0312	1134	N08E79	N17E59	2.0	3	N	15	1.9	28	34	71	32	N13E69	
670504	0556	1544	N38E42	N25E10	1.2	3	N	30	2.1	62	26	44	18	N33E25	
670505	0926	1145	N23W26	N16W36	0.4	2	S	12	0.3	4	71	39	37	N20W31	
670505	0926	1145	N45W06	N41W24	1.0	2	S	14	0.8	11	87	49	49	N43W15	
670508	0225	1158	S32W27	(S40W35)											
				S09W43	1.6	2	S	42	2.9	121	--	43	--	S27W35	
670509	0213	1151	N24W20	N39W21	0.4	3	S	15	0.3	5	30	40	19	N32W20	
670509	0213	1151	S52E64	S48E24	2.4	3	N	22	3.2	68	29	60	25	S52E43	
670510	0252	1249	S51W49	S46W87	1.2	2	N	19	1.0	20	26	74	25	S50W69	
670511	0238	1057	S33E34	S11E04	0.4	3	S	35	0.3	11	6	26	3	S23E18	
670514	0226	1152	N13W06	N03W08	1.8	2	N	10	5.9	60	44	13	9	N08W07	
670514	0226	1152	S53E14	S50W12	0.4	1	N	16	0.3	5	78	49	48	S52E01	
670519	0605	1104	S35W36	S40W42	1.2	2	S	7	2.1	15	11	50	8	S38W39	
670520	0605	1104	N46E27	N39E05	2.0	1	N	18	2.6	46	45	47	31	N43E15	
670521	0444	1111	S32E37	S19E15	1.2	3	S	24	2.4	56	6	34	3	S26E25	
670521	0444	1111	S56E74	S36E14	2.2	3	N	39	4.1	162	14	58	12	S50E38	
670525	0247	1206	N03E73	N12E63	1.6	2	N	13	1.5	20	47	69	43	N08E68	
670529	0216	1156	S33E84	S25E49	1.0	2	N	23	0.7	15	4	69	4	S30E66	
670530	0341	1032	S42W16	S35W36	1.0	2	S	17	0.8	14	75	45	43	S39W26	
670602	0432	1434	N44W07	N40W17	0.8	2	N	8	0.5	4	79	44	43	N42W12	
670608	0217	1149	N42W08	N29W26	2.6	3	N	20	3.6	71	76	40	39	N36W18	
670609	0213	1207	S04E25	S08E20	1.0	2	S	6	1.1	7	53	23	18	S06E23	
670609	0213	1207	N80W05	N55W19	1.0	1	N	20	0.9	17	25	68	23	N68W16	
670609	0213	1207	S33E25	S26E14	1.4	2	S	12	3.2	38	18	35	10	S30E19	
670611	0156	1208	N17E18	N15E13	2.4	3	S	5	8.1	42	22	22	8	N16E15	
670614	0206	1215	N47E29	N30E20	0.2	1	N	18	0.3	6	14	44	10	N39E24	
670615	0228	1208	N55W22	N55W51	0.2	1	S	17	0.3	5	48	62	41	N56W37	
670616	0219	1144	S12W37	(S24W36)											
			(S21W44)	S24W46	0.2	1	N	24	0.3	7	--	46	--	S20W41	
670621	0339	1021	S41W09	S18W54	0.8	3	N	45	0.5	24	71	46	43	S31W34	
670623	0251	1207	N48E63	N30E32	1.4	3	N	26	2.2	58	7	56	6	N40E45	
670624	0501	1403	S29E22	S12E00	1.2	3	S	27	2.7	71	25	25	10	S21E10	
670624	1904	1546 2													GAP
670625	1725	2221	S17E30	S25E28	0.8	1	S	8	0.5	4	68	37	34	S21E29	
670627	0239	1053	N23E84	N20E64	1.0	2	N	19	0.5	10	5	74	5	N22E74	
670628	0423	1451	S18W70	S09W81	0.6	2	N	14	0.4	5	46	77	44	S14W76	
670702	0218	1160	N35W65	N24W67	1.0	3	S	11	0.8	9	89	68	68	N30W66	
670706	0301	1310	N41E20	N27W05	0.6	3	S	25	0.3	7	43	32	21	N35E06	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
670708	0159	1135	N31E38	N31E32	0.8	3	S	5	0.6	3	33	43	22	N31E35	
670709	0141	1207	N19E28	(N23E36)											
				N33E27	0.8	3	S	21	0.7	14	--	38	--	N25E30	
670709	0141	1207	N50E83	N53E43	1.0	1	N	17	0.8	14	27	72	26	N53E64	
670710	0209	1222	N42W17	N26W32	1.2	3	N	20	1.3	26	80	38	37	N34W25	
670711	0213	1143	N30E09	N29W10	1.2	2	S	17	1.5	25	88	26	26	N30W01	
670712	0150	1154	N38E35	N33E29	0.2	1	S	7	0.3	2	6	43	4	N36E32	
670712	1344	1422 2													GAP
670716	0220	1212	S29E01	S26W10	0.2	1	N	10	0.3	3	81	32	32	S28W05	
670717	0248	1216	S48W47	S43W49	0.2	1	N	5	0.3	2	70	66	59	S46W48	
670717	0248	1216	S05E32	S07E30	1.6	3	S	3	1.9	5	63	33	29	S06E31	
670718	0240	1137	S01E25	S02E23	0.8	2	S	2	0.7	2	41	25	16	S02E24	
670718	0240	1137	N26E44	(N26E34)											
			(N19E24)	N28E23	0.4	2	U	30	0.3	9	--	35	--	N25E31	
670729	0447	1504	S33W61	S25W78	2.2	3	N	17	2.2	37	44	75	42	S29W70	
670802	0319	1040	N40E54	N20E29	0.4	3	N	29	0.3	9	19	45	13	N31E40	
670805	0347	1345	N30E42	(N35E38)											
				N30E23	1.4	3	S	20	2.1	42	--	43	--	N32E34	
670806	0402	1030	N25W63	(N32W66)											
				N27W75	0.8	3	U	15	0.6	8	--	68	--	N28W68	
670807	0226	1154	S29E13	S15E01	0.2	1	S	18	0.3	5	24	29	11	S22E07	
670808	0207	1147	N14E84	N18E72	2.0	2	S	12	1.9	24	16	77	16	N16E78	
670809	0236	1242	S66E13	S70W01	3.6	2	N	7	3.6	23	59	75	56	S68E07	
670809	0236	1242	N32W24	N28W35	1.8	3	S	10	2.6	27	57	37	30	N30W30	
670810	0447	1330	N80W77	N20W97	3.0	1	N	61	2.9	179	77	88	77	N50W94	
670810	0447	1330	S32W33	(S40W49)											
				S46W46	0.8	3	U	22	0.7	14	--	62	--	S39W43	
670810	1817	1421 2													GAP
670813	0316	1255	N32W27	N28W37	0.4	2	S	10	0.3	3	56	38	31	N30W32	
670813	0316	1255	S05W13	S08W25	0.4	1	N	12	0.3	4	20	23	8	S07W19	
670813	0316	1255	S45E83	S40E49	2.0	2	N	25	1.2	31	11	77	11	S44E65	
670815	0215	1121	N32W09	N35W21	0.8	2	N	10	0.6	7	43	30	20	N34W15	
670817	0226	1237	N13E83	N00E41	3.0	2	N	34	3.8	128	22	61	19	N07E62	
670818	0243	1140	N35W46	N26W52	0.4	2	S	10	0.3	3	77	52	50	N31W49	
670819	0315	1252	S40W22	S21W37	2.6	3	N	23	3.2	74	76	47	45	S31W30	
670820	0328	1120	S13E44	S19E36	3.0	2	S	10	3.5	34	65	46	41	S16E40	
670821	0235	1147	N50E74	N41E42	3.0	2	N	19	5.1	99	2	62	2	N47E57	
670822	0226	1205	S02W10	N03W14	0.2	1	N	6	0.3	2	80	14	14	N01W12	
670825	0310	1132	N39W50	N31W58	0.8	3	N	10	0.5	6	67	57	51	N35W54	
670830	1507	2225 3													GAP
670907	0306	1115	S32E56	S34E44	1.4	2	S	8	1.3	10	42	62	36	S33E50	
670907	0306	1115	N30E22	N24E16	0.4	1	N	8	0.3	2	4	27	2	N27E19	
670908	0225	1204	S33E03	S25E02	0.2	2	U	8	0.3	2	2	36	1	S29E02	
670909	0313	1112	S09E06	S12E03	1.0	2	N	4	1.3	5	59	18	15	S11E05	
670911	0239	1214	S60W22	S58W47	1.0	2	N	13	0.8	11	63	72	58	S60W35	
670912	0243	1150	N55E84	N55E64	1.2	2	N	8	0.7	5	9	75	9	N55E74	
670912	0243	1150	N28W08	(N34W01)											
				N40W16	1.2	2	U	22	1.8	40	--	28	--	N34W08	
670914	0234	1142	N32E30	N31E24	1.2	2	N	5	2.3	12	27	35	15	N32E27	
670915	0228	1211	S40E10	S23W24	2.6	3	N	33	3.6	119	72	41	39	S33W09	

Date	Time	Err		Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
670920	0219	1134		N17W42	N06W47	0.2	1	N	12	0.3	4	68	44	40	N12W45	
670920	0219	1134		S58E03	S44W26	3.0	3	N	23	3.2	73	67	60	53	S52W14	
670921	0220	1228		N69E23	N67E12	2.0	1	S	4	2.1	8	44	62	38	N68E17	
670923	0300	1204		N60W02	N43W22	3.2	3	N	21	4.7	99	54	46	36	N52W14	
670925	0656	1552		S19W62	S15W69	0.6	2	N	8	0.3	2	46	69	42	S17W66	
670927	0343	1245		S52E03	S58W37	0.2	1	S	23	0.3	7	57	65	49	S57W15	
670929	0307	1201		S31W17	S33W25	0.4	1	N	7	0.3	2	43	44	28	S32W21	
671001	0225	1153		S32E11	(S40E09)											
					S38E03	0.8	2	U	13	0.5	7	--	45	--	S37E08	
671002	0241	1224		N20E34	N16E31	1.2	2	N	5	1.4	7	39	34	21	N18E32	
671002	0241	1224		S25E36	S30E33	0.4	1	U	6	0.3	2	78	48	47	S28E35	
671006	0222	1146		S41W24	S40W38	2.8	2	S	11	3.2	34	57	55	43	S41W31	
671007	0216	1208		S60W14	S69W37	1.6	2	S	10	1.5	15	22	73	21	S65W24	
671007	0216	1208		N08W07	N06W17	0.6	2	N	10	0.3	3	14	12	3	N07W12	
671008	0218	1155		N22W56	N16W66	1.4	2	S	11	1.4	15	36	61	31	N19W61	
671011	0257	1227		N70W47	N72W97	1.2	2	N	11	1.1	12	9	78	9	N73W71	
671011	0257	1227		S36E38	S30E03	1.4	3	N	30	1.6	46	49	45	32	S34E20	
671012	0321	1157		S50W21	S68W36	0.8	2	U	15	0.4	6	7	69	7	S59W27	
671016	0254	1218		S40E53	S30E39	0.2	1	S	13	0.3	4	7	59	6	S35E46	
671021	1534	1450	2													GAP
671024	0245	1155		N44E05	N31W33	2.4	3	S	32	3.3	109	88	37	37	N39W16	
671026	0308	1229		N20E71	N25E51	0.4	2	N	15	0.3	4	22	62	19	N23E61	
671027	0337	1200		N22E61	N09E45	1.4	2	N	18	1.4	24	34	53	27	N16E53	
671027	0337	1200		N42E35	N18W26	1.8	3	N	57	3.1	180	62	29	25	N34E00	
671027	0337	1200		S05E23	S15E18	1.0	2	S	11	0.9	11	81	25	25	S10E21	
671028	0330	1153		S14E53	S25E43	2.0	2	S	14	2.0	29	72	53	49	S20E48	
671102	0247	1217		S40W27	S35W35	4.4	2	S	8	5.4	44	87	51	51	S38W31	
671105	0335	1211		S46W10	S42W18	2.4	3	N	7	2.8	19	74	50	47	S44W14	
671107	0725	1519		N28W58	N20W67	1.4	3	N	11	1.3	15	53	64	46	N24W63	
671109	0259	1156		S30W36	S20W46	1.0	1	N	13	0.8	11	78	49	48	S25W41	
671112	0444	1135		S01E54	N03E52	1.8	2	S	4	1.8	8	60	53	44	N01E53	
671113	0425	1206		N12W62	N26W67	1.4	3	N	15	1.3	19	66	65	56	N19W64	
671116	0255	1232		N02E24	N09E23	0.8	2	S	7	0.6	4	88	24	24	N06E24	
671117	0452	1325		S35W39	S28W49	1.0	1	N	11	0.8	9	70	54	49	S32W44	
671117	0452	1325		N21E63	N10E62	1.8	3	N	11	1.7	19	80	63	61	N16E62	
671120	0334	1211		N25W42	N30W59	1.0	3	N	16	1.3	21	0	54	0	N28W50	
671120	1545	1546	2													GAP
671124	0340	1205		N40W37	N38W77	3.0	3	S	27	3.8	104	25	65	23	N41W57	
671124	0340	1205		S29E43	S29E35	2.2	1	S	7	3.2	22	33	48	24	S29E39	
671126	0624	1513		N43E17	N40E01	1.4	2	N	12	1.6	19	62	41	35	N42E09	
671128	0249	1241		N36E40	N28E36	1.4	2	N	9	1.5	13	34	47	24	N32E38	
671128	0249	1241		N15W09	N28W12	0.6	1	N	13	0.3	4	16	23	6	N22W10	
671129	0517	1012		S22W31	S12W36	0.2	2	N	11	0.3	3	90	38	38	S17W34	
671201	0349	1201		S40W29	S28W57	0.4	2	S	26	0.3	8	59	54	44	S35W44	
671204	0259	1137		N23W31	N19W45	1.6	3	N	14	2.3	31	41	43	27	N21W38	
671206	0310	1159		N55E35	N53E24	0.6	1	N	6	0.3	2	38	59	32	N54E29	
671208	0325	1231		N25W27	N12W37	1.4	3	N	16	1.7	28	81	37	36	N19W32	
671211	0401	1153		S40E74	S27E64	2.0	2	S	15	1.9	29	46	72	43	S34E69	
671211	0401	1153		N50E64	N40E52	3.0	2	N	10	3.2	31	26	68	24	N45E57	
671213	0624	1436		N20E53	N08E50	0.8	2	U	12	0.6	7	65	53	46	N14E51	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
671213	0624	1436	N38W33	N30W58	1.0	2	S	22	0.8	18	51	56	40	N35W46	
671214	1552	1618 2													GAP
671219	1531	1621 2													GAP
671220	1556	2425	N50E05	N39W43	0.6	2	S	35	0.3	11	82	52	51	N47W21	
671222	0411	1150	N40E84	N40E27	1.6	3	N	32	1.6	52	27	67	25	N44E56	
671223	1612	1627 2													GAP
671224	1620	2408	N28W43	N30W65	2.0	3	N	19	3.3	63	16	60	14	N29W54	
671226	0409	1141	S29E44	S40E43	0.8	2	U	11	0.6	6	65	52	46	S35E44	
671227	0423	1233	S50W02	S55W12	0.8	1	N	8	0.5	4	42	51	31	S53W07	
671227	0423	1233	S25E13	S20E07	0.2	1	N	7	0.3	2	21	22	8	S23E10	
671228	1619	1657 3													GAP
671230	0438	3619	N45E38	N28E06	1.4	3	N	29	2.3	68	26	44	18	N38E20	
680102	0408	1159	S23W26	S18W35	2.0	2	S	10	3.2	31	57	35	29	S21W31	
680105	0706	1047	N43W19	N22W38	0.2	1	N	26	0.3	8	80	46	45	N33W30	
680118	0442	1054	N38W53	N49W74	2.4	3	N	14	3.5	49	13	74	12	N44W63	
680119	1750	1746 2													GAP
680123	0416	1218	N38W17	N09W31	1.0	2	N	32	1.0	31	66	38	34	N24W25	
680126	0439	1211	N40E83	N42E53	2.0	2	S	23	1.9	43	24	78	23	N42E68	
680126	1650	2329 3													GAP
680208	0537	1218	S42E38	S20E34	3.0	2	S	22	3.8	84	52	42	32	S31E36	
680210	0360	1223	N43E53	N52E24	0.4	2	S	21	0.3	6	71	65	59	N48E40	
680211	1559	1615 3													GAP
680217	0402	1121	N55E44	N55E19	4.0	2	N	14	4.1	59	56	68	50	N56E32	
680217	0402	1121	N48E64	N37E33	1.0	2	S	19	0.8	15	11	66	10	N44E47	
680219	0637	0935	N50W15	N30W33	4.0	2	S	24	4.9	119	66	53	47	N40W25	
680221	0522	1320	S20E53	S10E43	1.0	3	S	14	0.8	11	42	48	30	S15E48	
680225	0509	1126	S55E44	S60E14	5.0	3	S	17	5.7	95	71	56	52	S58E30	
680226	0422	1147	S41W64	S28W96	1.0	2	S	21	0.8	17	26	79	25	S36W81	
680229	0644	0818	S35E46	S32E32	1.0	2	S	12	1.4	17	13	45	9	S34E39	
680304	0419	1052	S54E64	S54E52	2.0	2	N	5	2.5	14	23	66	21	S54E58	
680306	0347	1248	N21E83	N18E56	5.0	3	N	26	4.3	111	8	73	8	N20E69	
680306	0347	1248	N26E08	N02E03	0.6	2	N	24	0.3	7	3	22	1	N14E05	
680306	0347	1248	N32E29	N37E19	0.4	2	S	10	0.3	3	88	48	48	N35E24	
680307	0441	1207	S42W25	S35W50	0.8	2	S	21	0.5	11	53	47	36	S39W38	
680308	0333	1045	S45E44	S45E22	0.4	1	U	16	0.3	5	43	48	30	S46E33	
680308	1418	1621 3													GAP
680314	0413	1045	S05W28	S19W45	1.0	2	S	22	1.4	30	36	36	20	S12W36	
680320	0610	1450	N11E19	N21E15	1.0	2	N	11	0.9	10	58	29	24	N16E17	
680320	0610	1450	N21E02	N19W13	0.4	2	N	14	0.3	4	86	28	28	N20W06	
680319	1520	1504 2													GAP
680324	0425	1150	S14W24	S14W31	0.6	2	S	7	0.3	2	12	28	6	S14W28	
680326	0230	1150	S20E55	S27E54	1.0	2	N	7	0.8	6	89	55	55	S24E55	
680330	0248	1216	N11E73	(N39E43)											
				N32E24	1.6	3	N	54	2.1	113	--	60	--	N27E47	
680331	0308	1204	S28E28	S30E11	0.8	3	S	15	0.6	9	55	29	23	S29E20	
680403	2009	2003	N50E19	N50W03	1.6	2	S	14	1.5	21	81	58	57	N51E08	
680405	0336	1124	S10W41	S13W48	1.6	2	N	7	4.0	30	21	44	14	S12W44	
680407	0319	1151	S59E44	S60E24	1.0	2	N	10	0.8	8	55	59	45	S60E34	
680408	0244	1134	N32E22	N14E14	0.6	2	S	19	0.3	6	11	34	6	N23E18	
680411	0232	1214	N52E33	N36E01	2.8	2	N	27	4.2	112	35	53	27	N45E15	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
680412	0239	1153	N39W06	N14W10	0.2	2	N	25	0.3	8	23	34	13	N27W08	
680423	0254	1125	N24E34	N25E27	0.8	2	N	6	0.5	3	50	42	31	N25E31	
680424	0227	1208	S25W37	S30W52	3.6	3	N	14	11.2	159	1	48	1	S28W44	
680427	1142	1143	N40W46	N30W96	5.0	3	S	29	5.3	155	29	79	28	N38W73	
680428	1123	1158	N50E24	N50E04	3.0	1	S	13	3.2	41	73	56	52	N50E14	
680429	1120	1160	N03E09	(N06E03)											
				N18E05	0.4	2	U	18	0.3	5	--	14	--	N09E06	
680430	0720	0800	S35W25	S20W29	0.6	2	N	15	0.3	5	66	35	32	S28W27	
680504	0204	1151	N40W46	N20W46	4.0	3	N	21	5.0	104	60	56	46	N30W46	
680505	0239	1245	S16E83	S15E65	0.8	2	N	17	0.3	5	3	73	3	S16E74	
680506	0242	1118	S20W17	S08W19	1.4	2	S	12	3.6	44	71	20	19	S14W18	
680507	0235	1236	S30W29	S00W33	0.8	3	S	30	0.6	18	80	33	32	S15W31	
680507	0235	1236	S65E20	(S52E43)											
				S27E01	0.8	3	U	58	0.7	40	--	51	--	S48E21	
680509	0251	1119	S57W46	S53W86	1.0	2	N	17	0.8	14	28	75	27	S57W67	
680511	0625	1456	N39W08	N41W15	1.8	2	N	6	2.0	12	53	45	34	N40W11	
680514	0152	1201	S28E68	S07E43	2.0	3	N	27	2.2	58	33	56	27	S18E55	
680515	0146	1154	N17E57	N11E44	1.2	3	N	13	1.9	24	11	53	9	N14E50	
680519	0447	1307	N19E24	N19E14	0.6	2	N	9	0.3	3	47	29	21	N19E19	
680520	0851	1456	N30E28	N36E10	0.8	2	N	16	0.5	9	81	40	39	N33E19	
680520	0851	1456	S10W01	S14W01	2.0	2	N	4	7.0	28	6	10	1	S12W01	
680521	0713	0726	N55E64	N35E29	0.4	1	S	26	0.3	8	2	62	2	N46E43	
680522	0438	1359	N38E82	N30E44	0.4	1	S	23	0.3	7	4	69	4	N35E62	
680528	0146	1211	S60E83	S63E43	1.6	2	S	19	1.5	28	32	77	31	S63E64	
680531	0216	1108	N37W39	N37W59	1.0	2	N	15	0.9	13	29	59	25	N37W49	
680602	0318	1351	N43W04	N40W10	1.4	2	S	5	1.5	8	67	43	39	N42W07	
680602	0318	1351	N64E12	N64E02	3.0	2	N	4	3.0	13	82	65	64	N64E07	
680606	0523	1129	N41E34	N27E02	1.2	3	N	30	1.8	53	34	39	21	N35E17	
680607	0523	1231	N25W29	(N22W35)											
				N18W35	0.4	1	U	10	0.3	3	--	40	--	N22W33	
680608	0454	1101	S50W04	S33W36	2.4	2	S	29	2.8	82	84	47	47	S43W22	
680610	0226	1224	S05E43	S15E23	2.2	3	S	22	3.5	77	43	35	23	S10E33	
680612	0245	1238	N34W21	N46W21	1.2	1	S	12	2.0	25	31	44	21	N40W21	
680612	0245	1238	S40E31	S30E03	0.2	1	N	25	0.3	7	40	39	24	S36E16	
680612	0245	1238	N32E83	N24E53	1.0	1	S	19	0.9	17	6	70	6	N29E67	
680613	0300	1138	N46E69	N42E46	2.8	2	N	13	3.7	47	10	67	9	N45E57	
680615	0113	1135	S50E84	S40E44	0.8	2	N	21	0.3	6	1	72	1	S47E62	
680615	0113	1135	S37E14	S30W04	0.8	2	N	17	0.6	10	57	35	29	S34E05	
680615	0113	1135	N28W44	N25W48	0.8	2	N	5	0.5	2	62	51	43	N27W46	
680616	0406	1518	N42W40	N42W48	4.0	2	N	6	5.4	33	34	57	28	N42W44	
680617	0439	0915	N18E44	N28E42	0.8	1	S	10	0.5	6	79	47	46	N23E43	
680618	0435	1442	S05E62	S13E52	0.8	2	U	10	0.6	6	46	58	38	S09E57	
680621	0124	1207	N40E53	N30E15	3.2	3	S	34	8.2	275	23	46	16	N37E33	
680624	0153	1229	S15E13	S13E10	0.2	1	S	4	0.3	1	19	20	6	S14E11	
680626	0106	1232	S32E04	S26W09	1.6	1	N	13	2.4	31	67	31	28	S29W03	
680701	0142	1134	S45W36	S34W39	1.2	2	N	12	1.1	13	60	55	45	S40W38	
680704	0126	1151	S23W33	S28W51	0.6	2	S	17	0.3	5	12	50	9	S26W42	
680707	0236	1130	N30E20	N28E05	0.4	2	S	13	0.3	4	54	28	22	N29E12	
680707	0236	1130	N41E14	N41E04	0.4	2	N	8	0.3	2	75	39	37	N41E09	
680708	0207	1201	S20W25	S19W37	0.6	2	N	11	0.3	3	39	38	23	S20W31	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
680708	0207	1201	S20W22	S20W35	0.4	1	N	12	0.3	4	37	37	21	S20W29	
680709	0209	1201	S36E63	S22E23	0.4	2	N	35	0.3	10	10	52	8	S31E42	
680712	0406	1233	S10E25	S30E23	1.4	2	S	20	1.6	32	53	34	27	S20E24	
680712	0406	1233	N18E49	N11E18	1.6	2	N	31	3.8	117	2	35	1	N15E33	
680712	0406	1233	S29E43	S36E38	0.4	1	N	8	0.3	2	85	53	53	S33E41	
680714	0511	1138	S30W32	S23W46	2.2	2	N	14	2.6	38	62	49	42	S27W39	
680716	0148	1148	N40W11	(N55W11)											
				N50W32	0.4	2	U	29	0.3	9	--	48	--	N48W18	
680717	0150	1215	N21W17	N18W23	1.0	3	N	6	1.3	8	63	25	22	N20W20	
680717	0150	1215	N40E13	N40E00	2.0	3	N	10	2.6	26	79	36	35	N40E07	
680719	0305	1105	S23W45	S20W50	0.4	1	N	6	0.3	2	57	53	42	S22W48	
680722	0220	1204	S43W57	S38W72	1.6	2	N	12	1.5	18	45	75	43	S41W65	
680723	0226	1203	N75W05	N75W67	1.0	2	N	15	0.9	13	53	75	50	N77W36	
680723	0226	1203	S05W35	N09W43	1.0	3	N	16	1.0	16	66	39	35	N02W39	
680723	0226	1203	N40E43	N29E33	1.0	2	S	14	1.0	14	22	46	16	N35E38	
680728	0157	1148	N38W26	N28W36	0.6	2	S	13	0.3	4	87	40	40	N33W31	
680728	0157	1148	S48E34	S48E14	2.0	2	N	13	2.0	27	61	58	48	S48E24	
680729	0137	1152	S28E21	S28E11	1.0	2	S	9	0.9	8	63	37	32	S28E16	
680730	0132	1203	N28W19	N12W29	0.4	2	N	19	0.3	6	88	28	28	N20W24	
680804	0235	1056	S34W59	S27W76	1.0	2	S	16	0.8	13	43	74	41	S31W68	
680807	0409	1241	S38E48	S15E43	0.8	2	S	23	0.6	13	49	55	38	S27E45	
680810	0504	0919	N48E28	N42W01	0.8	2	N	21	0.5	12	54	41	32	N46E13	
680810	0504	0919	S20E07	S00W15	1.4	2	S	29	3.9	115	62	17	15	S10W04	
680811	0459	1437	N10E32	S02E27	0.4	1	S	13	0.3	4	74	29	28	N04E29	
680814	0203	1219	S14W57	S34W57	0.8	2	S	20	0.6	11	69	63	56	S24W57	
680814	0203	1219	N11E55	S02E51	0.4	1	N	14	0.3	4	78	53	51	N05E53	
680819	0220	1140	N05W11	S03W12	1.2	3	N	8	3.0	24	56	13	11	N01W12	
680821	0157	1208	N46E63	N45E41	1.0	1	S	13	1.0	13	21	59	18	N46E52	
680825	0258	1321	N20E53	N01E43	1.4	2	U	21	1.3	28	63	47	41	N11E48	
680828	0408	1015	S42E84	S32E32	0.6	2	S	30	0.3	9	14	70	13	S40E56	
680828	0408	1015	N40E84	N40E37	0.4	1	S	28	0.3	8	15	64	13	N42E60	
680828	1422	1308	2												GAP
680902	0208	1206	S04W67	N12W67	1.0	1	N	16	0.8	13	84	67	66	N04W67	
680902	0208	1206	S12E25	S19E13	0.8	2	S	14	0.5	7	80	30	29	S16E19	
680904	0204	1141	N29E45	N29E16	1.4	3	N	25	2.4	60	32	36	18	N30E30	
680908	0241	1130	S40E34	S32E16	1.0	2	N	17	1.1	18	28	49	21	S36E25	
680909	0150	1140	N05W41	N11W46	0.6	2	N	8	0.3	2	53	43	33	N08W43	
680909	0150	1140	N02E02	N10W16	0.2	1	N	20	0.3	6	34	7	4	N06W07	
680916	0201	1139	N26W41	N38W66	0.4	2	N	24	0.3	7	15	55	12	N33W53	
680922	0451	1235	N30W29	N20W38	0.4	2	S	13	0.3	4	74	37	35	N25W34	
680924	0230	1201	N31W02	N29W18	0.8	3	N	14	0.6	9	74	25	24	N30W10	
680928	0456	1438	S26E44	S19E40	1.2	2	N	7	1.1	8	32	50	24	S23E42	
681001	0608	1511	N07E54	N02E54	2.0	1	N	5	1.9	10	85	54	54	N05E54	
681003	0611	1402	S30E53	S20E47	0.8	2	S	9	0.6	5	35	58	29	S25E50	
681003	0611	1402	N29W08	N10W21	0.6	2	S	23	0.3	7	82	19	19	N20W15	
681004	0509	0856	S30W35	S18W40	1.0	2	N	13	0.8	11	76	48	46	S24W38	
681006	0256	1141	S31E01	S32W08	1.2	2	N	8	1.2	9	77	38	37	S32W03	
681010	0555	1546	N46E33	N48E18	3.0	1	S	11	3.6	39	65	47	42	N47E26	
681011	0611	0830	S32W11	(S29W24)											
				S23W25	3.0	3	S	18	4.8	84	--	40	--	S28W20	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
681014	0436	0934	N51E85	N42E35	3.0	1	N	27	4.5	122	6	65	5	N49E58	
681015	0217	1208	N32W20	N19W30	0.6	1	S	16	0.3	5	90	31	31	N26W25	
681016	0235	1211	N14E47	N05E33	0.2	2	S	16	0.3	5	31	40	19	N10E40	
681018	0228	1225	N07E26	S01E25	1.2	2	N	8	1.3	10	90	26	26	N03E25	
681019	0256	1204	S31W16	S24W35	0.4	2	S	18	0.3	5	72	42	40	S28W26	
681020	0323	1223	S11E68	S25E63	1.0	1	U	15	0.9	13	85	69	68	S18E66	
681022	0243	1208	S25W57	S19W67	1.0	1	N	11	0.8	9	49	67	44	S22W62	
681024	0502	1208	N15E83	N10E64	1.0	2	N	19	0.8	16	17	73	16	N13E73	
681025	0340	1030	S12E54	S21E49	0.4	1	N	10	0.3	3	80	55	54	S17E52	
681026	0516	1506	N05W29	N03W41	1.4	2	S	12	3.6	43	7	35	4	N04W35	
681027	0519	0856	S30E12	(S36E03)											
				S25W02	1.0	2	U	21	1.3	27	--	37	--	S30E04	
681030	0321	1146	N35E84	N32E62	3.0	2	S	13	3.0	38	3	73	3	N34E73	
681031	0320	1213	S05W57	S22W58	1.2	2	S	17	1.1	18	73	60	56	S14W57	
681031	0320	1213	N48E68	N38E41	1.0	2	N	18	0.9	17	4	61	3	N44E53	
681101	0443	1311	N35W17	N18W27	0.4	1	N	19	0.3	6	75	31	30	N27W22	
681103	0317	1219	N22E18	N12E14	1.0	2	N	11	1.4	15	31	20	10	N17E16	
681103	0317	1219	S48W21	S41W37	1.0	2	S	13	0.8	11	85	56	56	S45W29	
681105	0646	1448	N30E63	N18E54	2.0	2	S	15	2.0	28	46	60	39	N24E58	
681107	0310	1127	S24E26	S20E21	1.0	2	N	6	1.6	10	5	34	3	S22E23	
681107	0310	1127	N18E43	N15E38	1.6	2	N	6	2.8	16	19	42	13	N17E40	
681117	0544	1028	N12W61	N35W76	1.0	2	N	27	0.8	21	53	69	48	N24W68	
681120	0324	1156	S45E54	S08E39	0.6	2	S	36	0.3	11	45	52	34	S27E45	
681122	0342	1154	N04E36	N08E32	1.2	2	S	6	1.3	7	51	34	26	N06E34	
681124	1515	1915	2												GAP
681202	0543	1302	S50E39	S40E35	0.8	2	S	9	0.5	5	31	56	25	S45E37	
681204	0813	1323	N20E63	N05E54	1.0	2	S	17	0.8	14	53	59	43	N13E58	
681209	0421	1155	S17E41	S24E32	1.6	3	N	11	1.7	19	65	41	36	S21E37	
681212	0357	1223	S22W07	S25W18	0.8	1	N	11	0.7	7	44	26	18	S24W12	
681212	0357	1223	N25W24	N00W33	0.6	2	N	26	0.3	8	87	31	31	N13W29	
681219	0720	1537	S22W33	S21W49	1.2	2	N	15	1.7	25	25	45	17	S22W41	
681222	0517	1058	N10E64	N14E54	2.0	3	N	8	2.1	18	31	60	26	N12E59	
681222	0517	1058	S42E84	S22E40	2.0	3	S	32	2.5	80	13	64	12	S34E59	
681224	0535	1206	S22W02	S12W34	0.4	2	S	32	0.3	10	57	24	20	S18W18	
681230	0341	1225	S50E13	S35W12	0.6	2	S	24	0.3	7	51	41	31	S43W01	
690104	0607	1419	S38W30	S30W53	2.2	3	S	21	2.7	55	52	50	37	S35W42	
690114	0510	1143	N35W14	N31W29	2.0	2	N	13	2.4	32	75	43	41	N33W22	
690118	0532	1356	N39W28	N40W46	2.0	1	N	14	2.3	32	40	56	32	N40W37	
690119	0725	1156	N28W46	N25W56	3.6	2	N	9	4.5	41	43	58	35	N27W51	
690120	0830	1309	S48W26	S40W77	0.6	1	S	34	0.3	10	39	62	34	S47W53	
690122	0451	1134	S45E84	S33E59	1.6	2	N	16	1.5	24	24	72	23	S40E70	
690122	0451	1134	N22E84	N08E53	3.0	3	N	23	3.5	80	14	70	13	N16E68	
690128	0438	1126	N38W49	N38W57	2.0	2	S	5	2.2	12	29	66	26	N38W53	
690129	0357	1153	N29E19	N40E17	1.0	2	N	11	0.9	10	35	44	23	N35E18	
690131	0407	1224	N40E03	N39W11	2.0	2	N	11	2.2	24	90	46	46	N40W04	
690207	0613	1356	N43E17	N45E02	2.0	1	N	11	2.1	23	88	51	51	N44E10	
690208	0554	0946	N35W23	S27W37	3.0	3	S	63	5.5	349	83	32	32	N04W30	
690211	0708	1348	N58W01	N60W17	1.0	1	S	8	0.8	7	67	66	57	N59W09	
690214	0312	1148	S44E19	S43W21	0.8	2	S	29	0.5	15	90	39	39	S45W01	
690214	0312	1148	S22E37	S29E13	0.4	2	N	23	0.3	7	52	31	24	S26E25	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
690215	0528	1428	S22W33	S31W38	1.2	2	S	10	2.0	20	40	39	24	S27W35	
690215	0528	1428	S31W27	S19W38	0.2	1	N	16	0.3	5	75	36	35	S25W33	
690215	0528	1428	S30E52	S22E44	1.0	1	S	10	0.8	8	34	49	25	S26E48	
690217	0513	1257	S49E83	S45E61	0.6	1	S	11	0.3	3	6	73	6	S48E72	
690219	0305	1155	S40E84	S30E54	0.8	2	N	19	0.5	10	15	68	14	S36E68	
690218	1511	1600	2												GAP
690305	0343	1238	S65E41	S60W07	0.4	1	N	22	0.3	7	58	58	46	S65E15	
690306	0350	1130	N00W09	N07W11	0.2	1	N	7	0.3	2	27	15	7	N04W10	
690306	1520	1540	2												GAP
690307	1530	2410	N43E29	N47E04	1.2	2	N	18	1.0	19	82	55	54	N46E17	
690307	0330	1210	S37E25	S24E11	0.6	2	N	18	0.3	5	4	29	2	S31E18	
690309	0405	1225	N30W18	N28W30	1.2	2	N	11	1.2	12	65	43	38	N29W24	
690309	0405	1225	N18E03	N00W17	1.0	2	N	27	2.0	53	71	18	17	N09W07	
690310	0357	1127	S40W36	S30W53	0.6	1	N	17	0.3	5	59	50	41	S35W45	
690310	0357	1127	N55E49	N41E21	0.8	1	S	19	0.5	9	14	63	12	N49E33	
690316	0329	1231	S46W73	S30W73	1.6	2	U	16	1.5	24	85	72	71	S38W73	
690316	0329	1231	N20E03	(N10E03)											
				N09W12	0.2	1	U	25	0.3	7	--	20	--	N13W02	
690317	0330	1130	N28E03	N06E02	0.4	2	N	22	0.3	7	4	24	2	N17E02	
690319	0318	1141	S32E04	S17W03	0.6	2	S	16	0.3	5	22	17	6	S25E00	
690319	0347	1211	S30E43	(S37E41)											
				S30E29	0.4	1	U	19	0.3	6	--	45	--	S32E38	
690323	0318	1141	N13W32	(N02W27)											
				N02W39	0.4	2	U	24	0.3	7	--	34	--	N06W33	
690328	0354	1204	N33W04	N23W14	1.6	3	N	13	2.4	32	57	36	30	N28W09	
690329	0434	1236	N29E01	N18W20	0.0	3	S	22	0.3	7	79	32	31	N24W10	
690403	0323	1311	N37W57	N20W57	2.6	2	N	17	2.7	46	67	65	57	N29W57	
690407	0318	1203	S08E01	S17E01	0.6	2	S	9	0.3	3	9	6	1	S13E01	
690409	0335	1219	S50W16	S50W37	1.0	1	S	13	0.8	11	54	49	38	S50W26	
690415	0503	1357	N32W08	N18W28	0.6	2	N	23	0.3	7	84	36	36	N25W19	
690415	0503	1357	N47E34	N35E22	1.6	2	S	14	2.8	39	2	53	2	N41E27	
690421	0308	1141	N39W07	N22W25	0.4	1	S	23	0.3	7	69	40	37	N31W17	
690423	0226	1204	N17E53	N20E43	0.8	2	U	9	0.5	5	40	53	31	N19E48	
690424	0231	1201	S40W39	S33W53	2.0	3	N	13	2.2	29	57	53	42	S37W46	
690424	0231	1201	N51E38	N38E15	0.8	2	N	19	0.7	14	19	55	15	N45E25	
690424	0231	1201	S39E32	S28E28	0.2	1	N	11	0.3	3	34	40	21	S34E30	
690425	0351	1319	N34E20	N27E03	0.8	2	S	16	0.6	10	46	37	26	N31E11	
690426	0533	1223	S54W37	S54W67	2.4	1	S	15	2.7	40	30	65	27	S55W52	
690429	0245	1255	S21W11	S14W12	0.2	2	N	7	0.3	2	50	17	13	S18W12	
690503	0128	1159	N27E74	N22E52	0.6	2	S	15	0.3	4	2	68	2	N25E63	
690504	0250	1323	N25W42	N18W59	2.0	3	S	17	2.3	40	45	56	36	N22W51	
690506	0614	1419	S42E39	S58E32	4.0	1	U	17	4.4	73	61	55	46	S50E36	
690507	0538	0905	N10W69	N01W88	2.0	2	S	15	2.0	29	31	79	30	N06W79	
690507	0538	0905	N11E35	N11E29	1.2	3	N	6	2.3	13	23	35	13	N11E32	
690511	0218	1241	N22W49	N12W55	2.2	2	N	12	2.4	28	77	55	53	N17W52	
690516	0243	1208	S70E33	S80W27	3.2	1	S	17	3.2	54	63	74	59	S77E14	
690520	0357	1403	N40W28	N24W58	2.0	3	S	30	2.2	64	64	55	47	N33W44	
690521	0412	1012	N15E02	S07W01	0.6	2	N	22	0.3	7	3	6	0	N04E00	
690522	0418	1354	S41W18	S36W38	1.0	2	N	16	0.8	14	66	45	40	S39W28	
690524	0132	1323	S35W42	S25W57	1.6	2	S	16	1.6	27	59	55	45	S30W50	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
690530	1425	1400 2													GAP
690601	1400	1530 2													GAP
690602	1445	2445	S68E22	S70W33	0.4	1	S	19	0.3	6	79	70	67	S71W04	
690602	1445	2445	S21W41	S00W45	0.2	1	S	21	0.3	6	89	44	44	S11W43	
690604	0240	1110	S50E12	S44W26	0.4	1	S	26	0.3	8	87	49	49	S49W08	
690607	0218	1215	N20W45	N18W48	3.0	2	N	3	4.1	14	53	49	37	N19W47	
690614	0206	1233	N20W40	N04W40	0.2	2	N	16	0.3	5	77	41	40	N12W40	
690615	0229	1150	S60E34	S50W86	0.4	2	N	60	0.3	18	68	75	64	S70W38	
690618	0324	0942	S40W15	S33W45	0.2	2	N	25	0.3	7	63	48	41	S37W31	
690629	0318	1240	N45E05	N37W21	2.0	2	S	21	2.5	53	81	40	39	N42W09	
690703	0217	1158	S20W21	S22W29	0.4	2	U	8	0.3	2	27	34	15	S21W25	
690705	0359	0953	S30W17	S18W25	0.4	2	N	14	0.3	4	71	34	32	S24W21	
690709	0327	1340	N41E48	N30E23	0.6	2	N	23	0.3	7	8	46	6	N36E35	
690713	0145	1153	N25W20	N12W29	1.4	3	N	16	2.2	34	85	28	28	N19W25	
690716	0134	1218	N25W59	(N24W55)											
				N20W67	1.6	2	U	15	2.5	38	--	60	--	N23W60	
690722	0204	1237	N02E72	N02E58	1.2	2	U	10	1.0	10	4	65	4	N02E65	
690723	0213	1132	N43E54	N28E22	1.8	2	S	30	3.9	115	4	46	3	N37E36	
690724	0209	1224	S52W27	S46W39	2.4	1	N	10	2.4	24	89	62	62	S49W33	
690724	0209	1224	N23W27	N20W39	0.6	2	S	12	0.3	3	38	36	21	N22W33	
690730	0244	1132	S50E14	S38W31	2.0	2	S	34	2.1	71	82	53	52	S46W11	
690731	0214	1157	S35E17	S31W06	2.0	2	N	20	2.5	49	70	40	37	S34E05	
690731	0214	1157	N34E84	N32E64	1.2	2	S	11	0.8	9	3	73	3	N33E74	
690802	0211	1229	N03W11	S11W29	0.4	2	S	23	0.3	7	12	22	4	S04W20	
690811	0142	1343	N55E31	N48E03	1.0	2	N	19	0.9	16	46	48	32	N52E16	
690812	0254	1129	N31W56	N27W96	1.6	2	S	26	2.3	61	8	75	8	N31W76	
690816	0208	1229	N31W27	N28W43	3.0	2	N	14	5.3	76	40	40	24	N30W35	
690820	0202	1151	N05E74	N05E64	2.0	2	N	7	2.0	14	5	69	5	N05E69	
690821	0201	1208	N05E13	N07W01	0.4	2	N	14	0.3	4	0	6	0	N06E06	
690827	0310	1134	N52W36	N50W96	1.6	2	S	29	1.7	47	19	71	18	N55W67	
690828	0217	1133	S35W06	S23W20	0.4	1	N	17	0.3	5	67	39	35	S29W13	
690901	0300	1200	S55W22	S50W40	2.4	2	S	11	2.4	27	80	66	64	S53W32	
690904	0303	1306	S30W30	S18W49	2.2	3	S	21	2.5	54	69	50	46	S24W40	
690904	0303	1306	N20W57	N16W97	0.6	2	S	29	0.3	9	3	76	3	N19W77	
690906	0233	1150	S40E36	S32E26	1.2	2	N	11	1.7	19	5	52	4	S36E31	
690907	0212	1150	N40E03	N39W13	1.4	3	N	12	1.7	20	85	33	33	N40W05	
690910	0457	1407	N10E57	N18E27	0.6	2	N	30	0.3	9	21	42	14	N14E42	
690916	0131	1146	N20E84	N10E63	2.0	2	N	15	1.9	29	29	72	27	N15E73	
690926	0210	1204	S50E43	S23E16	0.4	2	N	34	0.3	10	1	51	1	S37E27	
690926	0210	1204	S50E45	S40E21	0.2	2	S	16	0.3	5	21	60	18	S46E32	
690928	0246	1142	N56E04	N49W56	1.0	1	N	36	0.8	29	67	54	48	N56W29	
691001	0214	1153	S30W27	S20W36	1.8	2	S	13	2.1	27	87	44	44	S25W32	
691002	0214	1153	N22E84	N14E56	2.0	1	N	20	2.1	42	17	69	16	N19E70	
691007	0417	1343	N06E51	N20E48	2.0	2	N	14	2.0	29	81	49	48	N13E50	
691008	0359	1000	N40E75	N45E45	1.0	2	S	18	0.8	14	30	65	27	N43E61	
691021	0243	1160	N60W01	N61W16	1.2	2	S	8	1.0	8	72	56	52	N61W08	
691021	0243	1160	N52W54	N49W79	2.6	2	N	13	2.8	36	26	71	24	N51W67	
691021	0243	1160	S21E15	(S30E13)											
				S23W01	1.0	2	U	24	1.1	25	--	33	--	S25E09	
691021	0243	1160	N23E28	N11E10	1.4	2	S	21	3.6	75	4	22	1	N17E19	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
691023	0640	1507	N40E82	N32E52	2.0	2	S	18	2.5	45	8	68	7	N37E66	
691024	0243	1160	N37E34	N30E20	1.0	2	S	14	1.5	20	12	38	7	N34E27	
691026	0357	1335	N20W52	(S24W58)											
				S17W68	2.0	2	U	56	2.1	117	--	61	--	S07W59	
691030	0549	1426	N42E10	N39W07	2.2	2	S	13	3.1	41	75	36	35	N41E01	
691110	0308	1120	S37W53	S33W71	1.6	2	N	12	1.5	19	35	70	33	S35W62	
691112	0444	1256	N50E55	N50W07	2.0	1	N	39	2.1	81	60	55	45	N54E24	
691113	0428	1048	N39E56	N28E24	0.4	2	S	29	0.3	9	9	48	7	N35E39	
691120	0328	1159	N13W12	(N19W16)											
				N17W26	1.6	3	S	17	4.0	68	--	23	--	N16W18	
691126	0252	1215	S35W26	S46W26	0.8	2	N	11	0.6	7	36	48	26	S40W26	
691202	0405	1257	N00E56	N10E41	2.6	3	N	17	3.3	56	37	49	27	N05E49	
691203	1719	1711	3												GAP
691207	0503	1153	S11E19	S01E13	0.8	2	N	12	0.8	9	39	17	11	S06E16	
691208	0522	1226	N30W36	N05W43	1.2	3	N	26	1.2	31	85	43	43	N18W40	
691210	0315	1225	S50W44	S40W57	0.8	1	N	14	0.6	8	78	64	62	S45W51	
691219	0544	1421	S05W28	S15W28	0.4	2	N	10	0.3	3	75	29	28	S10W28	
691226	0223	0742	S40E46	S21E11	2.2	2	S	35	6.1	215	11	39	7	S32E27	
700103	0758	1400	S12W34	S06W45	0.8	2	N	12	0.7	8	35	40	22	S09W40	
700105	0528	1140	N12W45	N28W50	1.0	2	N	17	0.8	14	52	52	38	N20W47	
700106	0425	1117	S42W26	S40W36	1.0	2	N	8	0.8	6	60	47	39	S41W31	
700110	0360	1130	S40W03	S40W15	2.0	2	S	9	2.6	24	75	37	36	S40W09	
700112	0408	1134	N18W24	N25W31	0.4	2	S	10	0.3	3	7	37	4	N22W27	
700118	0444	1227	S30W27	S22W29	0.4	2	N	8	0.3	2	69	34	31	S26W28	
700120	0529	1158	S32E21	S26W06	1.2	2	N	24	1.8	43	59	26	22	S30E07	
700129	0523	1041	N40E24	N38W03	2.2	2	N	21	2.5	53	70	46	43	N40E10	
700208	0324	1138	N35W66	N08W76	3.2	1	S	29	3.2	91	85	75	74	N22W71	
700210	0332	1220	N24E39	N30E26	2.0	2	N	13	2.2	28	69	46	42	N27E33	
700212	0337	1226	S38W15	S20W23	0.4	2	N	19	0.3	6	64	29	26	S29W19	
700220	0319	1156	N22E19	N10W03	0.4	2	S	24	0.3	7	41	24	15	N16E08	
700221	0347	1232	N11E23	N00E08	0.6	1	N	19	0.3	6	2	20	1	N06E15	
700226	0545	1411	S05E55	N12E53	1.2	2	N	17	1.0	18	85	55	55	N04E54	
700308	0432	1257	S36E83	S24E78	1.2	2	N	13	1.1	15	72	78	68	S30E80	
700312	0214	1354	N31E05	N31W21	4.6	3	N	22	6.6	146	78	40	39	N32W08	
700314	0357	1236	N40E53	N46E23	5.0	3	N	23	5.4	121	61	62	51	N44E39	
700321	0404	1249	N29E17	N12E05	0.6	2	S	20	0.3	6	11	30	5	N21E11	
700325	0435	1122	S53E22	S40E04	2.0	2	N	18	5.7	102	25	41	16	S47E12	
700326	0430	1234	S38W15	S38W38	2.0	1	N	18	2.9	52	46	40	28	S39W26	
700403	0108	1032	N21E10	N08W05	0.8	2	N	19	1.1	22	42	21	14	N15E02	
700421	0301	1154	N25W44	N23W54	0.4	2	S	10	0.3	3	37	56	30	N24W49	
700421	0301	1154	N28W17	N19W32	0.2	1	S	16	0.3	5	81	38	37	N24W25	
700427	0237	1148	N15E08	N25E01	1.0	2	S	12	1.1	14	44	25	17	N20E05	
700502	0152	1231	S30W46	S30W67	0.2	1	S	18	0.3	5	14	59	12	S30W57	
700503	0541	1519	S30E47	S40E44	1.2	2	N	10	1.0	11	78	52	50	S35E46	
700505	0132	1141	N40E15	N28W16	2.8	3	S	28	4.1	116	67	39	35	N35W02	
700512	0224	1124	S27W24	S25W39	0.4	2	S	14	0.3	4	40	38	23	S26W32	
700523	0246	1205	S33W19	S12W30	1.6	2	S	23	2.5	58	79	32	31	S23W25	
700524	0421	1330	S47W07	S28W10	0.6	2	N	19	0.3	6	22	36	13	S38W09	
700526	0457	0956	S04E85	S08E55	1.0	2	N	21	0.7	15	8	70	8	S06E70	
700526	0457	0956	S19E85	S19E65	1.2	2	N	19	0.5	10	3	75	3	S19E75	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
700527	0205	1112	N24E64	N18E51	2.0	3	N	11	3.1	33	12	60	10	N21E57	
700531	0025	1021	S32E84	S28E68	1.0	2	N	14	0.8	12	10	77	10	S30E76	
700531	0025	1021	N58W24	N43W32	2.0	1	N	15	2.2	34	53	57	42	N51W29	
700605	0149	1200	N31W03	N22W15	1.8	2	N	14	3.2	44	70	28	26	N27W09	
700610	0246	1236	S23E54	S13E53	1.0	2	S	10	0.8	8	71	56	52	S18E53	
700610	1522	1623	2												GAP
700615	0214	1049	N34W24	N27W31	0.6	2	N	9	0.3	3	87	40	40	N31W28	
700616	0126	1222	N23E63	N16E51	0.6	2	N	11	0.3	3	21	59	18	N20E57	
700623	0125	1245	S15W60	S22W69	2.0	2	S	10	2.5	25	29	66	26	S19W64	
700629	0321	1112	N35W03	N33W26	1.8	1	S	19	2.4	46	70	35	33	N35W15	
700629	0321	1112	N00W46	N11W63	1.4	2	N	20	1.8	36	32	54	25	N06W54	
700702	0151	1204	N40W17	N33W51	2.0	3	S	28	2.4	68	54	47	36	N38W35	
700706	0207	1148	N39W07	N30W26	1.4	3	S	18	1.7	30	90	35	35	N35W17	
700707	0134	1139	S18E35	S20E24	1.0	2	N	11	1.0	10	46	37	26	S19E30	
700721	0249	1241	S30W35	S23W40	1.8	2	S	8	2.0	17	87	48	48	S27W38	
700723	0136	1138	S14E29	S16E17	1.4	2	S	12	2.0	24	49	30	22	S15E23	
700724	0118	1204	N25E43	N16E35	2.4	2	N	12	3.4	40	34	41	22	N21E39	
700726	0336	1246	S50E48	S50E13	2.4	2	S	22	2.5	55	55	62	46	S51E31	
700806	0252	1130	N40W49	N18W96	2.8	2	S	35	3.0	104	32	74	31	N31W75	
700810	0234	1210	S43E53	S48E33	1.0	2	S	15	0.8	12	61	65	52	S46E43	
700815	0406	1318	S24E24	S24E13	1.0	2	N	10	0.9	9	57	36	30	S24E18	
700817	0241	1156	S33E14	S28E04	0.8	1	S	10	0.6	6	45	38	26	S31E09	
700822	0134	1236	N20E13	N00W07	1.0	2	N	28	2.0	56	4	4	0	N10E03	
700826	0228	1220	S42E83	S20E35	0.8	2	S	34	0.4	15	4	67	4	S33E56	
700902	0339	1151	N44E59	N40E44	2.0	1	S	10	3.4	35	3	57	3	N42E51	
700908	0238	1206	S31E11	S18W12	0.6	2	S	25	0.3	7	60	32	27	S25W01	
700920	0249	1158	N22W08	N12W25	0.4	2	N	19	0.3	6	61	19	17	N17W17	
700929	0243	1203	N48W77	N30W97	2.0	1	N	24	1.9	45	46	84	46	N39W88	
700930	0320	1138	S40E34	S22E04	0.8	1	N	31	0.7	22	27	42	18	S32E18	
701003	0320	1234	N30W49	N24W70	2.4	2	N	19	3.4	65	26	60	22	N27W60	
701004	0340	1145	N44E64	N45E26	0.6	2	N	24	0.3	7	33	55	26	N46E45	
701004	0340	1145	N35E34	N20E27	0.6	2	S	16	0.3	5	37	36	21	N28E30	
701006	1555	1500	2												GAP
701009	1457	1532	2												GAP
701017	0307	1225	N58W17	N57W77	0.6	1	S	26	0.3	8	39	66	35	N61W47	
701024	0330	1227	S19W07	S15W17	2.0	2	N	10	3.8	39	83	25	25	S17W12	
701025	0404	1207	N29W07	N30W27	0.4	2	S	17	0.3	5	51	30	23	N30W17	
701027	0312	1238	N10W22	S07W55	1.8	3	N	37	5.6	206	22	39	14	N02W39	
701104	0542	1222	N49E21	N50W67	1.2	1	N	54	1.0	56	62	57	48	N58W22	
701105	0509	1106	S31E18	S23E07	0.6	2	N	13	0.3	4	28	33	15	S27E12	
701108	0430	1313	S27E38	S20E19	0.0	2	N	19	0.3	6	19	39	12	S24E28	
701113	0243	0838	N32E25	N21E15	0.6	2	N	14	0.3	4	3	30	1	N27E20	
701119	0227	1428	S26E36	S04E25	1.0	2	S	24	0.9	23	37	35	20	S15E30	
701120	0622	1327	S28E73	S20E43	0.8	2	N	22	0.4	9	1	62	1	S25E58	
701127	0548	1448	N47W08	N30W51	3.0	3	N	37	3.7	136	74	49	47	N40W32	
701128	0908	1233	N50W42	N47W62	3.2	1	S	14	3.5	48	42	65	37	N49W52	
701128	0908	1233	S12E20	S08E13	1.2	2	N	8	2.7	22	3	20	1	S10E16	
701205	0445	1236	S26W24	S20W30	2.0	2	S	8	2.9	24	85	35	35	S23W27	
701209	1752	1935	2												GAP
701229	0421	1209	S13W34	(S05W47)											
				S26W52	0.4	2	U	37	0.3	11	--	46	--	S15W44	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
701230	0447	1217	S29W05	S29W27	0.6	2	S	19	0.3	6	57	31	26	S29W16	
710108	0346	1145	S18W40	S30W48	2.0	2	S	14	3.2	45	40	47	28	S24W44	
710114	0321	1138	N28W37	N18W43	2.0	2	S	11	2.3	26	89	48	48	N23W40	
710119	0225	1351	S35E82	S33E53	0.8	2	S	17	0.3	5	4	69	4	S35E67	
710123	0438	1234	N24W57	N20W65	2.0	2	S	8	2.1	18	45	66	40	N22W61	
710129	0722	1331	N30W58	N14W61	1.8	2	N	16	1.8	28	82	65	64	N22W60	
710206	0204	1349	N29W04	N22W16	2.4	3	S	13	3.9	50	76	33	32	N26W10	
710209	0358	1231	S06W75	S21W80	2.0	2	S	16	1.9	30	76	76	70	S14W77	
710211	0428	1557	N30W44	N22W69	2.0	3	N	22	2.1	47	42	64	37	N27W57	
710223	0509	1226	S22E18	(S28E08)											
				S25E13	0.4	1	N	16	0.3	5	--	22	--	S25E13	
710303	0626	1255	S50W02	S30W14	1.6	2	S	22	3.6	80	40	34	21	S40W09	
710304	1443	1613	2												GAP
710306	1613	1719	2												GAP
710309	0501	1142	N30W46	N10W58	2.0	2	N	23	2.1	47	84	58	58	N20W52	
710310	0458	1215	N33E53	N20E43	2.0	2	S	13	2.2	29	26	57	22	N27E48	
710315	0437	0949	N48W16	N46W55	1.0	2	N	26	0.8	21	54	64	47	N49W36	
710319	0347	1122	N12W12	N45W16	0.6	1	S	33	0.3	10	17	38	10	N29W14	
710409	0329	1201	S10E63	S17E49	4.0	1	S	13	5.5	71	29	56	24	S14E56	
710412	0239	1137	N40E17	N32W48	2.0	2	N	52	2.2	112	77	49	47	N41W17	
710413	0427	1410	N30W38	N30W48	2.0	2	N	9	2.5	22	34	55	27	N30W43	
710413	0427	1410	S31E57	S22E32	0.6	1	N	24	0.3	7	4	47	3	S27E44	
710415	0331	1305	N30W53	N18W59	1.6	1	S	13	1.5	20	87	62	62	N24W56	
710419	0647	1546	N35W59	N15W69	1.0	1	S	22	0.8	18	83	70	69	N25W64	
710501	0249	1223	N38E11	N38E03	1.6	2	S	6	1.7	11	80	43	42	N38E07	
710503	0203	1141	S45W26	S40W66	0.8	2	S	29	0.5	15	40	57	33	S44W47	
710505	0319	1139	S08E64	S18E64	1.6	2	S	10	1.5	15	88	64	64	S13E64	
710510	0157	0915	N30W20	N28W37	0.8	1	S	15	0.5	8	53	43	33	N29W29	
710518	0139	1434	N30W58	N19W63	1.6	3	S	12	1.5	18	83	65	64	N25W61	
710518	0139	1434	S31W28	S25W34	2.0	2	S	8	2.7	22	84	39	39	S28W31	
710531	0248	1053	N30E24	N20E06	0.8	2	N	19	1.1	21	28	30	14	N25E15	
710603	1356	1430	2												GAP
710606	0153	1124	S03W19	N08W30	0.8	2	N	16	1.1	17	39	25	15	N03W24	
710609	0129	1203	N46E06	N20W57	2.0	2	N	57	2.3	131	75	47	45	N37W31	
710627	0301	1131	N20E50	N05E34	0.6	2	S	22	0.3	6	34	43	22	N13E42	
710628	0414	1342	N00E43	N23E36	0.4	2	N	24	0.3	7	84	40	40	N12E40	
710630	0203	1248	N11E01	N07W07	1.2	2	S	9	3.0	27	88	7	7	N09W03	
710701	0211	1256	N37E83	N35E53	0.6	2	N	17	0.3	5	7	71	7	N37E68	
710703	0233	1237	S50W07	S50W15	2.0	1	S	5	2.1	11	76	54	52	S50W11	
710705	0241	1206	S20E23	S24E11	1.8	2	S	12	2.5	29	74	30	29	S22E17	
710715	0304	1234	N20E65	N30E63	0.4	1	N	10	0.3	3	87	65	65	N25E64	
710717	0218	1212	S30E12	S18W16	1.8	2	S	28	3.0	85	70	29	27	S25W03	
710719	0655	1603	N38E13	N28E04	1.6	1	N	13	4.2	53	20	29	10	N33E08	
710724	0200	1215	N38W52	N33W59	2.0	1	N	8	2.1	16	59	59	47	N36W56	
710726	0719	1621	S32E31	S18E11	1.0	2	S	23	1.5	34	16	36	9	S25E20	
710730	0108	1308	N39E83	N39E63	1.2	2	S	10	0.6	6	7	73	7	N39E73	
710809	0201	1107	S61E24	S60W06	1.6	2	S	15	1.5	22	77	68	65	S61E09	
710809	0201	1107	S01W09	S08W11	0.6	1	N	7	0.3	2	27	15	7	S05W10	
710813	0348	1206	S30E83	S25E63	1.2	2	N	18	0.5	9	2	78	2	S28E73	
710817	0302	1232	S14W41	S12W50	2.0	2	N	9	3.0	27	34	49	25	S13W46	

Date	Time	Err		Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
710818	1337	1528	2													GAP
710824	0301	1237		N40E15	N50E11	1.0	2	U	10	0.9	9	36	40	22	N45E13	
710828	0332	1038		S17W16	S22W27	1.0	2	N	12	1.4	16	24	34	13	S20W21	
710903	0239	1212		N35W05	N15W17	0.6	1	S	23	0.3	7	62	21	18	N25W11	
710904	0102	1011		N03E02	(S05W05)											
					S11E00	0.2	1	U	18	0.3	6	--	12	--	S04W01	
710908	0305	1249		S27E07	S11W06	1.2	2	S	20	3.3	66	37	26	15	S19E00	
710908	0305	1249		N28W08	N25W17	0.8	2	N	9	0.7	6	77	23	22	N27W13	
710909	0324	1131		S13E13	S05W14	0.2	1	S	28	0.3	8	75	17	16	S09W01	
710910	0317	1223		N04E26	S05E21	0.6	2	N	10	0.3	3	80	25	25	S01E24	
710912	0317	1147		S47E54	S40E27	1.0	2	S	17	0.9	14	24	63	21	S44E40	
710914	0240	1146		N32E29	N09E11	1.0	2	N	28	1.7	48	21	23	8	N21E19	
710916	2306	1202		N08E52	S06E50	3.4	2	S	14	3.6	51	90	51	51	N01E51	
710921	1255	1655	2													GAP
710925	0407	1151		N28E84	N18E54	0.6	2	S	21	0.3	6	18	67	17	N24E68	
710926	0343	1145		N05E54	N18E45	0.4	1	N	16	0.3	5	57	49	39	N12E50	
710927	0356	1229		S29E65	S18E48	0.6	2	N	15	0.3	4	14	63	12	S24E56	
711003	0305	1205		S28W07	S29W26	1.4	1	S	17	1.6	26	60	39	33	S29W16	
711008	0255	1219		S28W04	S25W21	0.8	1	N	15	0.5	8	79	35	34	S27W13	
711010	0339	1151		S02E72	(S18E72)											
					S12E54	0.8	2	U	30	0.6	16	--	70	--	S11E66	
711012	0222	1133		S33W19	S18W26	0.6	1	N	16	0.3	5	61	39	33	S26W23	
711012	0222	1133		S42W02	(S39E18)											
					S22W06	1.4	2	U	42	1.7	73	--	43	--	S34E03	
711017	0360	1400		S15E12	N07E03	1.0	2	S	24	2.2	52	16	12	3	S04E07	
711019	0415	1133		S23E54	(S17E40)											
					S03E47	0.6	2	U	29	0.3	9	--	50	--	S14E47	
711022	0221	1407		S13E24	S22E12	0.6	2	N	15	0.3	4	89	29	29	S18E18	
711026	0203	1306		S12W27	S22W40	0.8	3	N	16	0.8	13	8	40	5	S17W33	
711028	0352	1210		S40W26	S14W59	0.2	2	S	39	0.3	12	73	54	51	S28W44	
711106	0247	1340		S35E83	S25E43	0.2	2	S	26	0.3	8	2	69	2	S32E62	
711110	0140	1404		S48E47	S40E22	1.0	2	U	17	1.0	18	24	57	20	S45E34	
711115	2350	1206		S26E51	(S20E53)											
					S27E47	0.4	2	U	15	0.3	5	--	56	--	S24E50	
711118	0403	1557		S24E17	(S19E01)											
					S09E01	0.6	2	U	26	0.3	8	--	21	--	S17E06	
711120	0533	1106		S21W49	S05W68	1.2	2	N	24	1.1	26	52	60	43	S13W59	
711123	0160	1360		S41E04	S30W16	3.0	2	S	20	4.7	92	66	38	34	S36W07	
711128	0352	1210		S28W59	S18W66	4.0	2	N	12	4.3	52	70	66	59	S23W63	
711204	0559	1019		N14W26	(S02W38)											
					S05W36	0.4	2	U	24	0.3	7	--	35	--	N02W33	
711214	0547	1137		S20E29	S22E15	0.8	2	S	13	0.6	8	49	30	22	S21E22	
711215	0617	1254		S15W08	N10W16	1.0	2	S	26	2.0	53	80	12	12	S03W12	
711215	0617	1254		N37E45	N32E31	3.2	2	S	12	7.6	92	13	50	10	N35E38	
711225	0519	1216		S23E11	S21W02	0.7	2	U	12	0.4	5	68	21	19	S22E04	
711227	0510	1050		S03W36	N16W36	2.8	3	N	19	4.5	86	77	37	36	N07W36	
711230	0408	1233		S05E08	S09W05	0.8	2	S	14	1.0	14	88	5	5	S07E02	
720103	0027	1158		S07W53	S12W66	1.0	2	N	14	1.2	16	19	59	16	S10W59	
720106	0054	1210		N03E23	N03E20	0.8	2	N	3	0.9	3	17	22	6	N03E21	
720107	0040	1137		S30W39	S16W48	1.2	2	S	16	1.1	19	78	47	46	S23W44	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
720107	0040	1137	N52E74	N42E17	1.0	3	N	30	0.8	26	26	65	23	N51E43	
720111	0340	1508	S17E14	S27E12	0.8	2	N	10	0.6	6	47	22	16	S22E13	
720115	0835	1133	N52E49	N55E02	0.6	2	N	28	0.4	10	67	64	56	N56E26	
720115	0835	1133	N32W49	N30W96	2.0	2	S	29	2.1	62	16	78	16	N33W73	
720115	0835	1133	S00W66	S18W79	1.2	2	S	22	1.0	23	57	72	53	S09W72	
720116	0609	1001	N19W33	N05W43	0.6	2	S	17	0.3	5	77	41	40	N12W38	
720119	0938	1042	S47E32	(S38E09)											
				S18E09	0.4	2	S	39	0.3	12	--	34	--	S34E17	
720124	0450	1235	N25E83	N23E63	2.0	2	S	18	1.0	18	6	77	6	N24E73	
720129	0457	1628	S10W47	S20W49	0.4	1	S	10	0.3	3	73	48	45	S15W48	
720206	0313	1517	S14W18	S10W22	0.6	2	N	6	0.3	2	60	21	18	S12W20	
720206	0313	1517	N50E32	N45E09	1.4	2	N	14	1.3	19	48	57	39	N48E20	
720207	0547	1117	N30E20	N15E19	1.0	2	N	15	1.0	16	32	35	18	N23E19	
720207	0547	1117	N36E59	N22E39	0.4	1	S	19	0.3	6	10	59	9	N29E48	
720213	0708	1347	N54E63	N52E38	1.0	2	N	10	0.8	8	30	74	29	N54E50	
720216	0243	0936	N28E15	(N23E11)											
				N32E09	0.4	2	U	15	0.3	5	--	36	--	N28E12	
720225	0259	0920	N09E75	N12E55	0.8	2	N	15	0.5	8	21	67	19	N11E65	
720228	0303	1428	S30E32	S11E22	0.6	2	S	21	0.3	6	40	29	18	S21E27	
720304	0304	0900	S12E00	S23W05	0.9	2	S	12	1.5	18	10	11	2	S18W02	
720307	0327	1519	N20E42	N05E35	0.6	2	N	16	0.3	5	40	43	26	N13E38	
720309	0231	1413	S35E42	S25E14	2.0	2	S	26	5.4	141	14	35	8	S31E27	
720323	0608	1517	N44E20	N18E02	1.4	2	N	30	3.0	90	14	39	9	N31E10	
720326	0211	1349	N29E23	N31E06	1.4	2	N	15	1.5	22	75	40	38	N30E15	
720401	0203	1350	S02W37	S02W52	1.0	2	N	15	1.6	24	8	45	6	S02W45	
720405	1055	1151	S22W76	S18W81	1.4	2	N	5	1.3	6	38	77	37	S20W79	
720407	0457	1106	S33E74	S18E57	2.0	2	S	16	2.0	32	40	65	36	S26E65	
720413	0108	1309	S25W10	S10W10	1.0	2	N	15	2.0	30	42	15	10	S18W10	
720419	0012	1221	S30W57	S22W75	1.6	2	N	16	1.7	26	32	66	29	S26W66	
720420	0005	1132	S35E24	(S12E02)											
				S17W06	0.6	2	N	40	0.3	12	--	15	--	S21E07	
720421	0140	1344	N35E43	N30E23	0.6	2	U	17	0.3	5	28	49	21	N33E33	
720502	0001	1231	N30E73	N20E62	1.4	2	N	10	1.3	12	31	72	29	N25E67	
720505	0157	1146	S30E64	S26E54	1.0	2	S	8	0.9	7	13	61	11	S28E59	
720510	0349	1536	N27W25	N18W31	1.4	2	S	11	1.7	18	82	38	38	N23W28	
720513	0209	1201	S44E73	S25E46	1.2	2	S	23	1.1	24	25	62	22	S35E58	
720513	0209	1201	S58E33	S55E15	3.0	2	S	9	3.7	34	44	57	36	S57E24	
720514	0302	1253	S40E23	S32W07	1.0	2	N	25	1.0	25	58	35	29	S37E07	
720514	0302	1253	S25E01	S16W12	0.5	2	S	15	0.3	5	72	18	17	S21W06	
720516	0221	1123	S47W58	S42W86	1.5	2	S	15	1.4	21	25	76	24	S45W73	
720517	0218	1234	N33E61	N12E26	2.0	2	S	37	5.0	184	7	49	5	N23E42	
720603	0139	1149	N48E36	N23E24	0.6	2	S	27	0.3	8	23	45	16	N36E29	
720609	0419	1354	S25E22	S09W03	0.4	2	S	29	0.3	9	28	20	9	S17E09	
720612	0301	1236	S05E61	S12E51	0.8	2	N	10	0.5	6	42	57	34	S09E56	
720612	0301	1236	N25W15	N18W30	0.4	1	N	16	0.3	5	68	31	29	N22W23	
720613	0341	1204	S40E53	S20E13	0.4	2	N	40	0.3	12	10	43	7	S32E31	
720615	0234	1139	N01E12	S16E09	0.8	2	S	17	0.8	13	62	13	11	S08E11	
720616	0206	1153	N30W38	N18W52	1.0	2	N	18	0.8	14	64	50	44	N24W45	
720617	0150	1151	S33W21	S20W46	0.2	1	N	26	0.3	8	66	43	39	S27W34	
720618	0136	1154	S35W56	S18W91	1.0	2	S	26	0.8	21	38	77	37	S28W75	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
720618	0136	1154	S45W41	S55W61	2.0	2	N	13	3.1	41	5	67	5	S50W50	
720625	0258	1052	S32E14	S28E02	1.4	2	N	11	2.0	22	54	33	26	S30E08	
720703	2323	1219	N41W37	N40W47	1.8	3	N	8	2.1	16	41	53	32	N41W42	
720705	1325	1305	2												GAP
720710	0141	1205	S31W37	S26W49	0.6	2	N	12	0.3	3	56	53	41	S29W43	
720710	0141	1205	N03E63	N10E63	3.0	2	N	7	3.0	21	89	63	63	N06E63	
720711	0139	1154	S26W56	S24W96	0.6	2	N	26	0.3	8	13	79	13	S26W76	
720714	0250	1240	N18W23	N17W35	1.6	2	N	11	3.9	45	27	31	14	N18W29	
720722	0233	1112	N56W26	N55W51	2.0	2	N	14	2.1	29	48	60	40	N56W39	
720725	0209	1211	N19W46	N10W56	2.0	2	N	13	2.5	33	48	51	35	N15W51	
720731	0305	1215	S12E53	S25E49	1.6	2	S	14	1.5	20	85	56	56	S19E51	
720731	0305	1215	S65E83	S50E33	0.4	2	S	30	0.3	9	3	77	3	S60E52	
720731	0305	1215	N28E44	N24E23	1.0	2	S	19	1.5	29	15	38	9	N26E33	
720804	0624	1231	S32E63	S15E31	1.0	2	N	30	1.1	32	3	54	2	S24E46	
720805	0439	0944	S03E15	(N02E14)											
				N02W00	0.2	2	U	19	0.3	6	--	12	--	N00E10	
720805	0439	0944	N25E75	N18E63	1.6	2	S	10	1.5	14	30	68	28	N22E69	
720806	0208	1146	N21E55	N15E49	1.6	2	S	8	1.6	12	40	52	30	N18E52	
720807	0211	1217	S17E21	S08E11	1.1	2	S	13	2.2	29	6	25	3	S13E16	
720810	0216	1238	S20W49	S09W67	0.6	2	N	20	0.3	6	48	61	41	S15W58	
720811	0219	1125	N40W36	N30W58	6.0	2	N	21	8.2	167	52	52	38	N35W48	
720817	0213	1313	N01W36	N03W37	0.5	2	N	2	0.3	1	72	37	35	N02W36	
720822	0158	1145	N19W29	N17W38	0.8	2	S	9	0.8	7	28	34	15	N18W34	
720827	0220	1225	N28E73	N30E53	2.4	1	N	13	4.5	61	14	63	12	N29E63	
720830	0434	1149	S25W56	S23W58	2.3	3	N	3	2.3	6	69	64	57	S24W57	
720831	1428	1845	2												GAP
720905	0750	1531	S24E04	S15W10	1.0	2	S	16	1.3	21	63	27	24	S20W03	
720906	1146	1226	S20W52	S08W75	2.0	3	N	22	2.1	46	43	67	39	S14W64	
720916	0352	1305	N15E01	N10W19	0.4	2	S	20	0.3	6	45	11	8	N13W09	
720919	0327	1235	S40W15	S22W38	2.0	2	S	27	2.3	61	86	47	47	S32W28	
720921	0333	1203	N42E16	N42E05	0.7	2	S	8	0.4	3	72	36	34	N42E11	
720928	0254	1141	N32W05	N34W17	0.8	2	S	10	0.6	6	55	28	23	N33W11	
721002	0348	1214	S20W29	S12W53	1.6	3	N	24	2.0	48	45	47	31	S16W41	
721003	0406	1204	S16W39	S10W42	1.2	2	S	7	1.2	8	88	45	45	S13W41	
721015	0015	1245	S35E43	S10E12	1.0	2	S	38	1.5	56	3	39	2	S23E26	
721017	0358	1138	N42E84	N42E44	0.8	1	N	22	0.6	12	14	67	13	N44E64	
721017	1536	1118	2												GAP
721024	0322	1223	N30E08	N10E03	0.4	2	N	21	0.3	6	7	16	2	N20E05	
721030	0028	1153	S33E14	S35W01	1.2	2	N	13	1.1	14	89	39	39	S34E07	
721101	0216	0951	N34W38	N23W61	1.4	2	S	23	1.4	33	47	53	36	N29W50	
721102	0208	1402	S41E02	S35W18	0.8	2	N	17	0.5	9	81	43	42	S38W08	
721105	0632	0941	S18W07	(S10W23)											
				S13W24	0.4	1	S	21	0.3	6	--	26	--	S14W18	
721112	0028	1117	S33E29	S28E11	1.8	3	S	16	2.9	48	39	39	23	S31E20	
721115	0431	0813	S13E15	S00W09	0.8	2	N	27	1.0	27	44	10	7	S07E03	
721116	0237	1353	N33E67	N28E47	0.3	2	U	14	0.3	4	0	60	0	N31E57	
721117	1640	1630	2												GAP
721119	1630	1612	2												GAP
721122	0436	1224	N10W62	N28W87	2.0	1	N	23	2.1	49	34	74	33	N19W74	
721202	0435	1616	N10E53	S05E43	1.0	2	N	18	0.8	14	55	48	37	N03E48	

Date	Time	Err		Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
721211	0618	1144		S09E19	S02E04	1.2	3	N	16	2.9	47	1	13	0	S06E11	
721216	0409	1024		N40E84	N36E44	2.0	2	S	22	2.1	46	11	71	10	N40E63	
721219	0852	1217		S27E13	S20W77	0.6	2	S	81	0.3	24	43	44	28	S32W34	
721228	0728	1423		S33W68	S24W71	3.0	2	N	9	3.0	29	82	71	69	S29W70	
730108	0031	1159		S00E09	S09E02	1.2	2	N	11	3.5	40	61	6	5	S05E06	
730119	0305	1415		S00W31	S07W33	3.0	3	S	7	6.1	45	78	32	31	S04W32	
730130	1620	1610	2													GAP
730131	1615	2355		N35E44	N25E29	0.8	2	S	15	0.6	9	2	50	2	N30E36	
730131	1615	2355		N08W63	N17W69	1.0	2	N	10	0.8	8	45	68	41	N13W66	
730131	1615	2355		S47W76	S33W96	1.0	2	S	21	0.8	17	41	84	41	S40W87	
730210	0506	1236		S11W05	S05W09	0.4	2	S	7	0.3	2	69	7	7	S08W07	
730214	0741	1204		S31E31	S19E08	1.4	3	N	24	3.4	82	12	26	5	S25E19	
730221	0455	1115		S15W22	S13W32	0.4	2	S	10	0.3	3	24	27	11	S14W27	
730228	0028	1319		N30E02	N30W13	0.4	1	S	13	0.3	4	81	38	37	N30W05	
730304	0207	1355		N15E25	N10E13	1.4	2	N	13	3.4	44	22	27	10	N13E19	
730307	0524	1139		S32W30	S39W44	0.6	1	N	13	0.3	4	0	44	0	S36W37	
730311	0443	1303		S03W17	S00W31	0.6	2	N	14	0.3	4	2	25	1	S02W24	
730318	0512	1212		S36W41	S20W87	1.7	2	S	38	1.8	70	29	66	26	S30W66	
730318	1724	1637	2													GAP
730322	0718	1058		S24E09	S17W01	1.4	2	N	12	3.9	45	37	14	8	S21E04	
730327	0157	0947		N30E45	N16E37	1.0	2	S	15	0.9	13	30	50	23	N23E41	
730328	1224	1500	3													GAP
730401	1603	2100	2													GAP
730405	1527	1519	4													GAP
730410	1728	1550	2													GAP
730414	1516	1530	2													GAP
730421	0447	1131		N03E40	N09E40	1.6	2	N	6	1.6	10	75	42	40	N06E40	
730422	1407	1648	2													GAP
730427	0453	0942		S02E31	N03E20	0.4	2	N	12	0.3	4	37	26	15	N01E26	
730429	1142	1533	3													GAP
730504	0327	1230		S38E55	S25E23	0.9	2	S	30	1.0	29	4	45	3	S33E38	
730507	0216	1156		S23E54	S30E44	3.0	1	S	11	3.4	39	55	52	40	S27E49	
730508	1448	2436		S32E22	S20W13	0.4	2	N	33	0.3	10	60	24	21	S27E04	
730507	1412	1524	2													GAP
730521	0149	1203		N61W17	N58W39	1.6	2	N	12	1.5	17	74	66	61	N60W28	
730603	1343	1347	2													GAP
730604	1345	2402		S28E17	S13E09	1.6	1	S	17	3.5	59	7	24	3	S21E13	
730604	1345	2402		N48W29	N28W36	1.0	1	N	21	0.9	19	61	49	41	N38W33	
730613	0417	1359		N00E54	N20E52	1.4	2	N	20	1.3	25	89	54	54	N10E53	
730616	0620	1312		N29E63	N03E35	1.2	2	S	35	1.1	40	32	50	24	N16E48	
730622	0135	1155		S20E26	S23E14	0.8	2	S	12	0.6	7	62	30	26	S22E20	
730701	1435	1345	2													GAP
730702	1410	2335		S35W01	S22W23	2.8	1	N	23	5.0	115	79	34	33	S29W13	
730702	1410	2335		N21W50	N14W56	2.0	3	N	9	2.4	22	60	54	44	N18W53	
730712	0528	0848		N52E20	N45W05	1.6	3	N	18	1.8	32	57	46	37	N49E07	
730712	1415	1425	3													GAP
730714	0220	3605		N30E10	N15E00	1.4	2	N	18	3.6	63	17	19	5	N23E05	
730717	1506	2214	4													GAP
730729	0308	1237		N29E83	N05E50	0.8	2	S	29	0.6	17	36	65	32	N18E65	
730807	0406	1415		N26W63	N20W71	0.8	2	S	9	0.5	5	43	67	39	N23W67	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
730807	0406	1415	N36E52	N33E42	1.0	2	U	8	1.1	9	2	52	2	N35E47	
730809	0554	1134	N35W55	N15W76	1.2	2	N	27	1.0	29	52	66	46	N25W66	
730822	0405	1420	S20W30	S18W39	0.6	2	N	9	0.3	3	47	43	30	S19W35	
730830	1132	1742	2												GAP
730902	0544	1203	N28E73	N18E61	0.8	2	S	15	0.6	9	40	66	36	N23E67	
730909	0634	1141	N17E12	N14E04	2.0	2	N	8	6.8	56	25	11	5	N16E08	
730914	0549	1155	S00E02	S10W06	0.6	1	S	13	0.3	4	29	12	6	S05W02	
730930	1121	1429	2												GAP
731018	0333	1157	S30E24	S32E09	0.8	2	S	13	0.5	7	73	40	38	S31E17	
731027	0412	1023	S26W10	S26W16	2.0	3	S	5	2.9	15	66	33	30	S26W13	
731029	0333	1156	N18W19	N28W21	1.4	3	S	10	4.2	42	39	27	17	N23W20	
731114	0428	1134	N19E29	N09E15	1.8	3	N	17	5.3	90	11	24	4	N14E22	
731118	0406	1224	N30E43	N20E23	1.0	3	S	21	1.5	30	2	39	1	N25E33	
731122	0749	1219	S09E23	S03E11	1.0	2	N	13	1.8	24	2	19	1	S06E17	
740106	0239	1402	S27E48	S21E17	1.5	2	S	29	3.3	96	17	38	10	S25E32	
740115	0317	1421	N33E09	N26W18	0.6	2	S	24	0.3	7	82	35	35	N30W05	
740118	1352	0528	N03E14	S10E14	1.2	1	S	13	2.1	28	85	14	14	S04E14	
740121	0913	1107	S10W04	S08W13	0.6	2	V	9	0.3	3	38	9	6	S09W09	
740121	1444	0623	N40W27	N23W31	2.4	1	N	17	3.2	56	54	46	36	N32W29	
740123	1038	1028	N28E28	N27E24	0.6	2	V	4	0.3	1	33	41	21	N28E26	
740128	0623	1146	S38E54	S31E38	1.0	2	S	14	1.2	17	4	51	3	S35E46	
740204	1635	1645	2												GAP
740213	1142	1142	N20E32	N19E23	1.2	1	N	9	1.7	14	35	38	21	N20E27	
740214	1335	1410	S43E36	S30E18	0.6	2	V	19	0.3	6	3	38	2	S37E26	
740215	0604	1347	N40E30	N40E18	1.6	3	S	9	1.6	14	59	52	42	N40E24	
740220	0258	0938	S26E46	S40E35	1.0	2	S	17	0.8	13	82	46	45	S33E41	
740227	1018	1208	S31W44	S36W59	0.6	2	V	13	0.3	4	5	54	4	S34W51	
740228	1018	1153	N38W37	N30W61	0.6	2	N	21	0.3	7	54	63	46	N35W50	
740302	1105	1230	S20E53	S18E47	0.6	2	V	6	0.3	2	13	50	10	S19E50	
740309	1125	1200	N07E01	N11W04	0.6	3	V	7	0.3	2	46	16	11	N09W01	
740311	1125	1155	S32W05	(S40W07)											
				S42W16	0.6	3	V	15	0.3	5	--	32	--	S38W09	
740312	1135	1215	S18W07	S03W13	0.6	2	V	16	0.3	5	86	10	10	S11W10	
740315	1160	1110	N02W46	S03W46	1.8	2	V	5	2.1	11	80	46	45	S01W46	
740317	0005	2225	1												GAP
740322	1147	1203	S37W29	S41W52	0.6	2	V	18	0.3	5	18	48	13	S40W40	
740329	1323	1203	S42W17	S42W27	0.6	1	V	7	0.3	2	55	40	32	S42W22	
740403	1555	1215	S38E34	S42E33	0.6	2	V	4	0.3	1	62	45	39	S40E34	
740404	1355	0945	N29E13	N33E09	0.6	1	V	5	0.3	2	58	39	32	N31E11	
740405	1145	1205	S15W19	S09W25	0.6	1	V	8	0.3	3	58	22	19	S12W22	
740405	1145	1205	S31E51	S35E50	0.6	1	V	4	0.3	1	84	54	54	S33E51	
740407	0407	1128	N12E02	N00E02	0.6	1	V	12	0.3	4	9	13	2	N06E02	
740415	1425	1325	N21W38	N22W39	1.2	1	N	1	2.3	3	15	47	11	N22W38	
740415	1145	0514	S34W17	S22W23	1.8	2	N	13	2.9	39	68	29	27	S28W20	
740415	1145	0514	S42W27	S28W58	1.0	2	N	29	0.8	24	56	50	39	S36W44	
740417	1317	1057	S15E50	S09E48	1.2	1	V	6	1.0	7	69	49	45	S12E49	
740419	0412	1252	N43E25	N48W09	0.5	2	S	24	0.3	7	89	53	53	N47E09	
740419	0412	1252	S12W05	S08W28	0.5	2	S	23	0.3	7	25	17	7	S10W17	
740422	1203	1213	N31W11	N40W17	0.6	1	V	10	0.3	3	8	43	5	N36W14	
740425	0246	1214	N31E73	N31E58	0.5	2	S	9	0.3	3	18	72	17	N31E66	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
740427	0412	1310	N38W05	N40W17	0.8	1	S	10	0.5	5	62	45	39	N39W11	
740429	1752	0607	N49E12	N45W13	1.2	2	N	17	1.1	18	78	52	50	N48W01	
740505	1218	1038	S12E60	S04E52	0.6	2	V	10	0.3	3	45	56	36	S08E56	
740505	1218	1038	S05E00	S08W03	0.6	2	V	4	0.3	1	13	3	1	S07W01	
740509	0316	1206	S33E37	S27E28	0.5	2	N	10	0.3	3	3	40	2	S30E32	
740514	0219	1150	S30W31	S27W51	0.7	2	N	18	0.4	6	35	47	25	S29W41	
740516	0308	1147	S11W52	(S20W49)											
				S15W62	1.0	2	V	23	0.9	20	--	54	--	S15W54	
740528	0330	0115A	N48E39	N30E14	1.2	2	N	26	2.1	56	11	47	8	N40E25	
740603	2358	1149	S25E13	S10W00	0.6	2	N	19	0.3	6	19	18	6	S18E06	
740606	1125	1145	S14E39	(S21E26)											
				S16E14	0.6	2	S	27	0.3	8	--	32	--	S17E26	
740610	1108	1208	S19W37	S17W47	0.6	1	V	10	0.3	3	31	45	21	S18W42	
740617	1331	0839	N43E35	N39E05	1.2	1	N	23	1.2	28	51	45	33	N42E20	
740618	1045	1200	S33W43	S33W48	0.6	2	V	4	0.3	1	29	55	23	S33W45	
740619	1038	1153	S26E06	S08W06	0.6	2	V	21	0.3	6	33	18	10	S17W00	
740624	2357	1147	S40E34	S48E24	1.2	1	V	11	1.0	11	80	53	52	S44E29	
740626	1402	0815	N28W17	N43W24	1.2	3	S	16	2.4	39	13	38	8	N36W20	
740703	1150	1200	S20W25	S13W37	0.6	3	V	13	0.3	4	61	36	31	S17W31	
740705	0121	1343	N13E33	N08E13	0.6	2	V	20	0.3	6	2	24	1	N11E23	
740708	0326	1209	S45W38	S38W50	1.0	2	N	11	0.8	9	75	60	57	S42W44	
740715	0330	1150	S16E10	S25E04	1.2	3	S	11	1.6	16	48	26	19	S21E07	
740723	1218	1057	S23E67	S20E52	1.2	2	V	11	1.1	12	5	64	4	S22E59	
740726	1318	1233	S40E63	S32E46	0.6	2	V	12	0.3	4	3	65	3	S36E54	
740727	1357	1208	S18E05	S14W06	0.6	2	V	11	0.3	3	71	21	20	S16W01	
740811	1127	1138	N02E20	N07E19	0.6	1	V	5	0.3	2	72	20	19	N05E20	
740813	1105	1200	S09E15	S12E14	1.2	2	V	3	1.5	5	59	22	19	S11E15	
740818	1232	1328	S23W10	S21W25	0.6	1	V	14	0.3	4	66	34	31	S22W18	
740826	0011	1206	S23E09	S28E02	1.2	3	N	8	1.3	10	62	33	29	S26E06	
740829	1107	1158	S41E11	S42E02	0.6	1	V	7	0.3	2	90	49	49	S42E07	
740901	1135	1055	N38W56	N42W56	1.8	2	V	4	1.8	7	72	60	55	N40W56	
740907	1112	1153	S38E44	S42E22	1.2	2	N	17	1.0	18	63	57	48	S41E33	
740910	1227	2429	S26W13	S45W13	1.8	2	V	19	0.3	6	19	44	13	S35W13	
740915	1112	1243	N32W29	N48W43	1.2	1	V	19	2.3	45	20	46	14	N40W35	
740917	0233	1152	S22E52	S08E44	0.3	2	S	15	0.3	4	40	52	30	S15E48	
740929	0713	0438	S45W36	S38W93	2.0	2	N	29	1.9	56	32	79	31	S45W66	
741011	1416	1460	N30E12	N38E10	0.6	1	V	8	0.3	2	34	30	16	N34E11	
741015	1103	1201	S18W39	S08W47	1.2	2	N	13	1.1	15	73	47	44	S13W43	
741018	0258	0856	S45E85	S25E19	1.8	3	N	45	2.6	116	11	63	10	S40E47	
741022	1118	1217	S52W27	S52W32	0.6	1	V	3	0.3	1	56	63	48	S52W29	
741025	1104	1201	S10E08	N01E06	0.6	1	V	11	0.3	3	26	12	5	S05E07	
741026	1445	1540	S29E12	S24E01	1.2	2	V	11	1.7	18	51	32	24	S27E06	
741101	0958	1507	N41W18	N45W33	1.2	2	V	12	1.3	15	33	45	23	N43W25	
741107	1037	1152	N08W40	N07W42	1.2	2	V	2	1.9	4	30	41	19	N08W41	
741111	0957	1213	S45W28	S39W29	1.8	1	V	6	2.3	14	44	52	33	S42W29	
741112	1403	1543	N24W09	N19W12	1.8	1	V	6	6.8	39	60	21	18	N22W11	
741114	1403	1543	S03W09	S05W17	1.2	1	V	8	3.0	25	14	15	4	S04W13	
741123	1103	1143	S13E64	S10E56	1.2	1	V	7	1.4	9	12	61	10	S12E60	
741127	1118	1021	S11W10	(S11W15)											
				S17W14	0.6	2	V	11	0.3	3	--	20	--	S13W13	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
741129	1233	1428	S22E40	S31E37	1.2	2	V	9	1.1	10	76	46	44	S27E39	
741205	0047	1238	S27W37	S15W38	0.6	2	V	12	0.3	4	69	42	39	S21W38	
741211	1018	1153	N49W06	N50W19	1.2	1	S	8	1.1	9	67	51	46	N50W12	
741230	1013	1157	S21E42	S13E29	0.6	2	V	15	0.3	4	14	38	9	S17E35	
741231	1010	1200	N18W43	N08W45	0.6	2	V	10	0.3	3	84	46	46	N13W44	
750101	1020	1210	N33E11	N25E04	0.6	2	V	10	0.3	3	24	33	13	N29E07	
750104	1333	0828	S41E40	S44E40	1.2	2	V	3	1.1	3	53	53	40	S43E40	
750105	1026	1226	S18E08	S04E01	0.6	3	V	16	0.3	5	4	9	1	S11E04	
750106	1023	1131	S02W20	S15W24	0.6	2	V	14	0.3	4	61	22	19	S09W22	
750112	0502	0142A	N25W31	N22W41	1.8	2	S	10	2.2	21	52	45	34	N24W36	
750115	1330	1215	S51E43	S51E27	0.6	2	V	9	0.3	3	46	55	36	S51E35	
750117	1008	1158	S32E36	S25E24	1.2	1	S	13	2.3	28	1	37	1	S29E30	
750119	1025	1130	S21W08	S20W18	0.6	1	V	9	0.3	3	56	20	16	S21W13	
750126	1703	0426	N33E32	N22E13	1.2	1	S	20	2.4	48	21	39	13	N28E22	
750126	1703	0426	S13W22	S06W26	0.6	1	V	8	0.3	2	69	24	22	S10W24	
750201	0646	0643	S16W49	S10W56	0.6	2	V	9	0.3	3	44	52	33	S13W53	
750203	1131	1117	N22E44	N10E21	0.6	2	S	25	0.3	8	4	39	3	N16E32	
750204	1031	1144	S36E54	S32E31	0.6	1	N	19	0.3	6	14	48	10	S35E42	
750207	0923	1208	N19E16	N17E13	0.6	2	V	3	0.3	1	23	28	11	N18E14	
750207	0923	1208	N14W28	N00W29	0.6	2	V	14	0.3	4	70	31	29	N07W29	
750209	1259	0735	N00E51	N08E48	2.4	2	S	9	2.5	22	81	51	50	N04E50	
750211	1055	1115	N10E05	S03W07	0.6	1	V	18	0.3	5	48	10	7	N04W01	
750215	1350	1235	S22W29	S16W32	1.2	1	V	7	1.5	10	83	32	32	S19W31	
750216	1218	0953	N16E06	N18W15	0.6	2	V	20	0.3	6	74	24	23	N17W04	
750216	1218	0953	N43W18	N30W35	1.2	1	N	19	1.1	20	82	50	49	N37W27	
750225	0052	1143	N44E23	N44W34	1.8	1	S	40	1.8	71	83	55	54	N48W05	
750226	1008	1153	S43E74	S43E62	1.2	1	V	6	0.9	6	10	69	9	S43E68	
750228	1150	1215	N24E83	N03E52	0.6	2	V	25	0.3	9	22	70	21	N14E67	
750306	1058	1218	N12E49	N08E43	1.2	2	V	7	1.6	11	15	49	11	N10E46	
750308	1315	1405	N05E15	N02E07	0.6	1	V	9	0.3	3	24	15	6	N04E11	
750310	1353	1458	S19W49	S27W75	0.6	2	V	25	0.3	7	14	61	12	S24W62	
750315	1216	1425	N18E02	N18W11	1.2	1	V	12	1.5	19	80	26	26	N18W05	
750317	0036	1251	N45E43	N40E33	1.0	2	N	7	0.9	7	11	61	10	N43E38	
750318	2345	1205	S31W09	S40W27	0.8	2	S	17	0.7	12	25	33	13	S36W17	
750331	0025	1154	S22E84	S18E64	1.0	2	S	13	0.8	10	13	73	12	S20E74	
750403	0529	0620	N04E37	(N18E28)											
				N12E19	1.8	1	S	27	3.5	96	--	35	--	N11E28	
750406	0913	0713	N30E26	N15E17	0.6	1	S	17	0.3	5	9	36	5	N23E21	
750424	1819	0547	N05E87	(N04E73)											
				S02E87	0.5	2	U	29	0.3	10	--	80	--	N02E82	
750426	0553	0638	N03E56	N03E51	0.6	1	V	5	0.3	1	8	54	6	N03E53	
750427	1125	1110	N22W26	N31W26	0.6	1	V	9	0.3	3	43	40	26	N26W26	
750504	2301	1151	S30E49	S35E41	1.2	2	V	8	1.1	9	61	51	43	S33E45	
750509	2318	1148	S15W23	S18W28	0.5	2	N	6	0.3	2	8	28	4	S17W25	
750509	2318	1148	S05W56	S03W62	0.5	2	S	6	0.3	2	17	59	15	S04W59	
750511	1716	0604	S41E39	S40E32	0.6	2	V	6	0.3	2	29	49	21	S41E35	
750514	0547	0547	N47W00	N46W15	0.6	1	V	10	0.3	3	86	50	50	N47W08	
750514	0547	0547	S28W37	S27W43	0.6	1	V	5	0.3	2	36	45	25	S28W40	
750517	0538	0554	N48W28	N48W37	1.2	2	V	6	1.1	6	51	58	41	N48W33	
750520	1115	1205	N30E44	N30E38	0.6	1	V	5	0.3	1	32	51	24	N30E41	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
750520	1115	1205	N41E07	N40W02	0.6	1	V	7	0.3	2	78	43	42	N41E02	
750521	0502	0543	S34E20	S35E13	1.2	2	V	6	1.2	7	71	36	34	S35E17	
750521	1702	0618	N50E87	N44E57	1.2	2	V	21	0.5	11	1	79	1	N48E71	
750524	0120	1110	S41E36	S41E27	0.7	1	S	7	0.4	3	46	48	32	S41E31	
750527	0623	0548	S49E57	S48E27	1.2	1	S	17	1.1	19	36	60	31	S49E42	
750530	1701	0534	S20E22	S24E13	0.6	1	V	9	0.3	3	74	27	26	S22E18	
750606	0604	0649	S34E61	S37E35	1.2	1	S	19	1.1	21	36	57	30	S36E48	
750609	1909	0701	N45E56	N43E32	0.6	1	V	15	0.3	5	29	59	25	N45E44	
750612	1117	1148	N43W50	N42W64	1.2	1	N	9	1.1	10	29	66	26	N43W57	
750621	2340	1206	S38E35	S41E33	2.0	2	U	3	2.0	7	73	52	49	S40E34	
750629	0338	1244	S20E73	S13E58	1.0	2	S	11	0.8	9	16	67	15	S17E65	
750706	1734	0621	S32W46	S20W48	1.2	1	S	12	1.1	13	73	54	51	S26W47	
750707	2300	1201	N42W50	N48W80	1.2	2	S	18	1.3	24	0	70	0	N46W64	
750712	2315	1147	S08W18	S18W24	0.6	1	V	12	0.3	3	22	27	10	S13W21	
750721	1940	0820	S24W18	S16W19	0.6	2	V	8	0.3	2	45	31	21	S20W19	
750722	1458	1057	S28W44	S34W46	1.2	2	V	6	1.2	8	42	56	34	S31W45	
750724	1818	0638	N22E46	N16E41	1.2	2	V	8	1.2	9	39	45	26	N19E43	
750728	0728	0343	N23W04	N18W08	1.2	2	V	6	2.8	17	59	16	14	N21W06	
750730	1925	0815	S27E36	S25E22	1.2	2	V	13	1.5	19	35	42	23	S26E29	
750805	0924	0502	N11W18	N08W25	1.8	1	V	8	6.6	49	31	22	11	N10W22	
750812	1723	0526	S35E42	S38E19	2.4	2	N	19	2.7	50	59	52	42	S37E31	
750819	0006	1141	N06E50	S06E46	0.6	2	N	13	0.3	4	81	48	47	S00E48	
750819	0006	1141	S13W46	S40W56	0.5	2	N	28	0.3	8	45	59	37	S27W50	
750825	1659	0429	N22W48	N17W52	1.2	1	V	6	1.1	7	60	50	42	N20W50	
750830	2333	1158	S35E30	S33E24	1.2	1	V	5	1.4	8	31	48	23	S34E27	
750903	0841	0444	N43W58	N38W58	3.0	1	S	5	3.2	16	74	61	57	N40W58	
750910	1016	1159	S32E34	S25E27	1.2	1	V	9	2.0	19	3	46	2	S29E30	
750922	2341	1220	N41W20	N48W42	1.0	2	S	17	1.1	18	22	46	16	N45W30	
750925	0009	1134	N40E43	N51E32	1.5	2	S	13	1.4	19	87	51	51	N46E38	
750929	2341	1220	S04E30	S05E21	0.7	2	S	9	0.4	4	30	28	14	S05E26	
750930	1730	0530	N36E37	N48E27	2.4	1	S	14	2.7	38	80	46	45	N42E32	
751008	2340	1146	S33E24	S23E14	1.2	1	V	13	2.2	30	11	39	7	S28E19	
751012	1631	0539	N30E57	N18E38	0.6	1	V	22	0.3	7	21	49	16	N24E47	
751016	2001	0814	N43E76	N52E46	1.2	1	V	17	1.0	17	42	68	38	N48E62	
751110	0003	1156	S35E74	S27E39	1.2	1	S	24	1.2	28	8	64	7	S32E56	
751205	0045	1310	N26E53	N26E38	1.2	1	N	13	1.5	19	23	51	18	N26E46	
751211	0842	1012	N47E06	N45W11	0.6	1	V	12	0.3	4	84	47	47	N46W03	
751213	2020	0700	S35E33	S20E10	1.2	1	V	25	2.5	62	14	34	8	S28E21	
751231	0509	0709	S35W33	S45W45	1.2	2	V	14	2.0	27	11	51	9	S40W39	
760103	1656	0523	S29E33	S22E24	1.2	2	V	11	2.4	26	6	35	3	S26E28	
760104	0535	0716	N29W01	N29W04	1.2	1	V	3	1.3	3	85	32	32	N29W02	
760104	1726	0435	N48W10	N43W18	0.6	1	V	8	0.3	2	67	50	45	N46W14	
760109	0513	0724	S13E50	S08E44	0.6	1	V	8	0.3	2	36	47	25	S11E47	
760117	1700	0509	N15W23	N06W33	0.6	1	V	13	0.3	4	70	32	30	N11W28	
760120	1648	0412	N24W30	N14W42	0.6	2	V	15	0.3	5	72	43	40	N19W36	
760123	0017	1201	N20E33	N12E15	0.6	1	V	19	0.3	6	15	32	8	N16E24	
760202	0251	0935	S28E17	S34E15	0.6	1	V	6	0.3	2	50	29	22	S31E16	
760204	0549	0704	S30W30	S30W40	0.6	1	V	9	0.3	3	29	41	19	S30W35	
760207	0047	1153	S33E28	S25E22	0.6	1	V	10	0.3	3	18	33	10	S29E25	
760210	0328	1512	S07E16	N01E12	0.6	2	V	9	0.3	3	78	14	14	S03E14	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
760212	0019	1204	S40E83	S42E61	0.5	2	N	11	0.3	3	14	72	13	S42E72	
760216	1018	1218	N31W30	N26W42	0.6	1	V	12	0.3	3	65	50	44	N29W36	
760219	0042	1132	S27W54	S20W66	1.0	2	N	13	0.8	10	38	60	32	S24W60	
760224	1859	0631	S43E15	S50E08	0.6	2	V	8	0.3	3	52	41	31	S47E12	
760302	0554	1731	S02E81	S02E61	1.0	2	S	20	0.5	11	7	71	7	S02E71	
760309	0524	0724	S25E51	S16E42	1.2	2	V	12	1.2	15	37	47	26	S21E46	
760318	0955	1200	N49E07	N50W06	1.2	2	V	9	1.0	10	84	57	57	N50E01	
760321	1007	0127	S48E54	S42E14	1.8	1	S	29	2.6	73	31	49	23	S47E33	
760326	0833	1028	N45W35	N50W54	1.2	2	S	11	1.1	13	20	67	18	N48W44	
760406	1712	0458	N33E33	N34E17	1.0	2	N	13	0.8	11	59	47	39	N34E25	
760406	1712	0458	N53E51	N45E16	2.0	2	N	20	2.2	43	34	63	30	N50E32	
760414	0514	0658	S44E09	S42W17	0.6	2	V	19	0.3	6	89	38	38	S44W04	
760417	1011	0225	S40E28	S48E04	1.8	2	N	19	2.0	38	90	42	42	S45E17	
760422	0443	0633	S28E16	S17W04	1.2	1	S	21	3.5	75	41	18	12	S23E06	
760512	0512	0627	S35W42	S29W45	0.6	1	V	7	0.3	2	87	50	50	S32W44	
760514	0049	1145	N04W35	S04W36	0.6	2	V	8	0.3	2	88	36	36	S00W36	
760514	0049	1145	N58W32	N53W56	1.5	3	N	14	1.4	20	62	69	56	N56W45	
760514	0049	1145	S12E64	S03E48	0.5	2	S	16	0.3	5	28	56	23	S08E56	
760514	0049	1145	S25E84	S20E64	1.0	2	U	13	0.8	10	12	74	12	S23E74	
760515	1632	0454	S52E67	S40W19	1.2	2	S	56	1.1	61	52	54	40	S55E18	
760517	0444	0639	S40W23	S43W32	1.2	2	V	7	1.5	11	26	46	18	S42W27	
760520	1645	0544	N15W39	N13W43	0.6	2	V	4	0.3	1	46	44	30	N14W41	
760527	0526	0656	N20E36	N08E34	0.6	1	V	12	0.3	4	59	38	32	N14E35	
760605	2334	1150	N30E29	N10E26	0.6	1	V	20	0.3	6	48	34	25	N20E27	
760616	0555	0730	S22W05	S08W12	0.6	1	N	16	0.3	5	54	18	14	S15W09	
760618	0808	0732	N50E14	N50W04	1.2	1	S	12	1.1	12	83	49	49	N50E05	
760702	1701	0436	S45E88	S38E26	2.4	2	S	35	3.1	107	19	69	18	S46E55	
760715	1744	0511	N14E27	N05E16	0.6	2	V	14	0.3	4	27	22	10	N10E21	
760814	1018	1158	S08W15	N01W23	0.6	2	V	12	0.3	4	77	22	21	S04W19	
760816	1035	1205	N53W06	N57W13	0.6	2	V	6	0.3	2	33	49	24	N55W09	
760819	0510	0640	S31E47	S31E31	1.2	1	S	13	1.1	15	39	53	30	S31E39	
760904	0457	0627	S46E13	S48E05	2.4	2	V	6	2.5	15	81	55	54	S47E09	
760908	0524	0655	N09E07	N06W02	0.6	2	V	9	0.3	3	12	2	0	N08E02	
760909	0723	0558	S31E15	S12W00	0.6	1	N	24	0.3	7	22	30	11	S22E07	
760912	0447	0637	N37W49	N30W49	1.2	1	V	7	1.1	8	71	52	48	N34W49	
760915	1720	0445	N55E17	N52W03	1.2	1	N	12	1.1	14	67	47	42	N54E07	
760917	0008	1217	S33E42	S32E29	1.8	1	V	10	2.1	22	38	52	29	S33E35	
760917	1733	0508	N08E57	N00E47	1.8	1	V	12	1.9	24	45	52	34	N04E52	
760924	2352	1159	S21E84	S18E54	0.5	1	S	19	0.3	6	8	73	8	S20E69	
760927	0517	0617	S35W06	S31W23	1.8	1	S	15	2.0	30	84	43	43	S33W15	
760930	1023	1153	S40E26	S40E22	1.2	2	V	3	1.1	3	59	52	42	S40E24	
761005	1656	0514	N32W53	N24W56	0.6	2	N	8	0.3	3	84	56	56	N28W55	
761015	0304	1213	S36E48	S43E33	2.0	2	N	13	2.0	26	72	59	55	S40E41	
761016	1521	1256	2												GAP
761029	0449	0649	S31E38	S43E31	2.4	1	N	13	2.5	33	70	53	49	S37E35	
761030	0215	1437	N32W10	N20W11	0.5	2	N	12	0.3	4	31	24	12	N26W11	
761102	0455	0652	S49W06	S43W24	1.2	2	V	14	1.1	15	84	52	52	S46W15	
761108	0506	0631	S50E41	S50E04	0.6	1	S	24	0.3	8	63	58	49	S51E22	
761120	0050	1037	N51E12	N45E05	2.0	2	N	8	4.5	35	26	46	18	N48E08	
761121	1653	0507	S32W13	S29W33	0.6	2	S	17	0.3	5	62	40	35	S31W23	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
761127	0530	0720	N11W34	N16W47	0.6	3	V	14	0.3	4	8	42	5	N14W40	
761204	0533	0723	S29E86	S29E51	2.0	2	S	22	2.8	59	12	72	11	S30E69	
761209	2024	0752	S42E48	S46E48	2.4	2	S	4	2.4	10	57	61	47	S44E48	
761213	0523	0713	S30E04	(S43E04)											
				S34W17	1.2	2	S	32	1.8	58	--	38	--	S36W03	
761231	0522	0709	S43W51	S36W74	1.5	1	S	15	1.4	22	38	68	35	S40W63	
770104	2105	1631	S32W42	S27W67	1.8	2	S	23	2.2	52	29	58	24	S30W55	
770106	1943	0718	S20E06	S12W10	0.6	1	V	17	0.3	5	72	13	12	S16W02	
770113	0701	0537	N35W23	N44W23	1.8	1	V	9	2.8	25	31	49	23	N39W23	
770114	0859	0724	N05E61	N06E45	0.6	2	V	15	0.3	4	13	54	10	N06E53	
770114	0859	0724	S43E66	S43E48	0.6	1	V	11	0.3	3	21	63	19	S43E57	
770118	1825	0606	N30W29	N25W35	0.6	2	V	7	0.3	2	84	45	45	N28W32	
770119	0628	0558	N52E17	N52E05	1.2	2	V	7	1.0	8	77	58	56	N52E11	
770121	0949	0939	S22E45	S19E33	0.6	3	V	12	0.3	3	2	41	1	S21E39	
770126	0243	0206A	S31E89	S42E34	1.8	2	N	35	1.9	67	29	66	26	S40E64	
770205	0526	0656	N23W38	N21W49	0.6	3	V	10	0.3	3	40	51	30	N22W44	
770217	0632	0532	S28E59	S10E47	0.6	2	V	21	0.3	6	52	53	39	S19E53	
770314	0453	0723	S42W32	S28W37	1.2	2	N	15	1.2	17	73	42	40	S35W35	
770317	0737	0808	S46E86	S40E48	1.8	1	S	21	2.0	42	1	68	1	S45E66	
770321	0631	0546	S25W13	S16W21	0.6	2	V	12	0.3	4	87	21	21	S21W17	
770409	0938	0244	N35E37	N42E17	1.2	1	S	17	1.1	18	79	52	51	N39E27	
770410	0027	0146	N40W21	N33W34	1.2	1	S	13	1.1	13	87	50	50	N37W28	
770412	2355	1229	S40W50	S35W72	0.6	2	V	16	0.3	5	30	64	27	S38W61	
770415	1737	0518	S50W09	S42W31	0.6	1	V	17	0.3	5	88	44	44	S47W21	
770419	1052	0327	S34E55	S40E41	1.8	2	N	12	1.9	22	52	54	40	S37E48	
770428	0526	0631	N38W07	N50W07	0.6	2	V	12	0.3	4	9	49	7	N44W07	
770428	2343	1146	N45E54	N38E22	2.4	2	N	22	3.4	73	28	58	23	N43E37	
770508	0115	0229E	S35W02	S23W31	0.6	1	S	28	0.3	8	80	31	30	S30W17	
770531	1903	1727	S02E23	N09E19	1.2	1	V	12	1.4	16	82	21	21	N04E21	
770531	1903	1727	S38W07	S31W10	0.6	2	V	7	0.3	2	35	34	19	S35W09	
770602	0001	1215	S35W33	S36W37	0.6	3	V	3	0.3	1	22	48	16	S36W35	
770606	0514	0634	N48E34	N58E27	1.2	1	V	11	1.0	11	59	59	47	N53E31	
770612	0601	0521	N42E51	N43E33	1.2	1	V	12	1.1	13	41	57	33	N43E42	
770619	1952	0658	N48E46	N35E16	0.6	3	V	27	0.3	8	18	49	13	N42E29	
770630	0121	1249	N48W27	N48W59	1.2	2	S	20	1.1	22	37	59	31	N49W43	
770701	0647	0512	N51W08	N38W11	0.6	3	V	13	0.3	4	24	43	16	N45W10	
770708	0547	0617	S25E37	S40E33	0.6	2	V	15	0.3	5	62	49	42	S33E35	
770719	0921	0239	N41E44	(N20E42)											
				N00E24	0.6	1	N	48	0.3	14	--	41	--	N20E37	
770720	1250	1200	N13E83	N25E63	0.6	2	V	15	0.4	6	34	73	32	N19E73	
770722	2002	0749	N43E46	N52E36	0.6	2	S	11	0.3	4	90	55	55	N48E41	
770727	0639	0759	N43E56	N48E46	0.6	2	V	9	0.3	3	62	60	50	N46E51	
770801	1637	0451	N41W32	N33W61	1.2	3	N	25	1.1	28	44	54	34	N38W47	
770806	0741	0833	S63E85	S50E28	0.6	2	V	22	0.3	7	11	77	11	S60E51	
770816	0454	0623	S55E10	S46W33	0.6	1	S	28	0.3	10	86	60	60	S52W14	
770818	0536	0705	S03W32	S03W42	0.6	1	V	10	0.3	3	15	38	9	S03W37	
770824	0536	0706	N18E76	N23E57	1.2	1	S	14	1.2	17	17	66	15	N21E67	
770904	0308	0108A	N58E31	N50W06	2.4	1	N	23	2.9	66	55	49	38	N55E11	
770909	1702	0435	N42W50	N32W74	1.8	2	S	18	1.8	33	39	64	34	N38W63	
770909	2354	1127	N27E74	N25E62	1.5	2	N	8	2.1	17	7	67	6	N26E68	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
770909	2354	1127	S34E84	S29E54	0.7	2	S	26	0.3	8	7	76	7	S32E69	
770916	0516	0706	S42W02	S37W17	0.6	1	V	13	0.3	4	80	48	47	S40W10	
770916	0516	0706	S52W11	S52W20	1.2	2	V	6	1.0	6	72	61	56	S52W15	
770919	1031	1200	S50E03	S47W17	0.6	2	V	14	0.3	4	86	56	56	S49W07	
770921	0937	1122	N28W48	N26W58	1.8	2	S	9	2.7	24	24	54	19	N27W53	
770921	0937	1122	N33E72	N31E55	0.6	1	V	11	0.3	3	1	64	1	N32E63	
770926	1809	0645	S35W37	S27W39	0.6	2	V	8	0.3	2	62	53	45	S31W38	
770929	1851	0504	S25E35	S20W01	0.6	1	S	34	0.3	10	51	34	26	S24E17	
771001	0617	0507	N43E33	N38E24	1.2	1	V	8	2.2	19	9	42	6	N41E28	
771006	0839	0939	N29W21	N38W21	0.6	2	V	9	0.3	3	40	33	20	N33W21	
771007	0552	0736	N51W50	N50W74	0.6	1	V	12	0.3	4	22	68	20	N51W62	
771011	0834	0749	N31E41	N29E14	1.8	3	N	23	3.6	84	33	36	19	N31E27	
771011	0834	0749	N27E51	N18E33	0.8	2	S	19	0.8	16	13	43	9	N23E42	
771014	0652	0821	N03W43	N16W45	0.8	1	N	13	0.5	7	80	44	43	N10W44	
771019	0630	0815	S53E16	S50W54	1.2	1	S	42	1.0	44	72	65	60	S57W20	
771020	0316	1222	S40E08	S30W42	0.6	2	N	42	0.3	12	79	46	45	S38W19	
771023	0407	1145	S38E22	S52E06	1.2	2	N	18	1.1	19	57	52	41	S45E15	
771102	0717	1142	S02E84	N03E54	0.6	2	V	21	0.3	6	5	69	5	N01E69	
771106	2051	0024A	N32E80	N17E48	2.4	2	S	27	3.4	92	19	64	17	N25E63	
771116	0615	0858	N16E33	N10E29	1.2	2	V	7	1.4	10	41	32	20	N13E31	
771116	0615	0858	N12W13	N30W13	0.6	2	V	18	0.3	5	36	22	13	N21W13	
771120	0932	0537	N42E09	N37W07	1.8	2	S	13	2.3	31	67	38	35	N40E01	
771124	0730	1021	N35E08	N45W06	0.6	1	V	15	0.3	4	49	38	28	N40E02	
771126	0333	1214	N37E38	N24E23	0.6	3	V	18	0.3	5	6	41	4	N31E30	
771128	0640	0840	N60E65	N50E33	1.8	2	N	16	2.2	34	7	66	6	N56E47	
771128	0640	0840	S32E54	S42E49	1.2	2	N	11	1.0	11	85	61	61	S37E52	
771129	0737	0752	N31E36	N25E18	1.2	2	S	17	2.7	46	21	37	12	N28E27	
771130	1033	1203	N43W19	N39W30	1.8	2	N	9	2.0	18	80	46	45	N41W25	
771201	0957	1222	N39W11	N15W37	0.6	2	N	33	0.3	10	90	36	36	N28W25	
771204	0757	0721	N35E09	(N30W04)											
				N40W02	0.6	2	U	22	0.3	7	--	34	--	N35E01	
771216	1355	0554	N34W33	N50W48	1.8	2	S	19	4.1	79	16	56	13	N42W40	
771217	0627	1111	S50W36	S53W61	1.0	2	U	13	0.8	11	24	65	22	S52W48	
771221	2122	0200	6												GAP
771228	2352	1722	N30W10	N20W22	0.6	1	V	15	0.3	4	79	32	31	N25W16	
771230	0639	0919	N33W70	N25W72	1.0	2	U	8	0.9	7	90	75	75	N29W71	
771231	1515	2120	2												GAP
780104	2130	2400	N40E49	N35E21	1.8	2	N	20	2.6	52	31	52	24	N38E35	
780104	2130	2400	S40E27	S58E27	1.8	2	S	17	1.9	31	36	51	27	S49E27	
780106	0945	1225	S05W33	N03W35	0.6	1	V	8	0.3	2	71	34	32	S01W34	
780108	1353	0728	N35W20	N30W29	0.6	2	V	9	0.3	3	86	43	43	N33W25	
780109	0915	1155	N28E30	N23E21	0.6	2	V	10	0.3	3	15	38	9	N26E25	
780111	0925	1205	N33E41	N36E33	1.2	2	V	7	1.1	8	65	52	46	N35E37	
780111	0925	1205	S38W65	S36W70	1.8	2	V	4	1.8	7	37	70	34	S37W68	
780111	0925	1205	S37W01	S10W17	0.6	1	N	31	0.3	9	55	22	18	S24W10	
780111	0925	1205	S20W47	S10W52	1.2	2	S	11	1.1	13	72	50	47	S15W50	
780115	1502	0654	N40W20	N52W22	1.8	2	N	12	3.8	46	20	54	16	N46W21	
780118	2145	0510	3												GAP
780120	0128	2742	N29W37	N14W55	1.8	2	S	22	2.1	46	67	53	47	N22W46	
780120	0128	2742	N28E10	N18E07	0.6	2	V	10	0.3	3	2	29	1	N23E08	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
780120	0128	2742	N55E37	N41E18	1.2	2	N	16	1.4	21	10	58	8	N48E26	
780124	1158	0703	N06E49	S03E35	2.4	2	S	17	4.8	79	23	42	15	N02E42	
780126	0611	0851	N55E25	N39E08	2.4	2	N	19	5.3	98	16	54	13	N47E15	
780127	2126	0555	N02W08	S05W14	0.6	2	V	9	0.3	3	70	12	11	S02W11	
780204	1345	0643	N42E22	N40E08	2.4	1	N	11	2.8	30	59	49	40	N41E15	
780205	1856	0234	S37E14	S28E04	0.6	2	V	12	0.3	4	24	28	11	S33E09	
780207	0930	1200	S08W16	S02W24	0.6	2	V	10	0.3	3	32	20	10	S05W20	
780209	1424	0606	N50E57	N39E29	1.2	2	N	18	1.8	34	13	64	12	N45E42	
780211	1510	0840	S39E45	S37E26	1.8	2	N	15	3.1	47	28	45	19	S38E35	
780216	1021	1200	S36E31	S30E18	0.6	1	V	12	0.3	4	15	35	9	S33E24	
780217	1021	1200	N28W34	N18W44	1.2	1	S	14	1.1	16	81	49	48	N23W39	
780219	1921	0239	S25W51	S43W53	1.2	2	S	18	1.1	19	68	55	49	S34W52	
780223	0930	1200	S07E39	S10E23	1.2	2	N	16	2.4	39	11	31	6	S09E31	
780301	0950	1220	N29W07	N07W15	1.2	2	S	23	2.7	62	44	28	19	N18W11	
780301	0950	1220	N50E14	N38W27	1.2	2	N	31	1.1	33	77	54	52	N46W09	
780302	2253	0023A	S39E40	S23E10	1.2	2	N	30	2.6	77	10	33	5	S32E24	
780308	0649	0836	S28E26	S30E18	0.6	2	V	7	0.3	2	58	30	25	S29E22	
780308	1849	0324	S42E78	S28E53	1.8	2	N	19	1.9	37	26	65	23	S36E64	
780309	0649	0836	S49W25	S51W36	0.6	1	V	7	0.3	2	33	50	25	S50W30	
780311	0655	0748	N07E36	N15E29	0.6	3	V	11	0.3	3	77	37	36	N11E33	
780314	2223	0117A	S10E19	S23E12	1.2	2	N	15	1.9	28	88	18	18	S17E16	
780316	0645	0834	S40W17	S18W53	0.6	2	N	38	0.3	11	62	42	36	S30W37	
780318	1442	1444 2													GAP
780325	0609	1531	S10W16	S16W35	0.6	2	V	19	0.3	6	7	26	3	S13W25	
780327	0658	0739	S29W40	S37W40	1.2	2	V	8	1.2	9	64	45	39	S33W40	
780330	0314	1158	S60E39	S45E09	2.4	2	S	24	6.6	156	20	50	15	S53E21	
780401	0610	1530	S32E01	S20W00	0.6	2	V	12	0.3	4	3	19	1	S26E00	
780405	0630	0818	N39W47	N37W66	3.0	3	N	12	3.3	40	35	69	32	N38W57	
780405	0630	0818	N30W43	N25W56	2.7	3	S	13	3.0	38	51	59	42	N28W50	
780406	0632	0813	S15E61	S18E48	0.6	2	V	12	0.3	4	18	54	14	S17E55	
780409	0638	0820	N33W16	N30W23	1.2	2	N	7	1.2	8	87	42	42	N32W20	
780412	0651	0835	S10W36	S20W37	0.6	1	V	10	0.3	3	74	37	35	S15W36	
780419	0625	0810	S18W02	S18W12	1.2	2	V	10	2.8	27	61	14	12	S18W07	
780423	1014	1107	S50E84	S34E44	1.2	2	S	25	1.1	29	13	66	12	S44E61	
780423	2249	1553	N38W59	N30W79	2.4	2	N	18	2.4	44	42	76	40	N34W69	
780425	0409	1328	S38E33	S32E25	1.5	2	S	9	3.3	29	1	40	1	S35E29	
780425	0409	1328	S44W59	S38W77	1.0	2	N	12	0.8	10	35	71	33	S41W68	
780428	0715	0845	S15W43	S20W45	1.2	1	V	5	1.2	7	58	45	37	S18W44	
780502	0857	1016	N21E34	N16E31	1.2	2	V	6	1.4	8	28	39	17	N19E32	
780509	0317	1153	N38E04	(N32W07)											
				N28E02	1.0	2	U	20	0.9	18	--	37	--	N33W00	
780511	1045	1215	S40W32	S23W36	1.2	2	N	17	1.3	22	67	43	39	S32W34	
780515	1901	0328	S22W50	S11W55	1.2	2	V	12	1.1	13	75	53	50	S17W53	
780516	1927	0333	N52E37	N39E32	1.2	2	N	12	1.2	15	27	57	22	N46E34	
780521	0650	0805	S48E86	S55E86	1.2	2	U	7	1.2	8	88	86	86	S52E86	
780528	0719	0804	S31E30	S33E22	1.2	2	S	7	1.2	8	63	39	34	S32E26	
780529	1856	0446	S50E12	S45W08	2.4	2	S	14	2.8	41	67	47	42	S48E02	
780531	0242	1210	N28W35	N20W49	1.8	2	N	15	2.1	31	58	48	39	N24W42	
780606	0155	0013A	S43W00	S20W12	1.2	2	N	25	1.8	46	36	32	18	S32W07	
780612	0201	1158	N32E64	N24E54	1.0	2	N	9	0.8	7	27	63	24	N28E59	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
780619	1030	1200	S02W06	S04W18	0.6	1	V	12	0.3	4	10	13	2	S03W12	
780625	0432	0050A	S50W19	S30W40	2.4	2	S	25	2.6	67	79	51	50	S40W31	
780627	0314	1305	S50W32	S55W52	3.0	2	N	11	3.9	43	21	65	19	S53W41	
780701	0628	1627	N20E39	N00E21	3.0	2	S	27	5.3	140	37	30	18	N10E30	
780701	0628	1627	S43E51	S25E21	0.6	3	N	29	0.3	9	5	50	4	S35E34	
780701	0755	0715	N53E56	N39E04	1.8	3	N	38	2.5	94	32	51	24	N49E26	
780703	0306	1206	S43W28	S40W37	2.0	2	N	7	2.1	16	72	53	49	S42W33	
780704	0238	1126	S62E34	S58W06	2.0	3	S	20	1.9	39	64	65	55	S62E13	
780706	0206	1160	N15W53	N10W57	1.0	2	S	6	0.8	5	57	55	43	N13W55	
780710	0326	1316	S35W17	S26W23	1.5	2	S	10	2.0	20	63	39	34	S31W20	
780712	0808	0943	N45W11	N20W33	1.8	2	S	31	2.4	75	77	36	35	N33W24	
780713	0520	0138B	N53W27	N62W51	1.8	2	S	14	3.8	51	10	61	9	N58W37	
780713	2351	1653	S40E41	S23E28	1.8	3	N	20	2.6	52	16	48	12	S32E34	
780717	0628	0808	S02E43	N03E39	1.2	2	V	6	1.2	8	45	41	28	N01E41	
780718	2200	0620	S21E10	S08E08	0.6	3	V	13	0.3	4	17	21	6	S15E09	
780720	0719	0849	S07W48	S12W50	1.8	1	V	5	2.1	11	54	51	39	S10W49	
780727	0155	1215	N33E73	N25E61	1.5	2	N	10	1.4	13	31	67	28	N29E67	
780802	1904	0326	S58E18	S58E11	1.8	2	S	4	1.7	6	74	65	61	S58E15	
780804	0750	0920	N22E45	N18E37	1.2	2	V	9	2.1	18	14	42	9	N20E41	
780806	0314	1205	S28W49	S21W57	1.0	2	S	10	0.8	8	67	60	53	S25W53	
780808	1458	1002	S30W15	S12W17	0.6	2	V	18	0.3	5	38	31	18	S21W16	
780810	0633	0734	S45E86	S27E29	1.8	2	N	37	2.1	76	6	68	6	S40E54	
780812	2111	0706E	S03W47	S05W67	2.4	1	N	20	5.4	105	5	58	4	S04W57	
780815	1354	0724	S30E46	S15E31	1.2	2	N	21	1.9	40	14	47	10	S23E38	
780816	0635	0735	N55E46	N55E26	1.2	2	S	10	1.1	11	46	56	37	N55E36	
780819	0307	1305	N42E50	N28E37	1.2	2	N	17	1.2	20	28	48	20	N35E43	
780819	0307	1305	S53E28	S45E08	0.6	2	S	13	0.3	4	38	58	31	S49E17	
780823	1025	0344	N16E18	N11E04	1.2	2	S	14	2.9	42	10	13	2	N14E11	HALO
780827	1840	0330	S33E62	S14E53	1.8	3	S	21	1.8	36	45	64	39	S24E57	
780829	0655	1536	S33E35	S20E29	0.6	2	V	15	0.3	4	25	46	18	S27E32	
780830	0651	0821	N42E00	N38W07	0.6	2	V	7	0.3	2	60	33	28	N40W04	
780830	1054	0418	S49E30	S42E15	1.2	2	N	12	1.2	14	29	56	24	S46E22	
780831	1849	0341	N28W04	N23W10	0.6	2	V	7	0.3	2	69	20	19	N26W07	
780902	0040	0030A	N46E90	N41E58	1.2	3	S	17	1.0	17	6	73	6	N45E73	
780910	0711	0811	S18W44	S10W44	0.6	3	V	8	0.3	2	67	49	44	S14W44	
780917	0743	0947	S28W45	S28W65	1.0	2	S	16	0.8	13	25	64	22	S28W55	
780917	2207	0437	S19W46	S10W51	1.5	2	N	10	1.5	15	83	53	52	S15W49	
780922	0748	0708	S20W03	(S33E03)											
				S24W08	0.6	2	U	27	0.3	8	--	35	--	S26W03	
780922	0748	0708	N58W44	N50W52	1.2	2	V	9	1.0	10	88	61	61	N54W48	
780925	0640	0750	S55E41	S50E03	1.3	2	U	23	1.2	27	54	63	46	S54E21	
781011	0611	0801	S25E36	S10E31	0.6	2	V	16	0.3	5	40	41	25	S18E33	
781012	0609	0055A	N20W20	N03W26	1.2	2	S	18	1.7	30	83	23	23	N12W23	
781013	0319	1302	N65E53	(N55E53)											
				N50E31	1.2	2	U	22	1.5	33	--	63	--	N57E46	
781013	0713	0908	N52E05	N60W15	1.2	2	S	14	1.1	15	49	51	36	N56W04	
781014	0320	1059	N20E29	N25E10	1.0	2	S	18	1.2	21	55	25	20	N23E20	
781014	0320	1059	S30E44	S40E44	0.8	2	S	10	0.6	6	54	58	43	S35E44	
781016	1035	1130	N45W28	N56W59	1.2	3	N	22	2.0	44	8	57	7	N52W42	
781016	1035	1130	S00E52	S12E44	1.2	1	N	14	1.1	15	69	49	45	S06E48	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
781017	2039	0301	S35W07	S30W15	0.6	2	V	8	0.3	3	71	40	37	S33W11	
781019	0659	0819	N06E14	N08E07	0.6	2	V	7	0.3	2	24	11	4	N07E11	
781026	0708	0853	N50W18	N39W37	0.6	2	V	17	0.3	5	89	47	47	N45W28	
781026	1400	0641	N42E61	N25E51	1.8	2	N	19	1.8	33	48	59	40	N34E56	
781031	0456	1338	N45W35	N30W49	0.8	2	S	19	0.5	10	84	51	51	N38W43	
781105	0457	1019	S57E04	S38W28	3.5	3	S	28	4.1	118	65	54	47	S49W15	
781105	0457	1019	S30W16	S18W44	0.5	2	N	28	0.3	8	65	41	36	S25W31	
781107	0634	0840	N18W26	N12W34	0.6	2	V	10	0.3	3	56	32	26	N15W30	
781108	0627	0842	N25E08	N33E08	0.6	2	V	8	0.3	2	18	27	8	N29E08	
781108	1823	0313	N25E61	N30E37	1.2	2	S	21	1.2	26	32	53	25	N28E49	
781114	1819	0301	S43W29	S35W31	2.4	2	S	8	3.0	24	52	50	37	S39W30	
781115	0625	0905	N03E10	S03E07	1.2	1	V	7	2.6	18	82	9	9	S00E08	
781115	0625	0905	S22E33	S15E23	0.6	2	V	12	0.3	4	1	35	1	S19E28	
781115	0625	0905	S54W45	S40W45	1.8	1	S	12	1.8	22	52	64	45	S47W45	
781117	0506	0047A	N60E66	N45E16	2.4	3	N	29	4.0	115	18	60	16	N55E36	
781122	1150	0355	N45W15	N38W21	1.8	2	S	8	2.2	18	60	43	36	N42W18	
781126	0559	0924	S34E56	S29E33	0.6	2	V	19	0.3	6	16	54	13	S32E44	
781126	0559	0924	S10E53	S21E52	1.2	1	N	11	1.0	11	82	55	54	S16E53	
781128	0725	0950	N58W05	N28W27	2.4	1	S	34	3.3	113	53	45	34	N43W19	
781129	0703	0803	S04E10	S13E10	0.6	2	V	9	0.3	3	46	14	10	S09E10	
781201	0808	0913	S27E15	S20E05	1.8	2	S	12	6.5	75	30	26	13	S24E10	
781202	0654	0836	N59W22	N48W30	2.4	1	N	11	2.7	30	55	57	43	N54W27	
781203	0635	1036	N25E19	N16E14	2.4	1	S	10	8.2	84	14	26	6	N21E16	
781207	1415	0545	N57E77	N49E35	1.8	2	S	19	2.2	42	12	70	11	N55E54	
781215	1200	0957	N30E12	N28E03	0.6	3	V	8	0.3	2	61	31	27	N29E07	
781216	0923	1126	S38E34	S31E24	1.2	2	V	11	2.1	22	5	43	3	S35E29	
781216	0923	1126	N60E74	N49E34	0.6	2	V	18	0.3	5	7	70	7	N56E51	
781220	0618	1503	S32W63	S25W69	1.2	3	N	9	1.0	9	64	68	56	S29W66	
781221	0620	0911	N50E25	N45W04	1.8	2	S	20	1.9	38	63	51	44	N48E10	
781228	0405	1247	N08E53	N03E23	1.0	2	U	30	1.4	42	1	39	1	N06E38	
790102	0707	0947	S35W23	S27W30	1.2	2	V	10	1.2	12	84	38	38	S31W27	
790102	1905	0210	S06W05	S20W08	0.6	1	V	14	0.3	4	21	12	4	S13W06	
790104	0610	0920	S48E03	S41W10	1.2	2	N	12	1.2	14	59	42	35	S45W04	
790107	0920	1150	N63E84	N63E44	1.8	2	N	18	1.7	30	25	82	25	N64E64	
790109	0620	0905	N28E20	N45E10	1.2	2	S	19	1.2	22	48	43	30	N37E16	
790111	0823	1058	N12E44	S04E35	1.2	1	S	18	1.2	21	50	40	29	N04E39	
790114	0619	0859	S35E50	S31E45	1.8	2	V	5	2.4	13	21	53	17	S33E47	
790115	0633	0903	N31E62	N26E43	0.6	2	V	14	0.3	4	8	60	7	N29E52	
790115	0633	0903	S31E16	S32E09	0.6	2	V	6	0.3	2	74	30	29	S32E13	
790120	0955	1205	N41E17	(N38E11)											
				N15E14	0.6	1	V	29	0.3	9	--	40	--	N31E14	
790120	1848	0312	N40W67	N40W81	1.8	2	N	7	1.8	12	14	81	14	N40W74	
790120	1848	0312	S60W42	S63W81	1.2	2	N	14	1.1	15	15	73	14	S63W61	
790121	0646	0845	N52E01	N49W21	1.2	1	S	14	1.0	15	90	57	57	N51W10	
790123	0624	0904	N09W13	N08W23	0.6	2	V	10	0.3	3	42	23	15	N09W18	
790124	0723	1013	S27W48	S20W49	0.6	2	V	7	0.3	2	84	50	50	S24W49	
790127	1742	0223	S30E63	S21E42	2.4	2	S	20	6.0	120	13	54	10	S26E52	
790131	1837	0243	S32E15	S22E05	1.2	3	S	13	2.8	37	16	23	6	S27E10	
790203	0157	0110A	N32W15	N28W23	1.8	2	N	8	2.1	17	90	40	40	N30W19	
790207	0710	0810	S08E46	S13E46	1.2	2	N	5	1.1	5	89	46	46	S11E46	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
790206	2345	0025A	N60E18	N45E08	1.2	2	S	14	1.6	22	7	60	6	N53E12	
790208	0317	1157	S15E48	S08E44	1.8	3	S	8	1.9	15	58	46	38	S12E46	
790211	0900	1215	S31W19	S25W27	1.8	2	S	9	2.9	27	81	31	31	S28W23	
790215	1005	0707	N42E16	N36W04	1.2	2	N	17	1.1	19	61	46	39	N39E06	
790216	0930	1200	S46W34	S42W37	1.8	2	N	4	2.0	9	79	48	47	S44W36	
790218	0444	1200	S32W21	S28W28	0.6	2	V	7	0.3	2	74	33	32	S30W25	
790217	2302	0106A	S55E49	S35E19	1.8	2	N	29	4.0	116	0	48	0	S46E31	
790219	0419	1135	S01W20	S15W27	1.0	2	S	16	1.6	25	63	23	20	S08W23	
790221	0607	0857	S33E11	S38E03	0.6	2	V	8	0.3	2	67	29	27	S36E07	
790222	1848	0333	S20W35	S20W52	1.2	3	N	16	2.3	37	11	44	8	S20W43	
790223	1001	1141	N05E39	S08E31	1.2	2	N	15	1.3	19	48	35	25	S02E35	
790301	1230	0920	N29E32	N18E20	0.6	1	V	16	0.3	5	2	40	1	N24E26	
790302	0955	1205	S55E13	S52W06	1.2	1	S	12	1.1	13	71	47	44	S54E03	
790305	1832	0338	N32E24	N34E18	1.2	2	V	5	1.1	6	81	45	44	N33E21	
790307	0625	0810	N39E31	N37E21	1.2	2	V	8	1.2	9	42	51	31	N38E26	
790312	0643	0833	S26W45	(S32W35)											
				S35W45	1.2	2	U	19	1.8	34	--	45	--	S31W42	
790317	0113	2058	N32W27	N20W29	0.6	1	V	12	0.3	4	52	43	33	N26W28	
790318	1005	1155	N55E46	N50E16	2.4	2	N	15	2.5	37	41	66	37	N53E30	
790318	1005	1155	S55W24	S42W28	1.8	1	N	13	2.4	32	48	47	33	S49W26	
790323	1438	1548	S22W43	S34W50	0.6	1	V	13	0.3	4	46	48	32	S28W46	
790326	0408	0328A	N50W42	N45W62	4.2	2	N	14	4.3	62	55	72	51	N48W52	
790327	0732	0911	N52E11	N33E03	1.2	2	N	21	1.9	39	8	50	6	N43E06	
790330	1907	0348	S44W10	S22W20	0.6	2	S	24	0.3	7	53	30	24	S33W16	
790401	0822	0722	N03W54	N17W60	1.2	3	S	15	1.1	16	53	59	43	N10W57	
790402	1058	0412	S56E05	S51W08	4.2	2	S	9	5.6	52	59	47	39	S54W02	
790406	1904	0343	N18E08	N17W05	1.2	2	S	12	1.6	20	82	24	24	N18E01	
790409	0611	0746	S00E56	S12E56	1.2	1	S	12	1.0	12	87	56	56	S06E56	
790411	0747	1308	S32W17	S13W27	0.6	2	N	21	0.3	6	82	27	27	S23W22	
790412	0912	0652	S36E64	S08E48	0.6	2	N	32	0.3	10	55	56	43	S22E55	
790413	1904	0400	N20E15	N12E08	0.6	2	V	10	0.3	3	12	25	5	N16E11	
790415	0138	0235A	N55E69	N50E39	1.8	2	N	13	1.9	25	18	74	17	N53E53	
790418	0720	0811	S38E34	S15E32	1.2	3	N	23	1.2	27	58	38	31	S27E33	
790420	0347	1145	S27W13	S21W18	1.2	2	S	8	1.9	15	79	24	24	S24W16	
790422	2030	0460	S40E29	S36E07	1.2	3	S	18	1.4	26	47	37	26	S39E18	
790423	0833	0703	S32E21	S18E06	1.2	3	N	19	2.7	53	10	24	4	S25E13	
790429	0909	1009	S15E67	(S20E65)											
				S15E55	1.2	2	U	14	1.1	15	--	63	--	S17E62	
790429	0909	1009	S25W45	S18W57	0.6	2	S	13	0.3	4	43	52	33	S22W51	
790430	1908	0307	N31W49	N31W66	1.2	2	N	12	1.2	14	22	65	20	N31W57	
790501	1013	1157	S31E34	S29E13	0.6	2	N	18	0.3	5	39	34	21	S30E23	
790508	0820	1000	S12W25	S03W35	1.2	3	N	13	1.9	26	48	30	22	S08W30	
790509	1030	0950	N18W25	(N18W23)											
			(N23W23)	N21W27	0.6	2	U	11	0.3	3	--	33	--	N20W24	
790521	1413	0738	S36W03	S31W14	1.8	3	S	10	2.5	26	78	32	31	S34W09	
790525	1255	1345	S02W04	S02W15	0.6	2	V	11	0.3	3	1	9	0	S02W10	
790526	0240	0105	2												GAP
790528	1140	1035	S18W11	S20W16	1.8	2	V	5	5.2	27	29	22	10	S19W13	
790606	0058	1941	S59E31	S60W10	1.8	2	N	20	1.7	35	81	61	60	S61E11	
790607	0133	1918	N53E46	N38E31	1.8	2	S	16	2.3	35	13	57	11	N46E37	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
790608	0841	1011	S16W16	(S10W21)											
				S07W16	0.6	2	V	14	0.3	4	--	21	--	S11W18	
790610	1000	0833	N30W35	N27W47	0.6	2	V	11	0.3	3	45	48	32	N29W41	
790610	1000	0833	S10E03	S03E00	1.2	2	V	8	3.0	23	10	7	1	S07E01	
790611	0909	1028	S34E24	S32E19	0.6	2	V	5	0.3	1	29	39	18	S33E21	
790613	0731	1230	N32W29	N24W34	0.6	2	V	9	0.3	3	82	41	41	N28W32	
790614	1210	1330	S35E55	S28E43	1.2	1	S	11	1.6	17	9	56	7	S32E49	
790614	0845	1004	S41W18	S38W27	2.4	2	N	8	2.9	22	81	45	44	S40W23	
790615	1040	0900	S28W27	S38W27	0.6	3	V	10	0.3	3	42	42	27	S33W27	
790617	0930	0958	S13E15	S21E13	0.9	3	N	8	0.9	7	52	23	18	S17E14	
790618	0837	1309	N20E27	S02E21	0.6	2	S	23	0.3	7	58	25	21	N09E24	
790618	0837	1309	N34W04	N30W12	1.8	2	S	8	2.7	21	75	32	31	N32W08	
790620	0904	1245	S35E18	S26E11	1.0	2	S	11	1.6	17	8	35	5	S31E14	
790621	0913	1124	N40W36	N35W48	2.0	2	S	11	2.2	23	61	53	44	N38W42	
790623	0954	1129	N52W12	N45W16	1.8	2	N	7	2.6	19	40	48	29	N49W14	
790623	0954	1129	N10W43	S04W49	1.2	3	S	15	1.2	18	67	46	41	N03W46	
790624	0853	0957	N26W42	N18W55	1.2	2	S	14	1.1	17	50	51	37	N22W49	
790626	0833	1013	S02E29	S02E19	1.8	2	N	10	5.2	52	10	24	4	S02E24	
790627	0730	1244	S38W47	(S42W47)											
				S42W57	1.2	2	N	11	1.1	11	--	63	--	S41W50	
790705	1045	1215	S41W15	S38W25	0.6	2	V	8	0.3	2	83	47	47	S40W20	
790706	0627	0727	N05W42	S00W44	1.2	2	V	5	1.2	6	66	43	39	N03W43	
790707	2207	1545	N30E25	N25E13	1.2	2	S	12	2.5	29	25	30	12	N28E19	
790709	1804	0417	S38E16	S28E11	0.6	2	V	11	0.3	3	1	39	1	S33E13	
790710	0610	0750	N10E42	N15E33	0.6	2	V	10	0.3	3	40	38	23	N13E38	
790712	0605	0750	S25W46	S31W55	1.2	2	V	10	1.8	17	12	58	10	S28W50	
790715	1053	0912	N23E37	N20E20	0.6	3	S	16	0.3	5	18	33	10	N22E28	
790715	1053	0912	N30W29	N25W43	1.2	3	S	13	1.3	17	50	42	31	N28W36	
790716	2103	0637	S02W20	N02W36	0.6	2	S	16	0.3	5	23	28	11	S00W28	
790717	1047	0707	N52E61	N45E41	1.8	2	N	12	2.7	33	1	62	1	N49E50	
790717	1047	0707	N58E01	N65W94	1.2	2	S	32	1.0	33	34	70	32	N70W39	
790720	1945	1811	N24W32	N20W50	1.2	1	S	17	1.6	28	31	43	21	N22W41	
790722	1840	0343	N60E68	N35E38	2.4	3	N	27	3.1	85	24	60	21	N48E49	
790723	0619	0744	S35W16	(S45W12)											
				S41W16	1.2	2	U	15	1.3	20	--	49	--	S40W15	
790723	0728	0636	N38W17	N28W29	1.2	2	S	14	1.3	18	88	36	36	N33W23	
790723	1029	0335	N15E33	S10E28	1.8	1	S	25	2.4	62	85	31	31	N03E30	
790725	0556	0736	N45W49	N16W64	1.8	1	U	32	1.8	56	80	60	59	N31W58	
790727	1004	0819	N28W52	N20W65	1.8	1	N	14	1.9	27	43	59	36	N24W59	
790804	1157	1258	S30E83	S24E57	0.6	2	V	24	0.3	7	0	75	0	S28E70	
790804	0335	0205A	S31W32	S22W40	1.8	2	N	11	1.9	22	89	48	48	S27W36	
790807	0958	0430	S32E29	S10E16	1.8	1	N	25	5.0	126	12	35	7	S21E22	
790808	1023	1147	S12E06	N02E02	1.2	1	N	15	3.0	43	4	12	1	S05E04	
790810	1011	1145	N31W29	N31W36	1.2	2	V	6	1.6	10	32	39	19	N31W32	
790811	0536	0751	N14W08	N21W14	0.6	2	V	9	0.3	3	6	15	2	N18W11	
790813	1022	1201	S40E27	S32E14	0.6	2	V	13	0.3	4	24	47	17	S36E20	
790813	1022	1201	S48E43	S29E31	0.6	1	U	19	0.3	6	19	56	16	S39E36	
790817	2221	2136	S33W27	S33W43	0.6	2	V	13	0.3	4	44	52	33	S33W35	
790818	0841	1245	N02W64	N10W97	1.8	2	S	24	1.9	47	20	80	20	N06W80	
790821	0903	0802	N21W42	N15W44	0.6	2	V	6	0.3	2	82	43	42	N18W43	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
790825	0300	1125	N23E29	(N20E44)											
				N11E27	0.5	2	V	33	0.3	10	--	37	--	N18E33	
790825	1755	0330	N28W36	N18W62	2.4	3	S	26	3.5	91	34	50	25	N24W49	
790826	0247	1223	S32E48	S17E45	1.0	2	S	15	0.8	12	51	55	40	S25E46	
790830	0445	1418	N28W43	N20W50	0.6	2	V	10	0.3	3	64	48	42	N24W47	
790830	0445	1418	N02W40	S07W45	0.6	1	V	10	0.3	3	48	43	30	S03W42	
790908	0042	1732	S53E57	S42E27	1.2	2	N	17	1.1	19	16	66	15	S48E40	
790908	2233	1521	N36E60	N22E38	1.8	2	S	22	2.3	51	20	50	15	N29E48	
790922	1749	0333	S29W27	S17W35	1.2	3	N	14	1.1	16	80	43	42	S23W31	
790925	1013	1203	N33E37	(N33E31)											
				N29E33	0.6	2	V	9	0.3	3	--	40	--	N32E34	
790929	0409	1418	N53W55	N54W58	1.0	2	N	2	1.0	2	5	65	5	N54W56	
791005	1202	0649	S36W40	S14W54	2.4	3	N	25	2.6	65	88	56	56	S25W48	
791009	1258	0522	N48W14	N40W37	3.6	2	S	18	4.7	85	78	45	44	N45W26	
791010	1010	1150	N28E14	N28E07	0.6	2	V	6	0.3	2	64	24	21	N28E11	
791010	0642	0822	S50W15	S40W25	1.2	2	N	12	1.1	13	60	54	44	S45W20	
791012	0444	1404	N18E22	N13E15	0.6	2	V	8	0.3	3	11	20	4	N16E18	
791012	2236	0032A	S40E80	S26E48	1.8	2	S	22	2.1	48	7	71	7	S34E63	
791015	0634	0819	N09W15	N20W15	0.6	1	V	11	0.3	3	61	17	15	N14W15	
791018	0858	1033	S20W46	S18W54	0.6	2	V	8	0.3	2	36	55	29	S19W50	
791019	1049	0654	N51E17	N30W13	2.4	2	S	31	4.4	134	46	36	25	N41W00	
791021	0750	1005	N10E32	S02E27	1.2	1	V	13	1.3	17	71	29	27	N04E29	
791022	0709	0849	S43W40	S30W85	0.6	2	S	38	0.4	14	42	74	40	S39W65	
791024	0820	0945	N48E56	N51E35	0.6	2	V	12	0.3	4	46	59	38	N50E46	
791028	1017	0847	S30W35	S25W51	1.2	2	S	15	1.1	17	51	53	38	S28W43	
791031	1245	0440	N65E67	N65E13	4.8	1	S	17	5.2	88	47	69	43	N67E40	
791102	0833	1118	S23W51	S08W68	0.6	2	V	22	0.3	7	56	62	47	S16W60	
791103	2022	0018E	S42E50	S32E19	1.2	2	N	27	1.5	40	23	52	18	S38E33	
791107	1057	0438	S51E34	S42E01	1.2	2	N	24	1.1	26	47	53	36	S48E16	
791110	1435	0646	S00W56	S19W60	1.2	2	N	19	1.1	20	69	59	53	S10W58	
791117	0655	0835	N26E55	N19E49	0.6	2	V	8	0.3	2	38	54	30	N23E52	
791122	0654	0929	N08E33	N04E19	0.6	2	S	14	0.3	4	8	26	3	N06E26	
791123	1106	0518	N40W15	N38W25	2.4	2	S	8	3.1	24	73	42	40	N39W20	
791127	0621	0041A	N13E04	S02W02	1.8	2	S	16	6.0	97	8	4	1	N06E01	HALO (?)
791128	0810	1055	N48W24	N37W38	1.2	2	N	15	1.1	16	86	50	50	N43W32	
791202	0601	0856	N39E37	N39E25	1.2	1	V	9	1.2	11	46	48	32	N39E31	
791212	0838	1123	S06E35	S13E35	1.2	2	V	7	1.1	8	78	36	35	S09E35	
791212	2305	0026A	S53E20	S58W20	1.8	2	S	23	1.8	40	78	57	55	S57E01	
791214	0849	1124	S57E33	S55E22	1.2	1	V	6	1.1	6	40	60	34	S56E27	
791220	0653	0938	N41W53	N32W56	0.6	1	V	9	0.3	3	81	63	62	N37W55	
791221	1133	0328	N33E88	N18E44	1.8	2	S	32	2.3	74	8	68	7	N27E65	
791225	1830	0230E	S40E50	S35E15	1.2	2	N	28	1.4	38	33	47	23	S39E32	
791226	0506	0108A	N33W22	N25W27	1.8	2	N	9	2.2	20	70	39	36	N29W25	
800101	2117	0233	S40E13	S30E02	1.2	3	S	13	2.2	30	28	33	15	S35E07	
800102	2225	1600 2													GAP
800103	1913	2048	S44E14	S30W01	0.6	3	N	18	0.3	6	30	35	17	S37E06	
800105	0345	1145	S36E24	S30E14	0.7	2	N	10	0.4	4	20	35	11	S33E19	
800110	0657	0856	S45W43	S33W72	1.0	2	N	25	0.8	20	47	64	41	S40W59	
800110	0635	0149A	S50E56	S58E56	2.4	1	S	8	2.4	19	63	67	55	S54E56	
800110	1211	0343	S50W27	S32W37	1.2	3	S	19	1.1	22	69	47	43	S41W33	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
800111	0044	0047A	S33E70	S20E60	1.2	1	N	16	1.0	16	48	66	43	S27E65	
800125	0712	0948	S28E63	S24E55	1.2	2	S	7	1.2	8	20	60	17	S26E59	
800129	0630	1010	S22E54	S15E45	1.2	3	U	11	1.2	13	31	50	23	S19E49	
800205	1901	0354	S30E46	S40E41	0.6	2	N	11	0.3	3	87	49	49	S35E44	
800206	0536	0259A	S55E41	S35E04	1.2	2	N	32	2.1	68	22	43	15	S46E19	
800206	1425	0551	S56E39	S45E15	2.4	3	N	19	6.0	116	19	50	14	S51E26	
800208	1025	1150	N09E47	N16E40	1.8	1	S	10	1.8	18	67	47	42	N13E44	
800209	0635	0820	N19W04	N30W11	0.6	2	V	13	0.3	4	16	32	8	N25W07	
800211	1150	0319	N19E02	N17W22	1.8	3	N	23	2.9	67	72	27	26	N18W10	
800211	1150	0319	S48W62	S33W67	1.8	2	S	15	1.7	26	88	67	67	S41W65	
800215	1513	0640	N38W14	N27W29	1.2	2	N	17	1.1	19	81	45	44	N33W22	
800215	1513	0640	N40W23	N32W39	1.2	2	S	15	1.1	16	81	52	51	N36W31	
800220	0917	1153	N02E43	N01E34	1.2	2	V	9	2.1	19	7	39	4	N02E38	
800221	1430	0612	N08W00	S04W13	1.2	2	S	18	3.8	67	83	11	11	N02W07	
800224	0643	0828	N28W30	N19W34	1.8	2	S	10	2.2	21	72	44	41	N24W32	
800229	1408	0633	S40W24	S27W49	1.8	2	N	24	2.1	52	62	44	38	S34W37	
800302	0114	0249A	S40W42	S13W57	1.2	2	S	30	1.1	32	77	52	50	S27W50	
800309	0233	1224	N28W48	N28W59	2.0	2	S	9	2.5	22	26	63	23	N28W53	
800309	1127	0330	S39E18	S30W03	1.2	2	S	19	1.8	35	48	28	20	S35E07	
800316	0420	0050A	S48W10	S53W32	3.0	2	N	15	4.3	64	42	47	29	S51W20	
800319	1809	0304	N32W18	N24W32	1.8	2	S	15	2.0	30	85	43	43	N28W25	
800329	1145	1045	N25E64	N25E52	1.2	1	V	8	1.1	9	21	65	19	N25E58	
800329	0830	0730	S30E04	S34W05	1.2	2	V	9	1.6	14	61	25	22	S32W00	
800331	1751	0321	S43E70	S28E29	1.8	2	N	35	3.6	126	2	53	2	S37E47	
800404	1050	1225	S32E17	S08W04	0.6	2	V	31	0.3	9	16	15	4	S20E06	
800405	0905	0950	N03E65	S02E64	1.2	2	U	5	1.1	5	71	65	59	N01E64	
800405	0905	0950	S03E50	N06E48	1.2	2	U	9	1.0	10	87	50	50	N02E49	
800410	0704	0854	S39W35	S45W43	1.2	2	V	8	2.1	17	10	50	8	S42W39	
800415	0627	0802	S30E66	S23E64	1.2	1	V	7	1.1	8	70	65	58	S27E65	
800415	0627	0802	S58W44	S51W64	1.2	1	N	13	1.0	14	58	66	51	S55W55	
800416	0923	1053	N13W45	(N25W46)											
				N13W59	1.2	2	U	29	1.1	32	--	55	--	N17W50	
800418	1137	1157	N05W05	S08W09	1.2	2	N	14	3.0	41	76	8	8	S02W07	
800502	1030	1220	N23W33	(N44W22)											
				N42W37	0.6	2	U	34	0.3	10	--	51	--	N36W31	
800506	1440	2228	3												GAP
800512	0717	0839	N06W23	N17W41	0.6	2	V	21	0.3	6	9	35	5	N12W32	
800513	1131	1221	N34W22	N40W25	1.2	1	V	6	2.2	14	12	46	9	N37W23	
800523	0628	0803	N42E86	N35E56	1.2	1	V	16	0.7	11	3	76	3	N39E70	
800523	0628	0803	N45W34	N36W46	1.2	1	N	13	1.0	13	84	56	56	N41W40	
800527	0118	1128	N30W35	N23W39	0.8	2	N	8	0.5	4	85	45	45	N27W37	
800528	0129	1243	S45E43	S35E34	1.1	2	N	11	1.1	13	17	52	13	S40E38	
800529	0200	1149	S50E46	S31E38	0.6	1	S	18	0.3	5	37	54	29	S41E41	
800602	1006	0335	N50W27	N32W37	4.2	1	S	19	5.2	101	66	51	45	N41W33	
800607	0530	0730	S28W26	S22W34	2.0	2	N	9	2.7	25	76	38	37	S25W30	
800607	0945	0314	N45W16	N40W43	2.4	2	N	20	2.7	55	64	51	44	N43W30	
800611	0247	0153A	S34E79	S25E59	1.8	2	S	14	2.0	28	16	72	15	S30E69	
800620	1907	0445E	N37E47	N12E16	1.2	2	S	37	2.4	89	8	37	5	N25E30	
800702	0546	1456	N41E07	N26W20	1.2	3	N	27	1.5	39	70	32	30	N34W08	
800705	0859	0937	N45W21	N38W45	1.8	2	N	19	1.9	37	65	49	43	N42W34	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
800713	0425	1019	S40E16	S31W16	0.8	2	S	27	0.5	15	72	41	39	S37W01	
800716	1050	1210	S52E03	S52W06	2.4	2	V	6	2.5	14	88	56	56	S52W01	
800717	0638	0738	N28E86	N23E56	0.6	2	U	20	0.3	6	6	71	6	N26E71	
800717	0638	0738	S13E08	S03E06	0.6	2	V	10	0.3	3	18	14	4	S08E07	
800722	0355	0110A	N45W23	N32W65	1.8	2	N	34	1.9	65	51	54	39	N40W46	
800723	1148	1058	N31W04	N30W16	0.6	2	V	10	0.3	3	73	27	26	N31W10	
800730	0249	0306A	N50W05	N34W52	3.0	2	S	38	3.6	135	72	48	45	N44W32	
800801	0719	0634	S03E57	N01E46	0.6	2	V	11	0.3	3	12	52	9	S01E51	
800803	0036	0021A	S50E32	S37W01	3.0	2	N	27	3.9	106	43	52	33	S45E14	
800812	1809	0331	N02W16	N02W24	1.2	3	S	8	2.9	23	13	20	4	N02W20	
800812	2323	0060A	S16W24	N03W35	1.2	2	U	22	1.3	29	84	32	32	S07W30	
800813	0405	0233A	N44E89	N30E31	1.2	2	N	40	1.4	57	1	61	1	N41E57	
800816	0531	0142A	S18W17	S07W32	1.2	2	N	18	1.4	25	74	31	30	S13W25	
800817	0333	0005A	S40W15	S32W29	2.4	3	S	14	2.7	37	85	48	48	S36W22	
800818	0620	0755	S23E86	(S10E51)											
				S15E42	1.2	2	U	35	1.1	37	--	61	--	S16E60	
800820	0852	0544	N38E57	N38E37	1.2	2	N	15	1.4	22	24	53	19	N38E47	
800822	0815	0606	N24E55	N19E48	0.6	2	V	8	0.3	2	29	52	22	N22E51	
800826	0554	0139A	N27E49	S01E39	1.2	2	S	30	1.1	33	68	43	39	N13E44	
800827	1309	1224	S40E31	S30E21	0.6	2	V	13	0.3	4	4	49	3	S35E26	
800831	1835	0410	N23E12	N18E07	0.6	1	V	7	0.3	2	7	16	2	N21E09	
800901	0649	0804	S38W28	S30W36	0.6	2	V	10	0.3	3	82	51	50	S34W32	
800902	1038	0332	N11W56	S03W56	1.8	1	S	14	1.8	25	84	56	56	N04W56	
800909	1038	1153	S15W31	S00W46	0.6	2	V	21	0.3	6	66	41	37	S08W39	
800910	1028	1153	N28W17	N28W26	1.2	2	V	8	1.8	15	42	29	19	N28W21	
800913	1021	1220	N20W20	N16W21	0.6	2	V	4	0.3	1	78	23	22	N18W21	
800917	0318	1241	N42W07	N30W14	2.0	2	S	13	4.9	65	46	31	22	N36W11	
800919	1843	0423	S20E46	S20E26	1.2	2	V	19	1.4	26	34	45	23	S20E36	
800921	0210	0042A	N40E25	N40E01	0.6	2	N	18	0.3	5	67	36	33	N41E13	
800923	1845	0350	S15W06	S02W12	0.6	2	V	14	0.3	4	55	18	15	S09W09	
800929	0634	0818	S55E46	S55E31	1.2	1	S	9	1.0	9	49	70	45	S55E38	
801001	2208	0113A	S48W18	S33W35	2.4	3	N	20	2.6	51	75	54	51	S41W27	
801007	0404	1342	S04W44	S30W47	1.8	3	N	26	2.1	55	60	51	42	S17W45	
801008	1101	0325	N45E88	N33E45	1.2	2	N	27	1.6	45	9	67	8	N41E65	
801008	1101	0325	S36W26	S28W36	1.2	2	S	12	1.1	13	90	49	49	S32W31	
801009	1015	1200	S05W35	S10W38	1.8	2	V	6	3.5	20	40	39	24	S08W36	
801010	1145	1330	S32W17	N23W17	0.6	2	V	55	0.3	17	58	20	17	S05W17	
801010	0630	0815	N12W44	N02W56	0.6	2	V	16	0.3	5	38	50	28	N07W50	
801010	1421	0643	S45E86	S39E42	1.2	2	S	22	1.2	26	13	76	13	S44E63	
801010	2000	0515	S25E45	S21E29	1.2	3	N	15	2.0	30	19	46	14	S23E37	
801012	1042	1143	N07W23	N05W36	0.6	2	V	13	0.3	4	7	29	3	N06W30	
801012	1042	1143	S23E24	S23E09	0.6	2	V	14	0.3	4	59	33	28	S23E16	
801016	0744	0908	N38W19	N32W27	1.2	2	V	9	1.3	11	89	36	36	N35W23	
801017	0411	1119	S21W02	S19W26	1.0	2	N	23	1.0	24	66	30	27	S20W14	
801017	0820	1529	N41E03	N30W06	1.8	3	S	13	6.0	79	37	30	18	N36W02	
801022	1020	1200	S08W47	S08W57	1.2	3	S	10	2.3	22	13	54	10	S08W52	
801023	0043	0101A	N27E01	N36W33	1.2	2	S	30	1.8	53	42	31	20	N33W15	
801027	0930	1200	S22E29	S20E20	0.6	2	V	9	0.3	3	31	35	17	S21E24	
801103	0834	1030	S23W46	S03W48	1.8	2	N	20	2.0	40	79	50	49	S13W47	
801105	1014	0529	S32E57	(S45E69)											
				S40E47	1.8	2	U	24	1.9	44	--	71	--	S39E58	

Date	Time	Err	Position		W	D	P	L	H	A	ξ	ϕ	α	Midpt	Com
801106	0838	1103	N45W06	N42W20	0.6	1	V	11	0.3	3	87	42	42	N44W13	
801108	0058	0132A	N30E49	N18E21	1.8	2	N	28	0.3	8	1	39	1	N25E34	
801109	0112	0121A	N42E09	N37W08	1.8	1	N	14	2.3	33	69	36	33	N40E00	
801114	0912	1157	S15E08	S14E01	1.2	3	V	7	2.3	16	67	18	17	S15E04	
801118	0545	0213A	S42W05	S42W31	1.8	2	N	19	1.9	37	65	48	42	S43W18	
801120	0620	0911	S20E38	S11E29	0.6	1	V	12	0.3	4	21	38	13	S16E33	
801120	1853	0322	N32E18	N23E08	1.2	2	V	13	2.7	34	16	28	7	N28E13	
801122	0953	1151	S35E13	S22W07	1.8	3	N	22	3.5	77	48	31	23	S29E02	
801122	0552	0036A	S30W25	N18W33	1.2	2	S	49	1.4	66	84	30	30	S06W29	
801123	1022	1238	S20E48	(S31E48)											
			(S09W14)	S20W05	1.8	2	N	86	4.0	344	--	34	--	S20E19	
801126	0643	0903	S01E12	N03E07	0.6	2	V	6	0.3	2	36	10	6	N01E10	
801126	0432	0333A	S01E52	N14E52	3.6	2	N	15	4.0	60	87	52	52	N06E52	
801129	1006	1204	N29E83	N18E54	1.2	2	S	20	1.1	21	15	69	14	N24E68	
801130	1225	1415	N12W42	N20W58	0.6	1	V	17	0.3	5	16	51	12	N16W50	
801202	0414	1134	S16W06	S12W22	0.7	2	S	16	0.4	7	60	20	17	S14W14	
801202	0414	1134	S22W54	S20W76	1.2	2	S	18	1.3	23	16	67	15	S21W65	
801204	1856	0254	N39E38	N38E30	2.4	3	N	6	3.6	23	33	49	24	N39E34	
801208	0705	0935	S20W25	S20W33	0.6	2	V	8	0.3	2	32	35	18	S20W29	
801209	0611	0037A	S19W37	S10W44	1.8	2	S	11	2.1	23	69	43	40	S15W41	
801211	0650	0935	S22W29	S19W40	0.6	2	V	11	0.3	3	43	39	25	S21W35	
801214	1844	0232	N18E18	N18E07	1.2	2	N	10	2.0	21	56	22	18	N18E12	
801219	0621	0901	S24E43	S30E30	1.2	3	N	13	1.1	15	58	44	36	S27E37	
801220	0652	0801	S40E21	S31E15	1.2	2	V	10	2.3	24	2	38	1	S36E18	
801223	0752	1016	S21W45	S21W56	1.2	2	N	10	2.0	21	14	53	11	S21W51	
801226	0747	0923	S03W23	S04W31	0.6	2	V	8	0.3	2	5	27	2	S04W27	
801229	0320	1217	S40E03	S30W07	1.2	2	S	13	2.0	26	43	33	22	S35W02	
801229	0320	1217	S29W55	S36W55	1.2	2	N	7	1.1	7	72	60	55	S33W55	
801231	1047	1341	S17E41	S19E34	1.5	2	N	7	2.1	14	35	40	22	S18E38	

UAG SERIES OF REPORTS

Fewer than four UAG Reports are published at irregular intervals each year. Copies of these publications may be purchased through the NATIONAL GEOPHYSICAL DATA CENTER, Solar-Terrestrial Physics Division (E/GC2) 325 Broadway, Boulder, Colorado 80303, USA. Please note that some reports are available on microfiche only at $4.00 a copy and that a $10.00 handling charge will be added. In this case orders must include check or money order payable in U.S. currency to Commerce, NOAA/NGDC.

UAG- 1 IQSY NIGHT AIRGLOW DATA, by L.L. Smith, F.E. Roach, and J.M. McKennan, ESSA Aeronomy Laboratory, Boulder, CO, July 1968, 305 pp.

UAG- 2 A REEVALUATION OF SOLAR FLARES, 1964-1966, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontaic, MI, August 1968, 28 pp.

UAG- 3 OBSERVATIONS OF JUPITER'S SPORADIC RADIO EMISSION IN THE RANGE 7.6-41 MHZ, 6 JULY 1966 THROUGH 8 SEPTEMBER 1968, by James W. Warwick and George A. Dulk, University of Colorado, Boulder, CO, October 1968, 35 pp.

UAG- 4 ABBREVIATED CALENDAR RECORD 1966-1967, by J. Virginia Lincoln, Hope I. Leighton and Dorothy K. Kropp, ESSA [now NOAA], Aeronomy and Space Data Center, Boulder, CO, January 1969, 170 pp.

UAG- 5 DATA ON SOLAR EVENT OF MAY 23, 1967, AND ITS GEOPHYSICAL EFFECTS, compiled by J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, February 1969, 120 pp.

UAG- 6 INTERNATIONAL GEOPHYSICAL CALENDARS 1957-1969, by A.H. Shapley and J. Virginia Lincoln, ESSA Research Laboratories [now NOAA], Boulder, CO, March 1969, 25 pp.

UAG- 7 OBSERVATIONS OF THE SOLAR ELECTRON CORONA: FEBRUARY 1964 - JANUARY 1968, by Richard T. Hansen, High Altitude Observatory, NCAR, Boulder, CO, and Kamuela, HI, October 1969, 12 pp.

UAG- 8 DATA ON SOLAR-GEOPHYSICAL ACTIVITY OCTOBER 24 - NOVEMBER 6, 1968, Parts 1 and 2, compiled by J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, March 1970, 312 pp, (includes Parts 1 and 2).

UAG- 9 DATA ON COSMIC RAY EVENT OF NOVEMBER 18, 1968, AND ASSOCIATED PHENOMENA, compiled by J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, April 1970, 109 pp.

UAG-10 ATLAS OF IONOGRAMS, edited by A.H. Shapley, ESSA Research Laboratories [now NOAA], Boulder, CO, May 1970, 243 pp.

UAG-11 [Superseded by UAG-30]

UAG-12 SOLAR-GEOPHYSICAL ACTIVITY ASSOCIATED WITH THE MAJOR GEOMAGNETIC STORM OF MARCH 8, 1970, Parts 1, 2 and 3, compiled by J. Virginia Lincoln and Dale B. Bucknam, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, April 1971, 466 pp, (includes 3 parts).

UAG-13 DATA ON THE SOLAR PROTON EVENT OF NOVEMBER 2, 1969, THROUGH THE GEOMAGNETIC STORM OF NOVEMBER 8-10, 1969, compiled by Dale B. Bucknam and J. Virginia Lincoln, World Data Center A, Upper Atmosphere Geophysics, ESSA [now NOAA], Boulder, CO, May 1971, 76 pp.

UAG-14 AN EXPERIMENTAL, COMPREHENSIVE FLARE INDEX AND ITS DERIVATION FOR 'MAJOR' FLARES, 1955-1969, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontiac, MI, July 1971, 25 pp.

UAG-15 [Superseded by UAG-30]

UAG-16 TEMPORAL DEVELOPMENT OF THE GEOPHYSICAL DISTRIBUTION OF AURORAL ABSORPTION FOR 30 SUBSTORM EVENTS IN EACH OF IQSY (1964-65) AND IASY (1960), by F.T. Berkey, University of Alaska, Fairbanks, AK; V.M. Driatskiy, Arctic and Antarctic Research Institute, Leningrad, USSR; K. Henriksen, Auroral Observatory, Tromso, Norway; D.H. Jelly, Communications Research Center, Ottawa, Canada; T.I. Shchuka, Arctic and Antarctic Research Institute, Leningrad, USSR; A. Theander, Kiruna Geophysical Observatory, Kiruna, Sweden; and J. Yliniemi, University of Oulu, Oulu, Finland, September 1971, 131 pp, $4.00 (microfiche only).

UAG-17 IONOSPHERIC DRIFT VELOCITY MEASUREMENTS AT JICAMARCA, PERU (JULY 1967 - MARCH 1970), by Ben B. Balsley, NOAA Aeronomy Laboratory, Boulder, CO, and Ronald F. Woodman, Jicamarca Radar Observatory, Instituto Geofisico del Peru, Lima, Peru, October 1971, 45 pp, $4.00 (microfiche only).

UAG-18 A STUDY OF POLAR CAP AND AURORAL ZONE MAGNETIC VARIATIONS, by K. Kawasaki and S.-I. Akasofu, University of Alaska, Fairbanks, AK, June 1972, 21 pp.

UAG-19 REEVALUATION OF SOLAR FLARES 1967, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontiac, MI, and Marta Rovira de Miceli, San Miguel Observatory, Argentina, June 1972, 15 pp.

UAG-20 [Superseded by UAG-30]

UAG-21 PRELIMINARY COMPILATION OF DATA FOR RETROSPECTIVE WORLD INTERVAL JULY 26 - AUGUST 14, 1972, by J. Virginia Lincoln and Hope I. Leighton, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, November 1972, 128 pp.

UAG-22 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES (AE) FOR 1970, by Joe Haskell Allen, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, November 1972, 146 pp.

UAG-23 U.R.S.I. HANDBOOK OF IONOGRAM INTERPRETATION AND REDUCTION, Second Edition, November 1972, edited by W.R. Piggott, Radio and Space Research Station, Slough, UK, and K. Rawer, Arbeitsgruppe fur Physikalische Weltraumforschung, Freiburg, GFR, November 1972, 324 pp.

UAG-23A U.R.S.I. HANDBOOK OF IONOGRAM INTERPRETATION AND REDUCTION, Second Edition, Revision of Chapters 1-4, edited by W.R. Piggott, Radio and Space Research Station, Slough, UK, and K. Rawer, Arbeitsgruppe fur Physikalische Weltraumforschung, Freiburg, GFR, November 1972, 135 pp.

UAG-24 DATA ON SOLAR-GEOPHYSICAL ACTIVITY ASSOCIATED WITH THE MAJOR GROUND LEVEL COSMIC RAY EVENTS OF 24 JANUARY AND 1 SEPTEMBER 1971, Parts 1 and 2, compiled by Helen E. Coffey and J. Virginia Lincoln, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, December 1972, 462 pp, (includes Parts 1 and 2).

UAG-25 OBSERVATIONS OF JUPITER'S SPORADIC RADIO EMISSION IN THE RANGE 7.6-41 MHZ, 9 SEPTEMBER 1968 THROUGH 9 DECEMBER 1971, by James W. Warwick, George A. Dulk and David G. Swann, University of Colorado, Boulder, CO, February 1973, 35 pp.

UAG-26 DATA COMPILATION FOR THE MAGNETOSPHERICALLY QUIET PERIODS FEBRUARY 19-23 AND NOVEMBER 29 - DECEMBER 3, 1970, compiled by Helen E. Coffey and J. Virginia Lincoln, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, May 1973, 129 pp.

UAG-27 HIGH SPEED STREAMS IN THE SOLAR WIND, by D.S. Intriligator, University of Southern California, Los Angeles, CA, June 1973, 16 pp.

UAG-28 COLLECTED DATA REPORTS ON AUGUST 1972 SOLAR-TERRESTRIAL EVENTS, Parts 1, 2 and 3, edited by Helen E. Coffey, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, July 1973, 932 pp.

UAG-29 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1968, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, October 1973, 148 pp.

UAG-30 CATALOGUE OF DATA ON SOLAR-TERRESTRIAL PHYSICS, prepared by NOAA Environmental Data Service, Boulder, CO, October 1973, 317 pp. Supersedes catalogs UAG-11, 15 and 20.

UAG-31 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1969, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, February 1974, 142 pp.

UAG-32 SYNOPTIC RADIO MAPS OF THE SUN AT 3.3 MM FOR THE YEARS 1967-1969, by Earle B. Mayfield, Kennon P. White III, and Fred I. Shimabukuro, Aerospace Corp., El Segundo, CA, April 1974, 26 pp.

UAG-33 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(10) FOR 1967, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, May 1974, 142 pp.

UAG-34 ABSORPTION DATA FOR THE IGY/IGC AND IQSY, compiled and edited by A.H. Shapley, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; W.R. Piggott, Appleton Laboratory, Slough, UK; and K. Rawer, Arbeitsgruppe fur Physikalische Weltraumforschung, Freiburg, GFR, June 1974, 381 pp.

UAG-35 [Superseded by UAG-92]

UAG-36 AN ATLAS OF EXTREME ULTRAVIOLET FLASHES OF SOLAR FLARES OBSERVED VIA SUDDEN FREQUENCY DEVIATIONS DURING THE ATM-SKYLAB MISSIONS, by R.F. Donnelly and E.L. Berger, NOAA Space Environment Laboratory; Lt. J.D. Busman, NOAA Commissioned Corps; B. Henson, NASA Marshall Space Flight Center; T.B. Jones, University of Leicester, UK; G.M. Lerfald, NOAA Wave Propagation Laboratory; K. Najita, University of Hawaii; W.M. Retallack, NOAA Space Environment Laboratory and W.J. Wagner, Sacramento Peak Observatory, October 1974, 95 pp.

UAG-37 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(10) FOR 1966, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, December 1974, 142 pp.

UAG-38 MASTER STATION LIST FOR SOLAR-TERRESTRIAL PHYSICS DATA AT WDC-A FOR SOLAR-TERRESTRIAL PHYSICS, by R.W. Buhmann, World Data Center A for Solar-Terrestrial Physics, Boulder, CO; Juan D. Roederer, University of Denver, Denver, CO; and M.A. Shea and D.F. Smart, Air Force Cambridge Research Laboratories, Hanscom AFB, MA, December 1974, 110 pp.

UAG-39 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1971, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, February 1975, 144 pp.

UAG-40 H-ALPHA SYNOPTIC CHARTS OF SOLAR ACTIVITY FOR THE PERIOD OF SKYLAB OBSERVATIONS, MAY 1973 - MARCH 1974, by Patrick S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO, February 1975, 32 pp.

UAG-41 H-ALPHA SYNOPTIC CHARTS OF SOLAR ACTIVITY DURING THE FIRST YEAR OF SOLAR CYCLE 20 OCTOBER 1964 - AUGUST 1965, by Patrick S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO, and Jerome T. Nolte, American Science and Engineering, Inc., Cambridge, MA, March 1975, 25 pp.

UAG-42 OBSERVATIONS OF JUPITER'S SPORADIC RADIO EMISSION IN THE RANGE 7.6-80 MHZ, 10 DECEMBER 1971 THROUGH 21 MARCH 1975, by James W. Warwick, George A. Dulk and Anthony C. Riddle, University of Colorado, Boulder, CO, April 1975, 49 pp.

UAG-43 CATALOG OF OBSERVATION TIMES OF GROUND-BASED SKYLAB-COORDINATED SOLAR OBSERVING PROGRAMS, compiled by Helen E. Coffey, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, May 1975, 159 pp.

UAG-44 SYNOPTIC MAPS OF SOLAR 9.1 CM MICROWAVE EMISSION FROM JUNE 1962 TO AUGUST 1973, by Werner Graf and Ronald N. Bracewell, Stanford University, Stanford, CA, May 1975, 183 pp.

UAG-45 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1972, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, May 1975, 144 pp, $4.00 (microfiche only).

UAG-46 INTERPLANETARY MAGNETIC FIELD DATA 1963-1964, by Joseph H. King, National Space Science Data Center, NASA Goddard Space Flight Center, Greenbelt, MD, June 1975, 382 pp.

UAG-47 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1973, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, June 1975, 144 pp, $4.00 (microfiche only).

UAG-48 [Superseded by UAG-48A]

UAG-48A SYNOPTIC OBSERVATIONS OF THE SOLAR CORONA DURING CARRINGTON ROTATIONS 1580-1596 (11 OCTOBER 1971 - 15 JANUARY 1973), [Re-issue of UAG-48 with quality images], by R.A. Howard, M.J. Koomen, D.J. Michels, R. Tousey, C.R. Detwiler, D.E. Roberts, R.T. Seal, and J.D. Whitney, U.S. Naval Research Laboratory, Washington, DC; and R.T. Hansen and S.F. Hansen, C.J. Garcia and E. Yasukawa, High Altitude Observatory, NCAR, Boulder, CO, February 1976, 200 pp. Supersedes UAG-48.

UAG-49 [Superseded by UAG-92]

UAG-50 HIGH-LATITUDE SUPPLEMENT TO THE URSI HANDBOOK ON IONOGRAM INTERPRETATION AND REDUCTION, edited by W.R. Piggott, British Antarctic Survey, c/o Appleton Laboratory, Slough, UK, October 1975, 294 pp.

UAG-51 SYNOPTIC MAPS OF SOLAR CORONAL HOLE BOUNDARIES DERIVED FROM HE II 304A SPECTROHELIOGRAMS FROM THE MANNED SKYLAB MISSIONS, by J.D. Bohlin and D.M. Rubenstein, U.S. Naval Research Laboratory, Washington, DC, November 1975, 30 pp.

UAG-52 EXPERIMENTAL COMPREHENSIVE SOLAR FLARE INDICES FOR CERTAIN FLARES, 1970-1974, by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, University of Michigan, Pontiac, MI, November 1975, 27 pp.

UAG-53 DESCRIPTION AND CATALOG OF IONOSPHERIC F-REGION DATA, JICAMARCA RADIO OBSERVATORY (NOVEMBER 1966 - APRIL 1969), by W.L. Clark and T.E. Van Zandt, NOAA Aeronomy Laboratory, Boulder, CO, and J.P. McClure, University of Texas at Dallas, Dallas, TX, April 1976, 10 pp.

UAG-54 [Superseded by UAG-85]

UAG-55 EQUIVALENT IONOSPHERIC CURRENT REPRESENTATIONS BY A NEW METHOD, ILLUSTRATED FOR 8-9 NOVEMBER 1969 MAGNETIC DISTURBANCES, by Y. Kamide, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO; H.W. Kroehl, Data Studies Division, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; M. Kanamitsu, Advanced Study Program, National Center for Atmospheric Research, Boulder, CO; Joe Haskell Allen, Data Studies Division, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; and S.-I. Akasofu, Geophysical Institute, University of Alaska, Fairbanks, AK, April 1976, 91 pp, $4.00 (microfiche only).

UAG-56 ISO-INTENSITY CONTOURS OF GROUND MAGNETIC H PERTURBATIONS FOR THE DECEMBER 16-18, 1971, GEOMAGNETIC STORM, Y. Kamide, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO, April 1976, 37 pp.

UAG-57 MANUAL ON IONOSPHERIC ABSORPTION MEASUREMENTS, edited by K. Rawer, Institut fur Physikalische Weltraumforschung, Freiburg, GFR, June 1976, 302 pp.

UAG-58 ATS-6 RADIO BEACON ELECTRON CONTENT MEASUREMENTS AT BOULDER, JULY 1974 - MAY 1975, by R.B. Fritz, NOAA Space Environment Laboratory, Boulder, CO, September 1976, 61 pp.

UAG-59 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11) FOR 1974, by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, December 1976, 144 pp.

UAG-60 GEOMAGNETIC DATA FOR JANUARY 1976 [AE(7) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, July 1977, 57 pp.

UAG-61 COLLECTED DATA REPORTS FOR STIP INTERVAL II 20 MARCH - 5 MAY 1976, edited by Helen E. Coffey and John A. McKinnon, World Data Center A for Solar-Terrestrial Physics, Boulder, CO, August 1977, 313 pp.

UAG-62 GEOMAGNETIC DATA FOR FEBRUARY 1976 [AE(7) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, September 1977, 55 pp.

UAG-63 GEOMAGNETIC DATA FOR MARCH 1976 [AE(7) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, September 1977, 57 pp.

UAG-64 GEOMAGNETIC DATA FOR APRIL 1976 [AE(8) INDICES AND STACKED MAGNETOGRAMS], by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO, February 1978, 55 pp.

UAG-65 THE INFORMATION EXPLOSION AND ITS CONSEQUENCES FOR DATA ACQUISITION, DOCUMENTATION, PROCESSING, by G.K. Hartmann, Max-Planck-Institut fur Aeronomie, Lindau, GFR, May 1978, 36 pp.

UAG-66 SYNOPTIC RADIO MAPS OF THE SUN AT 3.3 MM 1970-1973, by Earle B. Mayfield and Fred I. Shimabukuro, Aerospace Corp., El Segundo, CA, May 1978, 30 pp.

UAG-67 IONOSPHERIC D-REGION PROFILE DATA BASE, A COLLECTION OF COMPUTER-ACCESSIBLE EXPERIMENTAL PROFILES OF THE D AND LOWER E REGIONS, by L.F. McNamara, Ionospheric Prediction Service, Sydney, Australia, August 1978, 30 pp, $4.00 (microfiche only).

UAG-68 A COMPARATIVE STUDY OF METHODS OF ELECTRON DENSITY PROFILE ANALYSIS, by L.F. McNamara, Ionospheric Prediction Service, Sydney, Australia, August 1978, 30 pp, $4.00 (microfiche only).

UAG-69 SELECTED DISTURBED D-REGION ELECTRON DENSITY PROFILES. THEIR RELATION TO THE UNDISTURBED D REGION, by L.F. McNamara, Ionospheric Prediction Service, Sydney, Australia, October 1978, 50 pp, $4.00 (microfice only).

UAG-70 ANNOTATED ATLAS OF H-ALPHA SYNOPTIC CHARTS FOR SOLAR CYCLE 20 (1964-1974) CARRINGTON SOLAR ROTATIONS 1487-1616, by Patrick S. McIntosh, NOAA Space Environment Laboratory, Boulder, CO, February 1979, 327 pp.

UAG-71 MAGNETIC POTENTIAL PLOTS OVER THE NORTHERN HEMISPHERE FOR 26-28 MARCH 1976, A.D. Richmond, NOAA Space Environment Laboratory, Boulder, CO; H.W. Kroehl, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; M.A. Henning, Lockheed Missiles and Space Co., Aurora, CO; and Y. Kamide, Kyoto Sangyo University, Kyoto, Japan, April 1979, 118 pp.

UAG-72 ENERGY RELEASE IN SOLAR FLARES, PROCEEDINGS OF THE WORKSHOP ON ENERGY RELEASE IN FLARES, 26 FEBRUARY - 1 MARCH 1979, CAMBRIDGE, MASSACHUSETTS, U.S.A., edited by David M. Rust, American Science and Engineering, Inc., Cambridge, MA; and A. Gordon Emslie, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, July 1979, 68 pp, $4.00 (microfiche only).

UAG-73 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(11-12) FOR JANUARY - JUNE 1975, by Joe Haskell Allen, Carl C. Abston, J.E. Salazar and J.A. McKinnon, National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, CO, August 1979, 114 pp, $4.00 (microfiche only).

UAG-74 ATS-6 RADIO BEACON ELECTRON CONTENT MEASUREMENTS AT OOTACAMUND, INDIA, OCTOBER - JULY 1976, by S.D. Bouwer, K. Davies, R.F. Donnelly, R.N. Grubb, J.E. Jones and J.H. Taylor, NOAA Space Environment Laboratory, Boulder, CO; and R.G. Rastogi, M.R. Deshpande, H. Chandra and G. Sethia, Physical Research Laboratory, Ahmedabad, India, March 1980, 58 pp.

UAG-75 THE ALASKA IMS MERIDIAN CHAIN: MAGNETIC VARIATIONS FOR 9 MARCH - 27 APRIL 1978, by H.W. Kroehl and G.P. Kosinski, National Geophysical and Solar-Terrestrial Data Center, Boulder, CO; S.-I. Akasofu, G.J. Romick, C.E. Campbell and G.K. Corrick, University of Alaska, Fairbanks, AK; and C.E. Hornback and A.M. Gray, NOAA Space Environment Laboratory, Boulder, CO, June 1980, 107 pp.

UAG-76 AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(12) FOR JULY - DECEMBER 1975, by Joe Haskell Allen, Carl C. Abston, J.E. Salazar and J.A. McKinnon, National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, CO, August 1980, 116 pp.

UAG-77 SYNOPTIC SOLAR MAGNETIC FIELD MAPS FOR THE INTERVAL INCLUDING CARRINGTON ROTATIONS 1601-1680, MAY5, 1973 - APRIL 26, 1979, by J. Harvey, B. Gillespie, P. Miedaner and C. Slaughter, Kitt Peak National Observatory, Tucson, AZ, August 1980, 66 pp.

UAG-78 THE EQUATORIAL LATITUDE OF AURORAL ACTIVITY DURING 1972-1977, by N.R. Sheeley, Jr. and R.A. Howard, E.O. Hulbert Center for Space Research, U.S. Naval Research Laboratory, Washington, DC and B.S. Dandekar, Air Force Geophysics Laboratory, Hanscom AFB, MA, October 1980, 61 pp.

UAG-79 SOLAR OBSERVATIONS DURING SKYLAB, APRIL 1973 - FEBRUARY 1974, I. CORONAL X-RAY STRUCTURE, II. SOLAR FLARE ACTIVITY, by J.M. Hanson, University of Michigan, Ann Arbor, MI; and E.C. Roelof and and R.E. Gold, The Johns Hopkins University, Laurel, MD, December 1980, 43 pp.

UAG-80 EXPERIMENTAL COMPREHENSIVE SOLAR FLARE INDICES FOR 'MAJOR' AND CERTAIN LESSER FLARES, 1975-1979, compiled by Helen W. Dodson and E. Ruth Hedeman, The Johns Hopkins University, Laurel, MD, July 1981, 33 pp.

UAG-81 EVOLUTIONARY CHARTS OF SOLAR ACTIVITY (CALCIUM PLAGES) AS FUNCTIONS OF HELIOGRAPHIC LONGITUDE AND TIME, 1964-1979, by E. Ruth Hedeman, Helen W. Dodson and Edmond C. Roelof, The Johns Hopkins University, Laurel, MD, August 1981, 103 pp.

UAG-82 INTERNATIONAL REFERENCE IONOSPHERE - IRI 79, edited by J. Virginia Lincoln and Raymond O. Conkright, National Geophysical and Solar-Terrestrial Data Center, NOAA, Boulder, CO, November 1981, 243 pp.

UAG-83 SOLAR-GEOPHYSICAL ACTIVITY REPORTS FOR SEPTEMBER 7-24, 1977 AND NOVEMBER 22, 1977, Parts 1 and 2, compiled by John A. McKinnon and J. Virginia Lincoln, World Data Center A for Solar-Terrestrial Physics, NOAA, Boulder, CO, February 1982, 553 pp.

UAG-84 CATALOG OF AURORAL RADIO ABSORPTION DURING 1976-1979 AT ABISKO, SWEDEN, by J.K. Hargreaves, C.M. Taylor and J.M. Penman, Environmental Sciences Department, University of Lancaster, Lancaster, UK, July 1982, 69 pp.

UAG-85 [Superseded by UAG-91]

UAG-86 [Superseded by UAG-92]

UAG-87 CHANGES IN THE GLOBAL ELECTRIC FIELDS AND CURRENTS FOR MARCH 17-19, 1978, FROM SIX IMS MERIDIAN CHAINS OF MAGNETOMETERS, by Y. Kamide, Kyoto Sangyo University, Kyoto, Japan; H.W. Kroehl, National Geophysical Data Center, NOAA, Boulder, CO; and A.D. Richmond, NOAA Space Environment Laboratory, Boulder, CO, November 1982, 102 pp.

UAG-88 NUMERICAL MODELING OF IONOSPHERIC PARAMETERS FROM GLOBAL IMS MAGNETOMETER DATA FOR THE CDAW-6 INTERVALS, by Y. Kamide, Kyoto Sangyo University, Kyoto, Japan; H.W. Kroehl, National Geophysical Data Center, NOAA, Boulder, CO; and B.A. Hausman, National Geophysical Data Center, NOAA, Boulder, CO, November 1983, 197 pp.

UAG-89 ATMOSPHERIC HANDBOOK: ATMOSPHERIC DATA TABLES AVAILABLE ON COMPUTER TAPE, by V.E. Derr, NOAA Environmental Research Laboratories, Boulder, CO, July 1984, 56 pp.

UAG-90 EXPERIENCE WITH PROPOSED IMPROVEMENTS OF THE INTERNATIONAL REFERENCE IONOSPHERE (IRI): CONTRIBUTED PAPERS, MAINLY FROM THE URSI-COSPAR WORKSHOP HELD IN BUDAPEST IN 1980, edited by K. Rawer, University of Freiburg, Federal Republic of Germany, and C.M. Minnis, International Union of Radio Science (URSI), Brussels, Belgium, May 1984, 233 pp.

UAG-91 COMBINED CATALOG OF IONOSPHERE VERTICAL SOUNDINGS DATA, compiled by Raymond O. Conkright and Marcus O. Ertle, National Geophysical Data Center, NOAA, Boulder, CO, December 1984, 174 pp.

UAG-92 INTERNATIONAL CATALOG OF GEOMAGNETIC DATA, compiled by C.C. Abston, National Geophysical Data Center, NOAA, Boulder, CO; N.E. Papitashvili, Academy of Sciences of the USSR, World Data Center B2, Moscow, USSR; and V.O. Papitashvili, IZMIRAN, Moscow Region, USSR, August 1985, 291 pp. Supersedes UAG-35, 49, and 86.

UAG-93 IONOGRAM ANALYSIS WITH THE GENERALIZED PROGRAM POLAN, by J.E. Titheridge, University of Auckland, New Zealand, December 1985, 194 pp.

UAG-94 THE SOLAR MAGNETIC FIELD--1976 THROUGH 1985: AN ATLAS OF PHOTOSPHERIC MAGNETIC FIELD OBSERVATIONS AND COMPUTED CORONAL MAGNETIC FIELDS FROM THE JOHN M. WILCOX SOLAR OBSERVATORY AT STANFORD, by J. Todd Hoeksema and Philip H. Scherrer, Center for Space Science and Astrophysics, Stanford University, Stanford, CA, January 1986, 370 pp.

UAG-95 SUNSPOT NUMBERS: 1610-1985, (based on THE SUNSPOT-ACTIVITY IN THE YEARS 1610-1960, by Prof. M. Waldmeier, Copyright 1961, Swiss Federal Observatory, Zurich, Switzerland), revised by John A. McKinnon, National Geophysical Data Center, NOAA, Boulder, CO, January 1987, 112 pp.

UAG-96 SOLAR-GEOPHYSICAL ACTIVITY REPORTS FOR STIP INTERVAL XV, 12-21 February 1984 Ground Level Event, AND STIP INTERVAL XVI, 20 April - 4 May 1984 Forbush Decrease, compiled by Helen E. Coffey and Joe H. Allen, National Geophysical Data Center, NOAA, Boulder, CO, July 1987, 418 pp.

UAG-97 NUMERICAL MODELING OF POLAR IONOSPHERIC ELECTRODYNAMICS FOR JULY 23-24, 1983, UTILIZING IONOSPHERIC CONDUCTANCES DEDUCED FROM DMSP X-RAY IMAGES, by B.-H. Ahn, Kyungpook National University, Taegu, Korea; E. Friis-Christensen, Division of Geophysics, Danish Meteorological Institute, Copenhagen, Denmark; D.J. Gorney, Space Sciences Laboratory, The Aerospace Corporation, Los Angeles, CA; Y. Kamide, Kyoto Sangyo University, Kyoto, Japan; and H.W. Kroehl, National Geophysical Data Center, NOAA, Boulder, CO, April 1988, 133 pp.

UAG-98 TYPE II SOLAR RADIO BURSTS RECORDED AT WEISSENAU 1966-1987, by H.W. Urbarz, Astronomical Institute of Tubingen University, Weissenau Station, 7980 Rasthalde, Ravensburg, GFR, February 1990, 86 pp.

UAG-99 PROCEEDINGS OF THE WORKSHOP ON GEOPHYSICAL INFORMATICS, MOSCOW, AUGUST 14-18, 1988, edited by J.H. Allen, National Geophysical Data Center, NOAA, Boulder, CO; and V.A. Nechitailenko, Soviet Geophysical Committee, Academy of Sciences of the USSR, Moscow, USSR, January 1991, 304 pp.

UAG-100 CATALOGUE OF SOLAR FILAMENT DISAPPEARANCES 1964-1980, by C.S. Wright, Electronics Research Laboratory, Defence Science and Technology Organisation, Salisbury, South Australia 5108, Australia, February 1991, 62 pp.

☆U.S. GOVERNMENT PRINTING OFFICE: 1991 - 573-002/21034