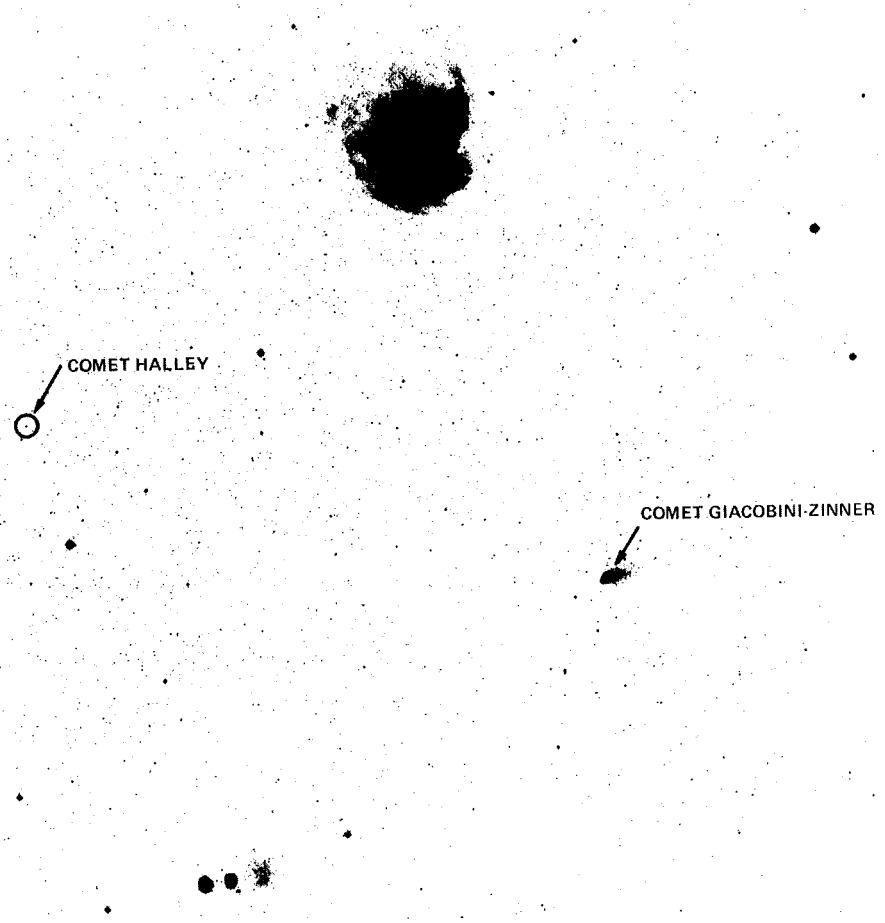
THE INTERNATIONAL COMET QUARTERLY

Whole Number 57 JANUARY 1986 Vol. 8, No. 1



Photograph of comets P/Halley and P/Giacobini-Zinner on 1985 Sept. 14 at 12^h UT. Thirty-minute exposure taken by E. F. Helin and A. Maury with the 48-inch Palomar Schmidt telescope (with new achromatic corrector lens, red emulsion 098-04 + filter).

INSIDE THIS ISSUE

The International Comet Quarterly (*ICQ*) is a non-profit journal devoted to news and observation of comets. Issues are published 4 times per year (January, April, July, and October). The *ICQ* is published by the Department of Physics and Astronomy at Appalachian State University in Boone, North Carolina.

The regular (invoiced) subscription rate is US$16.00 per year. Subscribers who do not wish to be billed may subscribe at the special rate of US$10.00 per year (US$12.00/year outside North America), although such subscribers are *not* entitled to back issues lost by not renewing promptly. [For special subscribers, the last set of digits (after the second hyphen) on the top line of the mailing address label gives the Whole Number that signifies the last *ICQ* issue which will be sent under the current subscription status.] Make checks or money orders payable in U.S. funds to *International Comet Quarterly* and send to Daniel Green; Smithsonian Astrophysical Observatory; 60 Garden St.; Cambridge, MA 02138, U.S.A. Group subscription rates and advertising rates are available upon request. Back issues are available ($4.00 each) from Dr. Thomas Rokoske; Dept. of Physics and Astronomy; Appalachian State Univ.; Boone, NC 28608, U.S.A.

Manuscripts will be reviewed for possible publication; send typed, double-spaced copy to the Editor (Cambridge address above). Cometary observations also should be sent to the Editor in Cambridge; all data intended for publication in the *ICQ* should be sent on standard *ICQ* observation report forms.

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This issue is No. 57 of the publication originally called *The Comet*, founded in March 1973, and is Vol. 8, No. 1, of the *ICQ*. *[ISSN 0736-6922]*

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THE LARGE-SCALE PHENOMENA NETWORK OF THE INTERNATIONAL HALLEY WATCH

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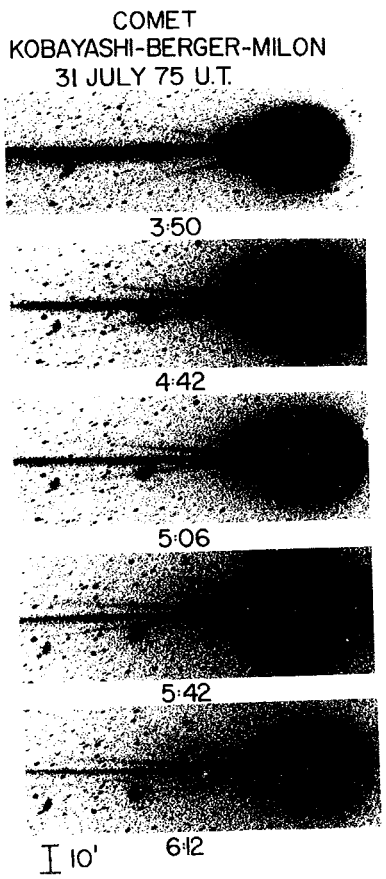
The plasma tails of comets are recognized today as an important diagnostic tool in the study of the three-dimensional structure of the solar wind and as an exciting space plasma physics laboratory which can be studied *remotely* using wide-field photographic imaging. The property of comets which permits this unique, dual approach is the *visibility* that CO^+ (and H_2O^+) ions impart to the tail as they stream from the head down along magnetic field lines which have been captured from the solar wind and frozen in the cometary ionosphere as described by Alfvén in 1957. For nearly 100 years, it has been known that plasma tails are remarkably transient in nature: the tails twist, are deflected, and even disconnect entirely from the head.

Some examples of these transient phenomena are given in the following figures. Hourly variations are shown in Figure 1, which shows tail rays lengthening and turning to the axis of the main tail. Figure 2 shows the rapid turning of the entire plasma tail on a timescale of minutes.

Most of these phenomena have been modelled in the context of interactions with the solar wind, but the theories have been based in large part on fragmentary observational data. Despite this state of affairs, a picture has emerged recently in which much of the plasma-tail



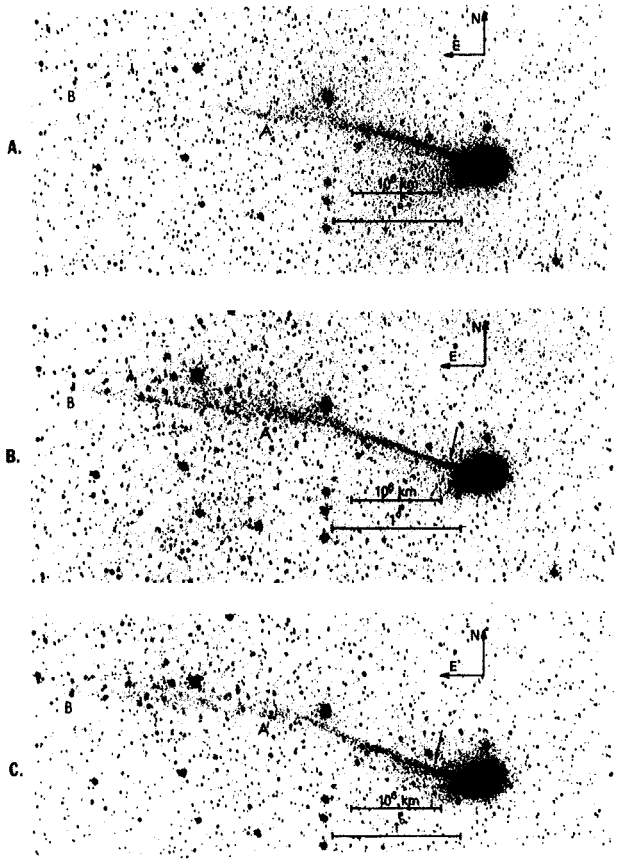


Figure 1 *(series at left). Photographic sequence showing the lengthening and turning of tail rays in comet Kobayashi-Berger-Milon (1975 IX). The measured rate averages ~ 3° per hour with respect to the tail axis.* **Figure 2** *(series at right). Photographic sequence showing the rapid turning of the main tail of comet Bradfield (1979 X) on 1980 February 6. Exposure midpoints are (A) $2^h32.5^m$ UT; (B) 2^h48^m; (C) 3^h00^m. The tail axis (see arrow) turned 10° in 27.5 minutes. (Joint Observatory for Cometary Research photographs).*

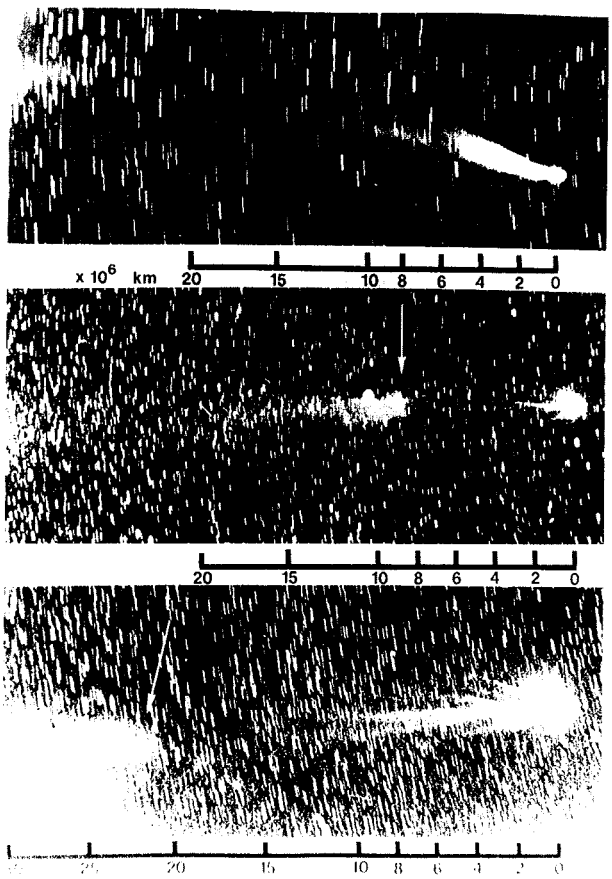
morphology can be understood in terms of a comet's interaction with the sector structure of the solar wind; see Niedner and Brandt (1978, 1979, 1980). The central idea involves a plasma physics process called magnetic reconnection occurring in the ionosphere at sector boundary crossings; the end result of this process is a disconnection event, or DE. The classic example occurred in comet Morehouse and is shown in Figure 3.

Disconnection events occurred in Halley's comet during the 1910 apparition. Figure 4 shows a DE recorded in a sequence of photographs organized by E. E. Barnard. The nature of the changes is clearly visible. The problem of limited coverage is illustrated in Figure 5. The event has been interpreted as a DE, but we have very few photographs taken at other times to study the event's kinematics or dynamics.

The International Halley Watch (IHW; Brandt *et al.* 1980) is a program to encourage worldwide observations and to collect data in each of many disciplines. The authors are responsible for the Large-Scale Phenomena Network of the IHW. The successful operation of this network will present a unique opportunity to study in detail many of the plasma-tail properties of comets (illustrated above) which have been so elusive in the past. While the dust tails will be recorded and the data analyzed, this discussion covers only the plasma/solar-wind interaction. The detailed scientific goals have been extensively described elsewhere (*e.g.,* Niedner, Rahe, and Brandt 1982; Brandt 1984). Here, we describe the network and the approach to data reduction.

The success of the Large-Scale Phenomena Network depends on the cooperation and support of observers around the world. The response to our requests for support have been very encouraging. A large fraction of the proposed instruments are fast ($\sim f/2$) Schmidt cameras (typical field-of-view, FOV = $5^\circ - 10^\circ$), which are probably the ideal (but not the only useful) telescopes for wide-field imaging of the plasma tail, an extended object of moderate to low surface brightness. Specifically, we note the significant opportunity for contributions to the network by amateur astronomers.

Our *modus operandi* exactly parallels that of the IHW: participating institutions are asked to forward data (in this case, film copies of the best plates or, when possible, the original plates) to the IHW for analysis in the context of the worldwide data as a whole, and for inclusion in the P/Halley archive, but — and this goes without saying — they retain full proprietary rights to the analysis of their own data. This arrangement has seemed very



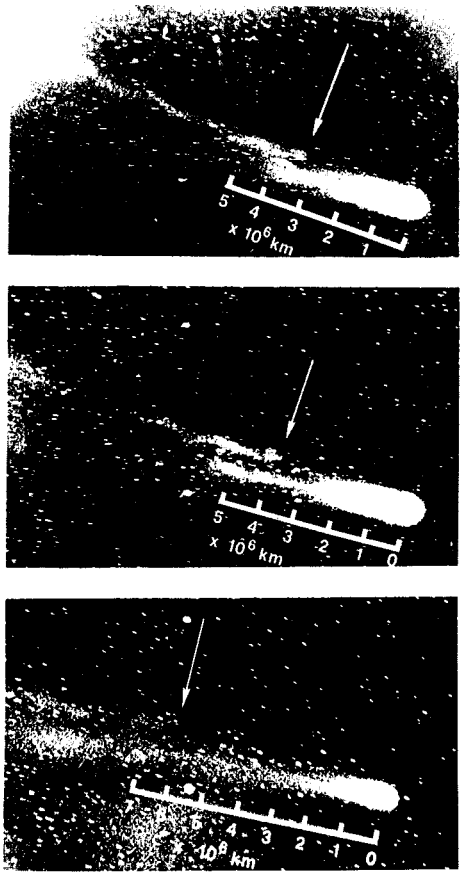


Figure 3 *(series on left). Disconnection event (DE) in comet Morehouse 1908 III. The sequence, top-to-bottom, runs 1908 Sept. 30, Oct. 1, and Oct. 2, respectively. A linear scale (applicable to the radial direction) has been added to show the large dimensions involved.* **Figure 4** *(series on right). Disconnection event in Halley's comet. The photographs, top-to-bottom, were taken at the Yerkes Observatory on 1910 June 6 (15^h48^m GMT); at Hawaii on June 6 (18^h30^m); and at Beiruit on June 7 (7^h0^m). The recession of the detached plasma tail is shown. (Photographs courtesy Yerkes Observatory.)*

satisfactory and fair to most of the observers and institutions we have contacted.

To carry out our scientific program, it is necessary to be able to obtain wide-angle images at approximately one-hour intervals for extended periods during the prime observing periods from Earth, roughly November-December 1985 and March-April 1986, and during the period of spacecraft closest approach, roughly March 7-14, 1986. To achieve this objective requires a network of observatories as uniformly distributed in longitude as the presence of land masses will permit, as near the equator as possible, and in both northern and southern hemispheres. Figure 6 shows the locations of observers who have access to wide-field telescopes and who have expressed a desire to participate in our network. Casual inspection of Figure 6 suggests a possible problem with coverage in March/April 1986, when P/Halley will have a southerly declination. Our response to the situation has been to create an "Island Network", sites denoted by triangles (▲s) in Figure 6.

The coverages obtained by the Network in December 1985 and March 1986 are summarized in Figures 7 and 8, which show the number of sites capable of observing Halley's comet at altitudes > 15° as a function of Universal Time (assuming clear weather). Note the crucial role of the "Island Network" sites in completing the coverage in March. Additional island sites might improve the coverage, but have not been implemented because of practical difficulties and limited resources. We expect additional coverage from the Wide-Field Cameras expected to be carried on the *Astro-1* mission, scheduled for launch in March.

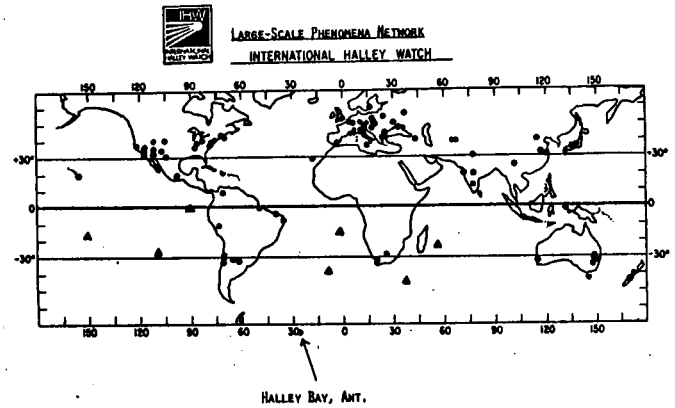


Figure 6. *The Large-Scale Phenomena Network of the IHW. "Island Network" sites are deonoted by ▲s.*

Figure 5. *Halley's comet on 1910 May 13. The wavy feature below the main (dust) tail is probably a DE. The tail extends over 40° in the sky. The lower left corner of the photograph also shows the lights of Flagstaff, Arizona, and the planet Venus (Lowell Observatory photograph).*

The resulting raw data from the network will be a large number of photographic plates. It is proposed that these plates be copied onto a transfer emulsion for subsequent study by the network team, and the original plates be returned to the observatories. Institutions not wishing to send original plate material would be requested to provide film copies (preferably on Kodak Technical Pan 2415, or Fine Grain Positive Film 7302, or equivalent) of the best plates. The data will be used in several different ways by the team:

A.) Working-quality pictures will be provided to the IHW project as quickly as possible to be used by other investigator teams and mission support as needed.

B.) The best time sequences in the data set will be digitized and computer processed to a uniform intensity level and scale. These images will then be combined into motion-picture format for the study of the time history of cometary activity by the network team and others.

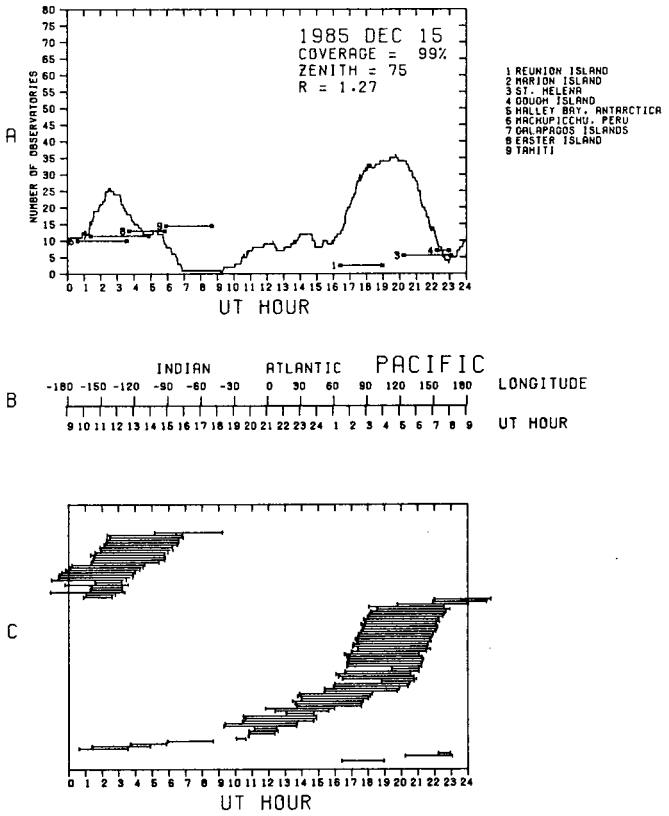
C.) The best 300 frames will be fully reduced, as described below.

D.) The best 1000 frames will be published as an atlas of Halley's comet and as part of the IHW archiving activity.

We regret that the charter of the IHW will not accommodate renumeration of observatories for their support (*e.g.*, plates, film, and mailing costs).

Because the photographic data will be obtained from many different locations under a variety of observing conditions, it is necessary to give the utmost attention to the calibration of the individual images. The calibration method to be used will be an outgrowth of the technique proposed by Zou, Chen, and Peterson (1981). The method requires that we are able to digitize a sufficient number of stars on each plate whose magnitudes are known on a standard magnitude system. With the density measures obtained from the digitization, the known magnitudes, and the density-to-intensity conversion technique in the paper mentioned above, it is possible to derive a characteristic curve for each individual plate. This gives an absolute intensity per pixel. The expected absolute magnitude errors are on the order of tenths of a magnitude (Klinglesmith and Warnock 1984).

In conclusion, the plasma tail of a comet is the site of many interesting and often spectacular phenomena, such as knots, helices, disconnected tails, rays, and condensation, all of which have been known and observed since the late 1800s. Central to the need for a ground-based P/Halley network are, first, the knowledge that these phenomena develop and evolve extremely rapidly (~ minutes or hours) and, second, the belief that such structures are produced by, or are related to, the solar wind, and that the relevant physics involves some of the most interesting plasma physics processes studied today. The cometary environment, and the plasma tail specifically, should be considered a giant cosmic plasma laboratory. Clearly, a major observational and theoretical effort directed at understanding the plasma tail of Halley's comet in 1985



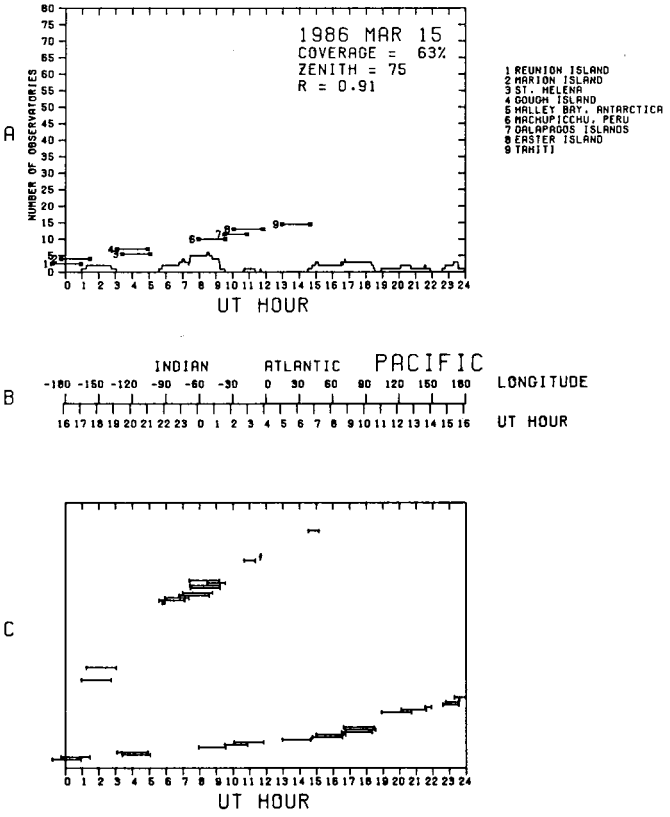


Figure 7 *(series on left). Coverage diagram for 1985 Dec. 15. The number of sites in our network capable of observing Halley's comet at altitutdes > 15° (ordinate) is plotted as a function of UT (abscissa) in panel A. Panel B shows the correspondence between UT of mid-observation and geographic longitude at the equator, and Panel C shows the actual lengths of the comet observation windows. Clear weather is assumed.* **Figure 8** *(series on right). Coverage diagram for 1986 Mar. 15. The "Island Network" sites are labelled.*

and 1986 and of P/Giacobini-Zinner in 1985 can be justified on the basis of providing important information about cometary structure and about solar-wind and plasma physics problems of interest. The network will also provide critical support for the space missions to comets Halley and Giacobini-Zinner.

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P/HALLEY'S LIGHT CURVE: SOME INITIAL THOUGHTS

Charles S. Morris
International Comet Quarterly

As should have been expected, the current apparition of periodic comet Halley is providing a number of surprises. This is certainly true of the visual light curve. In this initial look at the light curve, some preliminary findings based on the author's own observations will be presented.

Light Curve Summary

Although there will be claims to the contrary, P/Halley has not followed any published forecast (up through the end of 1985 November) including those by Morris and Green (1982), Bortle and Morris (1984) and Marcus (*cf.* 1982). The major area of disagreement in the various forecasts was the intrinsic pre-perihelion brightness of P/Halley. Marcus and others had suggested that the comet would be about 1.5 magnitudes brighter than either the Morris-Green or the Bortle-Morris studies had predicted. Most of the studies agreed that the value of n, the power-law exponent, would be about 4.5 during the pre-perihelion period.

All the studies were wrong. The value of n has been on the order of 8 (with $H_o = 2.0$) between the end of July and the end of November. Morris (1986) points out that this high value of n links the observations (with a photon-counting reticon spectrograph and the MMT) of Wyckoff *et al.* (1985) and the January 1985 visual observation by O'Meara (1985) with the rest of the visual light curve. The implication is that the comet's brightness has been increasing at $n = 8$ or 9 since the comet was at a heliocentric distance of 6 AU.

P/Halley's "Aperture" Effect

Is the comet behaving differently at this return? Were the 1910 magnitude estimates incorrect? Although more study is needed, the preliminary answer to both questions is "no".

Figure 1 illustrates P/Halley's estimated apparent brightness as a function of magnification in a 25-cm reflector on different dates (UT) in 1985. Two interesting points can be made about this figure. First, when the comet was faint, the comet was brighter at higher power. A similar situation was found by Morris in an early observation of P/Giacobini-Zinner (Morris 1985). Indeed, experienced comet observers are aware that faint comets often are not even visible at low power. This suggests the possibility that, during this period, P/Halley would not be brighter in smaller aperture instruments as the typical aperture correction (*e.g.*, Morris 1973) would suggest. This is verified by an examination of observations made by various observers in August and September 1985. There was no aperture effect in the early phase of P/Halley's visual apparition.

A second conclusion which can be drawn from Figure 1 is that the apparent brightness of P/Halley increased much more rapidly at at low magnification. This is important because Marcus (1985) has pointed out that observers in 1910 tended to use higher magnification. If the observations made at 156× are analyzed, the resulting photometric parameters are:

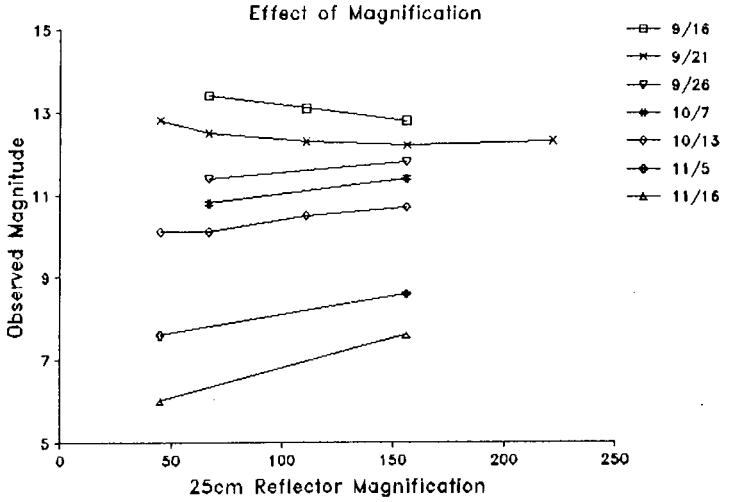
$$H_o = 5.18 \qquad n = 4.96$$

(20 Observations: August 18 to November 16, 1985)

These results are remarkably close to the Morris-Green results.

So what happened in 1910? All the studies assumed a constant "aperture" effect when evaluating the data. It appears much more likely that the "aperture" effect was non-existent initially and then grew as the comet's size and brightness grew. The observers in 1910 did not switch very often to smaller instruments as the comet brightened — a standard practice today. Thus, they were not aware of the dramatic increase in coma size because their telescopes did not show it. A similar situation occurred with the author's observations in his 25-cm reflector. The correction necessary to bring the 1910 observations to a standard photometric system steadily increased up to and past the aperture corrections used in the Morris-Green study, for instance. The increasing aperture correction explains the difference between the predicted and observed values of n.

Figure 1 P/Halley 1982i
Effect of Magnification



The impact of a changing aperture or instrumental correction with the changing brightness, size, or perhaps even the distance of the comet, may require a radical change in methodology used to analyze comet brightness data. At the very least, models of cometary brightness estimation will have to be able to explain results such as those depicted in Figure 1.

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RECENT NEWS AND RESEARCH CONCERNING COMETS

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Halley's comet has held center-stage among observable comets during the past few months, as it rose to naked-eye brightness by early November. Shortly after this column was written for the last issue, P/Halley accelerated at an unexpectedly rapid rate up to magnitude 5 by early December. The comet seemed more active than had been anticipated, and its coma size was substantially larger than expected. Its size reached up to a degree or more across, according to some observers, in late November and early December, and this large size created a rather large discrepancy among total visual magnitude estimates — a normal observational problem with comets having large coma diameters — although very experienced comet observers were amazingly consistent in their magnitude estimates (usually within half a magnitude).

From early December 1985 until mid-January 1986 (as this column is being written later than had been hoped, due in part to the large number of tabulated cometary observations published in this issue), the comet rose only slightly in brightness, thereby diminishing the hopes of many who were hoping the comet would continue its steep rise in brightness through perihelion. By mid-January, the comet was still near $m_1 = 4.1 - 4.3$. The author did note, however, a gradual increase from $m_1 = 5.0$ on Dec. 4 to $m_1 = 4.0$ in late December, and then an interesting *decrease* in m_1 back to 4.5 in early January. While the *apparent brightness* did not noticeably decline during this period, the coma size dropped from $\sim 20'$ in mid-December to $\sim 6'$ by mid-January, as the comet neared the sun, and this meant that the comparison stars were defocused much less toward the end of this 1-month period. The slightest difference in how far the comparison stars were defocused could easily make 0.1 or more difference in the total visual magnitude estimate. The author's seeing a larger coma in late December did account for his brighter estimates. Interestingly, E. P. Ney and A. G. Knutson (O'Brien Observatory, University of Minnesota) found that P/Halley had *faded* in infrared brightness between Dec. 12.08 and Dec. 14.00, and again between Dec. 25.05 and Jan. 1.0 UT, during which the author also noted some visual fading of the total magnitude. The increase in brightness to $m_1 = 4.0 - 4.5$ in December was not noted by some other experienced observers, some of whose estimates held the comet steady near $m_1 = 4.7 - 5.2$ during December.

(continued on page 39)

TABULATION OF COMET OBSERVATIONS

Space has not permitted publishing the entire Observers Key to the tabulated **ICQ** observations, but the entire set of keys is available to all readers from the Editor as a computer print-out for US$4.00 postpaid (use information given on page 2 of this issue for ordering these pages).

The columns in the tabulated data are: (1) Year and date, given as year, month and date to hundredths of a day, in Universal Time; (2) MM: Magnitude method used for making the magnitude estimate (*e.g.*, S = Sidgwick or In-out, B = Bobrovnikoff, M = Morris, *etc.*); (3) MAG.: Total visual magnitude estimate (except where denoted by photoelectric or photographic value), given to a tenth of a magnitude (a colon following the estimate indicates an estimate of lower accuracy, due to clouds, bright interfering moonlight, *etc.*; a left bracket, [, before the magnitude indicates the comet was fainter than that magnitude); (4) RF: Reference or source of comparison stars used for the magnitude estimate (*e.g.*, AA = *AAVSO Atlas*, S = *SAO Star Catalog*, *etc.*); (5) AP.: Aperture in centimeters of telescope used for the magnitude estimate; (6) T: Type of telescope used for the magnitude estimate (*e.g.*, L = reflector, R = refractor, B = binoculars, E = naked eye, *etc.*); (7) F/ and PWR: *f*-ratio of telescope and power (or magnification) used, respectively, when making the magnitude estimate; (8) COMA: Coma diameter (estimated) of comet at time of magnitude estimate (with same telescope and magnification!), preceded by an ampersand (&) when approximate size is given; (9) DC: Degree of condensation of comet as estimated by observer (0 = totally diffuse, 9 = totally stellar in appearance); (10) TAIL and PA: tail length (degrees; preceded by a question mark, ?, when questionable, and by an ampersand, &, when the estimate is approximate) and position angle of tail from nuclear condensation of comet; (11) OBS.: Observer (3-letter, 2-digit code). An asterisk (*) appearing after the date indicates the observation is a correction to one published in an earlier issue of the **ICQ**.

Since there is so much descriptive material with all of the tabulated data, this information is given below in more abbreviated fashion than in previous issues. Observers are denoted by their Observer Key 3- or 5-character code, and instrument types are listed by their single-letter **ICQ** abbreviation; if only one instrument was used on a particular night for which descriptive material is provided, and that instrument is also given in the tabulated data, the instrument is not repeated in the descriptive text. We list information chronologically for comets P/Halley, P/Giacobini-Zinner, Thiele, and Hartley-Good, rather than by observer (as we've done in past issues).

DESCRIPTIVE INFORMATION CONCERNING COMETS (to complement the tabulated data):

P/Boethin (1985n): William A. Bradfield of Dernancourt, Australia, accidentally found this comet while comet hunting on 1985 Nov. 1.4 UT at $m_1 \sim 11$. D. Seargent (SEA) noted that this comet was visible in 15 × 80 binoculars on Nov. 6.46. Michael Moeller (MOE) found the comet elliptical in shape in Dec. 31.71. Daniel Green (GRE) found the comet rather easily visible in 7 × 50 binoculars on 1986 Jan. 13.0 when the comet was at altitude ~ 25°.

P/Halley (1982i): 1985 Aug. 26.50, hint of stellar condensation in center of coma (DUC). Sept. 15.02: additional tail 0.01° long in p.a. 203° (MER). Sept. 21.46, Oct. 8.42, 13.44, 15.44, 22.44, 24.45, and Nov. 6.42: stellar condensation (DUC). Sept. 22.50, 16-inch *f*/5 L, 120×: "comet appeared more condensed (DC = 7) and larger (~ 2.0′)" (MAC).

Oct. 10.94: also tails of length 0.01° in p.a. 8° and 59° (MER). Oct. 12.00: also tails of length 0.01° in p.a. 48° and 84° (MER). Oct. 12.98: also tail of length 0.01° in p.a. 54° (MER). Oct. 13.10: 30.5-cm L, "at 150×, I saw a strong and well-defined central condensation (disk-like) of diameter 0.3′" (ZAN). Oct. 14.13: 30.5-cm L, "120×: strong central condensation, diameter 0.5′. At 187×, I saw a difficult, faint, star-like nuclear region" (ZAN). Oct. 15.44: magnitude-12 condensation at 130× (KEE). Oct. 16.16: 30.5-cm L, "much more bright than on Oct. 14; extremely diffuse outer coma with indefinite edges; strong central condensation of diameter 0.8′. Star-like nuclear region of mag ≃ 13.0 (150×)" (ZAN). Oct. 18.03: 25.4-cm L, "very diffuse outer coma, with indefinite edges. Strong central condensation; star-like nuclear region of magnitude ≃ 12.0" (ZAN). Oct. 18.95: central condensation of mag 12.1 (MOE). Oct. 19.94: 40-cm L, also tail of length 0.01° in p.a. 51° (MER). Oct. 20.93: also tail of length 0.03° in p.a. 50° (MER). Oct. 22.12: 25.4-cm L, "circular with strong, well-defined central condensation (dia. 1′), brighter toward center (190×). Extremely diffuse outer coma; 114×: star-like nuclear region of mag ≃ 12.0, difficult due to bright central condensation" (ZAN). Oct. 22.95: central condensation of mag 11.8 (MOE). Oct. 25.05: central condensation of mag ~ 12.5 (KAM01). Oct. 26.17: 30.5-cm L, "60×: I saw a strong central condensation (dia. 0.7′) and a star-like nuclear region (mag ≃ 12.0); probable coma extension in p.a. 98°" (ZAN). Oct. 28.75: observation made during lunar eclipse (SEA).

Nov. 6.24: "diffuse and oval shaped" (SPR). Nov. 9.22: "large, oval-shaped" in 11×80 B, "coma unusually 'speckled', like M13" in 20-cm *f*/20 C (SPR). Nov. 9.33: "coma shows an irregular shape" (MAC). Nov. 10.58: 15.2-cm L (76×), stellar "nucleus" of mag ~ 10.5 (SEA). Nov. 10.86: 40-cm *f*/5 L (81×), coma dia. ~ 10′; tails of length 0.03° in p.a. 38°, 244°, and 201°, the last of which then curved toward p.a. 228° (MER). Nov. 14.86: 40-cm L (81×), coma dia. 18′, tails of length 0.03° toward p.a. 175° and 199° (MER). Nov. 15.23: "inner (3′ dia.) coma magnitude = 7.8" (MAC). Nov. 15.84: "very pronounced central condensation, bright inner coma and faint, diffuse outer coma" (KAM01). Nov. 17.30: "strong, star-like nucleus" (SPR). Nov. 26.83: 40-cm L (254×), tails 0.02° long in p.a. 29°, 0.02° in p.a. 35°, and 0.04° in p.a. 224° (the last one curved toward p.a. 281°) (MER). Nov. 30.72: broad tail (MOE).

Dec. 1.70: coma 10′ × 14′ (GUB). Dec. 2.73: 20.3-cm *f*/10 T (92×), m_2 = 10.0, coma dia. = 11.3′, DC = 4 (HAS02). Dec. 2.79: 40-cm L (254×), tails 0.02° long in p.a. 213°, 0.10° in p.a. 260°, and 0.02° in p.a. 357° (MER). Dec. 3.80: 15-cm *f*/5 L (25×), tails 0.27° long in p.a. 102°, 0.12° in p.a. 206° (MER). Dec. 4.77: 40-cm L (254×), tails 0.03° long in p.a. 9°, 0.03° in p.a. 83°, 0.07° in p.a. 237° (very diffuse), and 0.05° in p.a. 297° (curved) (MER). Dec. 5.24: coma dia. 19′ × 14′, elongated E-W (MAC). Dec. 5.74: fan-shaped tail (MOE). Dec. 5.91: 7 × 50 B, tails 1.30° long in p.a. 71°, 0.50° in p.a. 189°, and 0.83° in p.a. 250° (nearly sunward) (MER). Dec. 6.88: 7 × 50 B, coma dia. 40′, DC = 3, tails 1.60° in p.a. 68°, 0.42° in p.a. 258° (nearly sunward), and 0.58° in p.a. 320° (MER). Dec. 9.00: 15.2′ tail in p.a. 68°, DC = 6 (10×70 B, DEA). Dec. 10.22: magnitude estimates of inner 4′ of coma: 6.6 (Sidgwick), 6.8 (Bobrovnikoff), reference D, same instrument (MAC). Dec. 10.81: 40-cm L (254×), tails 0.08° long in p.a. 44°, 0.17° in p.a. 221° (fountain-like jet), 0.20° in p.a. 180°, and 0.18° in p.a. 303° (curved toward p.a. 12°) (MER). Dec. 10.82: 7 × 50 B, coma dia. 45′, DC = 4, tails 1.17° long in p.a. 76°, 0.83° in p.a. 253° (nearly sunward), 0.75° in p.a. 319° (glimpsed) (MER). Dec. 11.02: coma diameter 13.0′, DC = 6, "tail invisible" (10×70 B, DEA). Dec. 11.78: tail 0.24° long in p.a. 65°, more visible with a yellow-green filter, 30.5-cm *f*/5 L (ZAN). Dec. 11.80: 7 × 50 B, tail 0.50° long in p.a. 234° (nearly sunward) (MER). Dec. 12.75: 9 × 60 B, coma dia. 40′, DC = 4, tail 1.25° long in p.a. 68° (MER). Dec. 12.77: 40-cm L, tails 0.06° in p.a. 31°, 0.05° in p.a. 167° (curved toward p.a. 113°), 0.01° in p.a. 229° (strongly condensed feature), and 0.08° in p.a. 276° (MER). Dec. 15.74: coma dia. 9′, DC = 6, tails 0.73° long in p.a. 65° ("narrow and straight, sharp near the coma"), 0.43° long in p.a. 15° ("broad and probably curved"); "star-like nuclear region"; diffuse outer coma has "indefinite edges" (ZAN).

P/Giacobini-Zinner (1984e): 1985 July 20.27: diffuse with stellar nucleus (SPR). July 21.28: diffuse with elongated nucleus (SPR). July 21.90: 8-cm *f*/3.7 R (25×), coma size 3′, elongated towards p.a. 320°, DC = 2 (KAR). Aug. 3.858: 10.5-magnitude nuclear condensation 20″ across (SZA). Aug. 4.847: 10.5-magnitude nuclear condensation 20″ across (SZA). Aug. 5.22 "V-shaped coma" (SPR). Aug. 5.861: 10.5-magnitude nuclear condensation 20″ across (SZA). Aug. 6.21: "much coma activity, halos" (SPR). Aug. 11.22: "coma activity; halos thrown off over 2 hrs" (SPR). Aug. 11.97: 40.6-cm *f*/5.6 L (126×), tail 0.08° long in p.a. 262° (BOU). Aug. 12.917: "ion tail" 4′ × 0.5′ in p.a. 280°; "dust tail" 2.5′ × 1.5′ in p.a. 260° (SZA). Aug. 13.22: "distinct coma halos" (SPR). Aug. 13.941: "dust tail" 0.0498° in p.a. 70° (SZA). Aug. 14.22: "active coma, stellar nucleus" (SPR). Aug. 14.35: "parabolic-shaped coma with stellar condensation near leading edge of coma and tail coming out the other end" (DUC). Aug. 14.91: 7.1-cm *f*/2.8 A, 5-min exposure on Tri-X film shows tail 10′ long in p.a. 260° (HAS02). Aug. 15.003: "3 – 4 condensations in the coma, jet in p.a. 20° and 1′ tail in p.a. 260°" (SZA). Aug. 16.23: "some activity around coma" (SPR). Aug. 16.892: coma size 5′ × 6′ (HOR). Aug. 16.92: 40.6-cm *f*/5.6 L (82×), DC = 6, tail 0.13° long in p.a. 265° (BOU). Aug. 17.22: "coma active, V-shaped" (SPR). Aug. 18.24: "much coma activity" (SPR). Aug. 20.02: 25.4-cm J (48×), DC = 5-6, tail 0.33° long in p.a. 271° (BOU). Aug. 20.955: faint tail (KOC). Aug. 21.90: 7.1-cm *f*/2.8 A, 103a-E film, tail in p.a. 270°, 14′ long on 5-min exp., ~ 26′ long on 10-min exposure (HAS02). Aug. 24.08: 40.6-cm *f*/5.6 L (67×), DC = 5, tail 0.33° long in p.a. 271° (BOU). Aug. 26.02: 25.4-cm *f*/6 J (48×), tail 0.25° long in p.a. 278° (BOU).

Sept. 10.77: 15.2-cm *f*/5 L (76×), coma dia. 1.8′, DC = 5 (SEA). Sept. 11.06: "comet appeared extremely diffuse, with no visible central condensation, and low surface brightness" (ZAN). Sept. 11.08: no nuclear condensation visible (KAM01). Sept. 12.12: condensation with offset to the east (KAM01). Sept. 12.45: "comet had a maximum tail width of 8′ or 9′" (MOR). Sept. 14.09: 15 × 80 B, DC = 1, tail 0.25° long in p.a. ~ 310° (SCH04). Sept. 15.75: 15.2-cm *f*/5 L (29×), tail 0.13° long (SEA). Sept. 16.37: 44.5-cm *f*/4.5 L (80×), tail 0.18° long in p.a. 275° (MOR03). Sept. 16.45: "there was a short fan (maybe 5′ – 10′) extending south from the main tail to p.a. ~ 270° (MOR). Sept. 17.08: "with 30.5-cm *f*/5 L, 60× and 150×, I could see a strong, round, central condensation" (ZAN). Sept. 18.14: 30.5-cm *f*/5 L (60×), disk-like central condensation, star-like nuclear region (ZAN). Sept. 20.47: "there was a bulge in the coma toward the south" (MOR).

Oct. 11.49: coma 2′ × 4′, elongated E-W (MAC). Oct. 12.06: tail 0.03° in p.a. 6° (254×, MER). Oct. 13.14: tail 0.03° in p.a. 87° (254×, MER). Oct. 13.15: "coma appeared fan-shaped in p.a. 262°; it had an extremely strong, well-defined central condensation of dia. 0.2′ asymmetrically placed in the coma (shifted toward p.a. 82°) at 94×. Tail straight, narrow (though not as narrow as during July-Sept.), and easily visible" (ZAN). Oct. 18.11: fan-shaped coma; central condensation was "arrow-point-like" with diameter 0.5′ (ZAN). Oct. 23.10: "at 91× I found the comet's coma and central condensation elongated at p.a. 265°. The tail was at least 4′ long, straight, and quite broad where it joined the coma" (ZAN).

Thiele (1985m): 1985 Oct. 16.47: "a Lumicon comet filter significantly enhanced the comet, suggesting a strong gas component" (MOR). Oct. 19.92: 254×, tails 0.01° long in p.a. 20° and 0.02° in p.a. 200° (MER). Oct. 24.43: stellar condensation (DUC). Oct. 26.16: 254×, sunward tail 0.03° long toward p.a. 55° (MER). Nov. 3.22: inner 2′ brighter with stellar condensation (DUC). Nov. 5.90: central condensation of mag 12 (MOE). Nov. 7.73: central condensation of mag 12.2 (MOE). Nov. 10.85: narrow tail; central condensation of mag 11.8 (MOE). Nov. 15.88: diffuse, but very-well-defined boundaries; slight central condensation; star-like nucleus in 20.3-cm T (KAM01).

Dec. 1.80: with 30.5-cm *f*/5 L at 60× and 150×, comet appeared diffuse with light, circular, central condensation (ZAN). Dec. 2.76: tail 0.09° long in p.a. 313° (MER). Dec. 3.71: 10 × 80 B, coma diameter 3.3′, DC = 3 (HAS02). Dec. 4.75: 254×, tail 0.03° long in p.a. 131° (MER). Dec. 10.78: 254×, tails 0.03° long in p.a. 277° and 0.04° in p.a. 316° (MER). Dec. 12.78: large and diffuse; tail 0.03° long in p.a. 218° (MER). Dec. 31.72: faint and diffuse (MOE).

Hartley-Good (1985l): 1985 Sept. 15.50: 15.2-cm *f*/5 L (29×), very faint extended coma ~ 10′ in diameter (SEA). Sept. 22.00: 254×, tails 0.04° long in p.a. 143° and 0.03° in p.a. 19° (MER). Sept. 22.33: 16-inch *f*/5 L (80×), almost totally diffuse, coma diameter 4.4′ (SIM). Sept. 24.01: additional tail 0.03° long in p.a. 170° (MER). Oct. 4.46: large difference in magnitude estimate from Oct. 1 is due to greater visibility of extended coma (SEA). Oct. 5.19: stellar condensation (DUC). Oct. 6.85: comet appeared large, circular, and extremely diffuse, especially in the outer coma. At 71×, faint, small, central condensation with extension at p.a. 130°, like "a just-resolved double star; difficult, very-low-contrast nuclear region"; very faint, narrow, straight tail 0.19° long in p.a. 130° (ZAN). Oct. 7.06: "thin, ray-shaped tail pointing due east ~ 10′ long" (HIL). Oct. 7.83: 40-cm L (254×), tail 0.05° long in p.a. 217° (MER). Oct. 7.83: "circular, extremely diffuse coma with indefinite edges (46×). At 71×, I found a star-like nuclear region (magnitude ≃ 12.5), and the coma appeared brighter toward center" (ZAN). Oct. 9.18: "*possible* tail to the S-SW" (DUC). Oct. 11.90: 25.4-cm L, "comet showed at least two concentric envelopes, brighter towards the center; star-like nuclear region was asymmetrically placed in the coma (shifted toward p.a. 315°; straight, narrow tail 0.27° long in p.a. 135°" (ZAN). Oct. 13.15: 32-cm *f*/4 L (130×), nearly-stellar central condensation of mag ~ 12 (KEE). Oct. 13.81: 20.3-cm T, (51×), conspicuous central condensation (KAM01). Oct. 13.83: very diffuse outer coma, with indefinite edges; central condensation (1.2′) brighter and larger than on Oct. 11; star-like nuclear region of mag ≃ 12.5 (ZAN). Oct. 14.83: "very diffuse outer coma; central condensation and star-like nuclear region" (ZAN). Oct. 15.78: narrow tail nearly 30′ long (MOE). Oct. 16.10: 32-cm *f*/4 L (200×), stellar central condensation of mag ~ 12 (KEE). Oct. 17.85: well-defined central condensation (ZAN). Oct. 19.89: 40-cm L (170×), diffuse tail 0.10° long in p.a. 70°, and "spiral-shaped streamers" 0.02° in p.a. 27° and 0.03° in p.a. 98° (MER). Oct. 20.88: 40-cm L (254×), "possible plasma tail" 0.03° long in p.a. 90°; 81×: "fountain-like features" 0.07° long in p.a. 30° and 0.05° in p.a. 202° (MER).

Nov. 2.73: narrow tail (MOE). Nov. 4.09: 32-cm *f*/4 L (40×), coma diameter 8′, DC = 5, tail 0.30° long in p.a. 90° (KEE). Nov. 7.11: 32-cm *f*/4 L (40×), coma diameter 5′, DC = 5, tail 0.20° long in p.a. 90° (KEE). Nov. 7.72: narrow tail (MOE). Nov. 10.83: additional tail 0.05° long in p.a. 250° (MER). Nov. 12.09: 32-cm *f*/4 L (40×), coma diameter 4′, DC = 5, tail 0.17° long in p.a. 90° (KEE). Nov. 17.07: 32-cm *f*/4 L (40×), coma diameter 5′, DC = 5, tail 0.17° long in p.a. 70° (KEE). Nov. 30.703: "narrow gas tail" (MOE). Dec. 1.75: strong coma, bright central condensation (ZAN). Dec. 2.74: 40-cm L (81×), tail 0.05° long in p.a. 44°; 254×: tails 0.03° long in p.a. 152° and p.a. 294° (MER).

P/Ciffréo (1985p): At 170×, there were tails of length 0.01° in p.a. 43° and 190°, on Nov. 14.85 (MER). On Dec. 12.81, the comet was "elongated at p.a. 21°/201°" (MER).

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NEW ADDITIONS TO THE OBSERVER KEY (*cf.* **ICQ 7,** 96):

BOL	Primosch Bole, West Germany
CLU	L. Cluyse, Belgium
KES01	Sa'ndor Keszthelyi, Hungary
LAA	T. A. van der Laan, The Netherlands
LOO01	F. R. van Loo, Belgium
MOE	Michael Moeller, West Germany
NOL	Michael Nolle, West Germany
SCH04	A. H. Scholten, The Netherlands
SZA	Sa'ndor Szabo', Hungary
THE	S. Thebault, France

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Comet Levy-Rudenko (1984 XXIII = 1984t)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1984 11 30.70	B	8.9	S	48.5	L	4	115	3				MOE
1984 12 09.70	S	8.5	S	6.0	R	12	25	4				MOE
1984 12 14.70	B	8.8	S	48.5	L	4	115	3				MOE
1984 12 19.22	B	8.7	S	6.0	R	12	25	4				MOE
1984 12 21.70	S	8.6	S	48.5	L	4	115	3				MOE
1984 12 22.78	S	8.7	S	6.0	R	12	25	3.5				MOE
1984 12 24.69	S	8.7	S	6.0	R	12	25	3				MOE
1985 01 05.73	S	8.9	S	6.0	R	12	25	2.5				MOE
1985 01 10.71	S	8.9	S	6.0	R	12	25	2				MOE
1985 01 16.71	S	9.1	S	6.0	R	12	25	2				MOE
1985 01 17.00	B	9.0	S	6.0	R	12	25	1.5				MOE
1985 01 18.72	S	9.1	S	15.0	R	20	170	2				MOE
1985 01 23.97	S	9.1	S	6.0	R	12	25	2				MOE
1985 02 12.83	S	10.2	S	48.5	L	4	115	2				MOE

Comet Shoemaker (1984f)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 09.74	S	11.3	AC	41	L	4	86	1.5	1			CLA
1985 11 16.75	S	11.1	AC	41	L	4	86	2	1			CLA

Comet Hartley-Good (19851)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 08 21.83	S	10.8	AC	41	L	4	86	4	4			CLA
1985 09 13.68	S	11.1	AA	31.7	L	5	49	3	3			PEA
1985 09 14.41	S	9.6	AA	15	L	3	24	10	3			KEE
1985 09 14.79	S	10.8	AA	41	L	4	86	3.5	4			PEA
1985 09 15.37	S	10.3	AA	25.4	L	4	32	4	1			MAC
1985 09 15.50	S	9.7	AC	8.0	B		15	& 6	1			SEA
1985 09 16.17	S	10.1	AC	8	B		15	6	1			MCN
1985 09 17.26	S	9.1	AA	15	L	3	24	11	3			KEE
1985 09 17.41	S	9.8	S	25.4	L	4	32	5	2			MAC
1985 09 17.44	S	9.5	AA	8.0	B		20	4	2			MOR
1985 09 17.45	S	10.0	AA	25.6	L	4	67	2.9	2			MOR
1985 09 17.46	S	9.6:	AC	8.0	B		15					SEA
1985 09 17.80	S	10.3	AA	31.7	L	5	49	4	4			PEA
1985 09 18.77	S	10.2	AC	12	B		20	4.5	4			MCN
1985 09 18.81	S	10.2	AA	31.7	L	5	49	4	4			PEA
1985 09 21.34	S	9.3	S	25.4	L	4	32	6	4			MAC
1985 09 21.35	S	9.5	AA	40.6	L	4	70	4	2			DUC
1985 09 21.43	S	9.4	AA	8.0	B		20	6	2			MOR
1985 09 22.00	S	8.8	S	40.0	L	5	81	2.5	4	0.03	335	MER
1985 09 22.34	S	9.1	S	25.4	L	4	32	5	4			MAC
1985 09 23.81	S	9.2	AC	41	L	4	86	4.5	3			CLA
1985 09 23.82	S	10.0	AA	31.7	L	5	49	4	4			PEA
1985 09 24.01	S	8.5	S	40.0	L	5	81	& 2.0	3	0.03	335	MER
1985 09 25.30	S	10.4	AC	15	R	5	62	2.0	0			MOR03
1985 10 01.42	S	8.7	AA	8.0	B		15	6	5			SEA
1985 10 04.03	S	9.3	AC	15	R	5	31	4.2	1			MOR03
1985 10 04.17	S	8.8	S	25.4	L	4	32	8.0	4			MAC
1985 10 04.46	S	7.5:	S	8.0	B		15	&12	5			SEA
1985 10 04.79	S	8.1:	S	8.0	B		20	5.6	3			HAS02
1985 10 04.80	S	8.0:	S	8.0	B		20	8.5	3			KOC01
1985 10 04.82	S	8.0:	S	8.0	B		20	7.0	3			KOC
1985 10 05.14	K	7.4	AA	4.0	B		8	25	4			KEE
1985 10 05.19	S	9.3	AA	40.6	L	4	70	7	3			DUC
1985 10 06.16	K	7.5	AA	4.0	B		8	20	4			KEE
1985 10 06.83	S	8.3	S	15.2	L	5	44	4	2			MOE
1985 10 06.83	S	8.1	AA	25.4	L	4	46	6.4	4			ZAN
1985 10 07.06	M	8.4	SP	15	L	5	30	10				HIL
1985 10 07.83	B	8.4	S	40.0	L	5	81	& 3.0	2/	0.05	72	MER
1985 10 07.83	S	8.0	AA	25.4	L	4	46	6.4	4	?	130	ZAN
1985 10 07.85	B	8.0	S	15.0	L	5	25	7.0	1/			MER
1985 10 08.01	S	8.8	AC	15	R	5	31	5.5	2			MOR03
1985 10 08.12	M	8.3	SP	15	L	5	30	11				HIL
1985 10 08.15	S	8.5	A	20.0	C	10	64	5	2			SPR
1985 10 08.21	S	8.3	A	8.0	R	4	19	6	3			SPR
1985 10 08.22	K	7.3	AA	4.0	B		8	20	3			KEE
1985 10 08.92	S	8.5	S	15.2	L	5	44	5	2			MOE
1985 10 09.18	S	8.5	AA	40.6	L	4	70	7	3	?0.7	200	DUC
1985 10 09.46	S	7.1	AA	5.0	B		10	15	1			SEA

Comet Hartley-Good (19851) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 09.79	B	8.7	S	5.6	B		8	10.7	4			HAS02
1985 10 09.79	B	8.7	S	10.0	B		14	9.4	4			HAS02
1985 10 09.80	B	8.9	S	5.6	B		8		4			KOC
1985 10 09.80	B	8.7	S	8.0	B		20	6.7	4			KOC
1985 10 10.42	S	7.2	AA	5.0	B		10					SEA
1985 10 10.76	S	8.1	S	15.2	L	5	44	6	2			MOE
1985 10 10.81	B	7.7	S	15.0	L	5	25	& 5.0	1/			MER
1985 10 11.04	M	8.0	SP	15	L	5	30	20				HIL
1985 10 11.79	B	8.6	AA	10.0	B		14	9.9	4			HAS02
1985 10 11.79	B	8.4	AA	5.6	B		8	9.0	4			HAS02
1985 10 11.80	S	8.7	S	8.0	B		20	9.0	4			KOC
1985 10 11.80	S	8.5	AA	5.6	B		8		4			KOC
1985 10 11.82	S	8.4	S	8.0	R	12	57	5	1			MOE
1985 10 11.84	S	7.8	AA	8.0	B		20	10.7	3			ZAN
1985 10 11.84	S	8.0:	AC	14.0	S	4	20	7.2	0			LIN01
1985 10 11.84	S	7.9	AA	25.4	L	4	46	7.2	5			ZAN
1985 10 11.94	B	7.3	S	15.0	L	5	25	& 7.0	1/			MER
1985 10 12.09	S	8.8	AC	15	R	5	31	5.3				MOR03
1985 10 12.14	K	7.1	AA	4.0	B		8	25	4			KEE
1985 10 12.15	S	7.8	A	14.0	S	4	28	5.5	4			SPR
1985 10 12.15	S	7.7	A	8.0	R	4	19	6.0	2			SPR
1985 10 12.16	S	7.6	A	8.0	B		11	7.5	3			SPR
1985 10 12.19	S	6.9	AA	8.0	B		20	12	3			MOR
1985 10 12.88	S	7.7	AA	8.0	B		20	9	3/			ZAN
1985 10 12.96	B	7.4	S	15.0	L	5	25	&12.0	1/			MER
1985 10 13.15	S	6.9	AA	8.0	B		20	13	3			MOR
1985 10 13.15	K	7.2	AA	4.0	B		8	20	4			KEE
1985 10 13.24	S	8.5	S	25.4	L	4	64	7.0	5			MAC
1985 10 13.76	B	8.7	S	10.0	B		14	8.1	3			HAS02
1985 10 13.80	B	8.6	S	8.0	B		20	8.9	4			KOC
1985 10 13.81	S	8.0:	S	6.3	B		9	& 8	3			KAM01
1985 10 13.83	S	7.7	AA	25.4	L	4	46	7	3/			ZAN
1985 10 13.86	S	7.6	AA	8.0	B		20	8.7	3			ZAN
1985 10 13.86	S	7.5	S	14.0	S	4	25	9.1	3			LIN01
1985 10 13.92	S	7.9	S	5.0	B		16	6	3			NOL
1985 10 14.83	B	6.9	S	5.0	B		7	20.0	1			MER
1985 10 14.83	S	7.6:	AA	25.4	L	4	46	6	4/			ZAN
1985 10 15.13	K	7.2	AA	4.0	B		8	18	4			KEE
1985 10 15.78	S	7.9	S	15.2	L	5	44	8	3	&0.50	100	MOE
1985 10 16.05	S	8.7	AC	15	R	5	31	5.5	4			MOR03
1985 10 16.10	K	7.0	AA	4.0	B		8	20	4			KEE
1985 10 16.43	S	7.0	AA	5.0	B		10					SEA
1985 10 16.77	B	8.4	S	10.0	B		14	10.2	3			HAS02
1985 10 16.79	B	8.7	S	8.0	B		20	5.7	4			KOC
1985 10 16.80	S	8.8	S	8.0	B		20	5.8	4			KOC01
1985 10 17.05	S	7.4	AA	22.9	R	12	86	& 5.0	3			GRE
1985 10 17.42	S	6.8	AA	5.0	B		10					SEA
1985 10 17.78	B	8.3	S	10.0	B		14	8.0	3			HAS02
1985 10 17.81	S	7.6	AA	8.0	B		20	7	3/			ZAN
1985 10 17.83	S	7.5	AA	5.0	B		7	8	3			ZAN
1985 10 17.85	S	7.7	AA	25.4	L	4	46	3.5	4/			ZAN
1985 10 17.93	S	7.3	AC	14.0	S	4	25	5.6	4			LIN01
1985 10 18.03	S	7.8	AA	22.9	R	12	86	& 4.3	3			GRE
1985 10 18.85	S	7.9	S	8.0	R	12	57	7	2			MOE
1985 10 19.11	S	8.5	A	40.6	L	4	140	8	4			DUC

Comet Hartley-Good (19851) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 19.18	M	7.0	SP	15	L	5	30	25				HIL
1985 10 19.55	S	7.8	AC	41	L	4	86	6	3			CLA
1985 10 19.73	S	7.5	S	15.2	L	5	44	7.5	3			MOE
1985 10 19.88	B	7.0	S	5.0	B		7	&30	0/			MER
1985 10 20.18	M	7.0	SP	15	L	5	30	23				HIL
1985 10 20.22	K	7.0	AA	4.0	B		8	17	4			KEE
1985 10 20.79	B	7.8	S	8.0	B		20	6.5	4			KOC
1985 10 20.80	S	7.0	S	8.0	B		20	14.8	4			KOC01
1985 10 20.88	B	6.8	S	5.0	B		7	&25	1			MER
1985 10 21.01	S	8.6	AC	15	R	5	31	5.1	4			MOR03
1985 10 21.75	S	7.4	S	15.2	L	5	44	6	2			MOE
1985 10 22.05	S	8.5	AC	15	R	5	31	4.6	3			MOR03
1985 10 22.82	S	7.4	S	15.2	L	5	44	5	1			MOE
1985 10 23.75	S	7.4	S	15.2	L	5	44	6	3			MOE
1985 10 26.00	S	7.9	AC	15	R	5	31	4.8	5			MOR03
1985 10 28.00	S	7.9	AC	15	R	5	31	5.2	3			MOR03
1985 10 28.07	K	6.9	AA	4.0	B		8	11	1			KEE
1985 10 28.74	B	7.4	AA	8.0	B		20					BOL
1985 10 28.74	B	7.6	AA	10.0	B		14	10.1	4			HAS02
1985 10 28.75	S	7.6	AA	5.0	B		10					REI01
1985 10 28.80	S	7.3	S	15.2	L	5	44	5	2			MOE
1985 10 28.81	B	7.6	AA	8.0	B		20	10.1	4			KOC
1985 10 28.81	S	7.4	AA	8.0	B		20	13.1	5			KOC01
1985 10 30.00	S	7.8	AC	15	R	5	31	5.6	3			MOR03
1985 10 31.42	S	7.2	AA	5.0	B		10					SEA
1985 10 31.73	B	7.6:	AA	10.0	B		14	6.0	4			HAS02
1985 11 01.10	S	8.4	S	15.2	L	8	76	5	6			MAC
1985 11 01.71	S	7.5	S	48.5	L	4	115	5	3			MOE
1985 11 02.14				8.0	B		20			0.17	95	MOR
1985 11 02.14				8.0	B		20			0.5	80	MOR
1985 11 02.14	M	7.2	AA	8.0	B		20	8	5	1.0	57	MOR
1985 11 02.15	S	7.9	S	25.4	L	4	32	9	7			MAC
1985 11 02.73	S	6.9	S	15.2	L	5	44	6	6	&1	80	MOE
1985 11 03.07	K	7.1	AA	4.0	B		8	7	3			KEE
1985 11 03.73	B	7.5	AA	10.0	B		14	7.7	4			HAS02
1985 11 04.09	K	7.0	AA	4.0	B		8	8	3			KEE
1985 11 04.72	S	7.4	S	48.5	L	4	115	4	5			MOE
1985 11 04.76	B	7.4	AA	10.0	B		14	5.3	5			HAS02
1985 11 04.76	B	7.4	AA	5.6	B		8		4			HAS02
1985 11 04.76	B	7.5	AA	8.0	B		20	6.6	5			KOC01
1985 11 05.04	B	8.4	A	10.0	B	3	14		2			SIM
1985 11 05.04	B	8.6	A	10.0	B	3	14		2			SIM01
1985 11 05.09	K	7.3	AA	4.0	B		8	8	4			KEE
1985 11 05.52	S	7.6	AC	20	L	6	60	6	4			CLA
1985 11 06.13	S	8.4	S	15.2	L	8	76	6	6			MAC
1985 11 06.17	S	6.5	A	8.0	B		11	6	4			SPR
1985 11 06.77	S	7.4	S	5.0	B		16	5	4			NOL
1985 11 06.83	B	7.4	S	15.0	L	5	25	10.0	4	0.11	302	MER
1985 11 07.10	K	7.5	AA	4.0	B		8	8	4			KEE
1985 11 07.72	S	6.8	S	15.2	L	5	44	6	6	>1.5	70	MOE
1985 11 08.76	O	7.2	A	8.0	B		20	6	4			AND01
1985 11 08.99	S	7.7	AC	3.5	B		7	9.5				MOR03
1985 11 09.00	S	7.7	AC	6	R	15	36	5	4			MOR03
1985 11 09.12	M	7.7	AA	8.0	B		20	5	8	0.25	36	MOR
1985 11 09.14	S	6.5	A	8.0	B		11	5	5			SPR

Comet Hartley-Good (19851) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 10.74	S	7.5:	AA	6.3	B		9	6	5			KAM01
1985 11 10.83	B	7.8	S	15.0	L	5	25	& 5	4	0.05	39	MER
1985 11 10.84	B	7.8	S	5.0	B		7					MER
1985 11 11.10	S	6.4	A	8.0	B		11	4	3			SPR
1985 11 11.10	S	6.6	A	8.0	R	4	19	4	4			SPR
1985 11 11.71	O	7.2	A	8.0	B		20	6	4			AND01
1985 11 11.72	B	7.6	AA	8.0	B		20	4.5				KOC
1985 11 11.73	S	7.9	S	8.0	B		20	6.7	6			KOC01
1985 11 11.73	B	7.6	AA	10.0	B		14	3.9	5			HAS02
1985 11 11.76	S	7.2	S	5.0	B		16	3	3			NOL
1985 11 11.79	B	7.3	S	15.0	L	5	25	& 6	4	0.07	53	MER
1985 11 12.10	K	7.2	AA	4.0	B		8	6	3			KEE
1985 11 12.10	S	6.5	A	8.0	R	4	19	3.5	3	?		SPR
1985 11 12.11	S	6.3	A	8.0	B		11	5	3			SPR
1985 11 13.13	S	6.4	A	8.0	R	4	19	3.5	3			SPR
1985 11 13.13	S	6.3	A	8.0	B		11	5	3	?		SPR
1985 11 14.15	S	6.4	A	8.0	B		11	4	3			SPR
1985 11 14.79	B	8.0	S	15.0	L	5	25	9.0	4	0.08	73	MER
1985 11 15.02	S	7.6	AC	3.5	B		7	10				MOR03
1985 11 15.11	S	8.1	S	25.4	L	4	32	6	8	0.1	99	MAC
1985 11 17.07	K	7.0	AA	4.0	B		8	8	3			KEE
1985 11 17.18	S	6.4	A	8.0	B		11	5	3			SPR
1985 11 18.11	M	7.5	AA	8.0	B		20	7	7			MOR
1985 11 18.14	S	6.4	A	8.0	B		11	4	3			SPR
1985 11 25.72	S	6.8	S	15.2	L	5	44	4.5	6			MOE
1985 11 30.70	S	6.9	S	15.2	L	5	44	6.0	6	1	50	MOE
1985 12 01.08	S	6.3	A	20.0	C	10	64	4.5	4			SPR
1985 12 01.71	B	8.5	S	10.0	B		14	1.7	6			HAS02
1985 12 01.74	S	7.1	S	15.0	L	5	25	6.0	4			MER
1985 12 01.75	S	7.2:	AA	8.0	B		20	7	7			ZAN
1985 12 02.71	B	8.4	S	10.0	B		14	3.0	6			HAS02
1985 12 02.72	B	8.6	S	20.3	T	10	92	1.5	6			HAS02
1985 12 02.73	S	7.6	S	15.0	L	5	25	6.0	4			MER
1985 12 03.71	B	8.1	S	10.0	B		14	2.7	6			HAS02
1985 12 04.73	S	7.8	S	15.0	L	5	25	6.0	4	0.15	54	MER
1985 12 06.09	S	8.2	S	25.4	L	4	32	5	6			MAC
1985 12 12.70	S	7.3	S	15.2	L	5	44	5	6			MOE
1985 12 17.47	S	7.8	AC	6	R	15	36	3.5	4			MOR03
1985 12 18.47	S	8.0	AC	6	R	15	36	3.5	3			MOR03
1985 12 22.22	B	8.4	S	20.3	T	10	92	2.1	4			HAS02
1985 12 22.22	B	8.3	S	10.0	B		14	3.0	5			HAS02
1985 12 24.21	B	8.6	S	10.0	B		14	3.0	6			HAS02
1985 12 24.21	S	7.3	S	15.2	L	5	44	5	7	0.8	310	MOE

Comet Thiele (1985m)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 15.41	S	11.6	AA	25.4	L	4	64	2.5	2			MAC
1985 10 15.47	S	9.9	AC	32	L	4	40	8	3			KEE
1985 10 16.47	S	10.3	WA	25.6	L	4	67	2.3	1			MOR
1985 10 17.34	S	10.0	WA	25.6	L	4	67	2.4	3			MOR
1985 10 17.36	S	9.3	NP	8.0	B		20	12	1			MOR
1985 10 17.41	S	10.8	AA	25.4	L	4	64	2.5	2			MAC
1985 10 19.41	S	9.8	NP	25.6	L	4	45	7.3	1			MOR
1985 10 19.42	S	10.1	S	25.4	L	4	64	4.0	4			MAC

Comet Thiele (1985m) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 19.42	S	9.2	NP	8.0	B		20	16	0/			MOR
1985 10 19.92	S	11.5	AC	40.0	L	5	81	2.1	3	0.02	293	MER
1985 10 19.93	S	10.4	AC	15.2	L	5	44	4	2			MOE
1985 10 20.37	S	9.3	AA	32	L	4	40	10	3			KEE
1985 10 20.38	S	10.0	S	25.4	L	4	64	4.0	4			MAC
1985 10 20.38				12	B		20	15	1			KEE
1985 10 20.66	S	9.8	WA	15.2	L	5	29					SEA
1985 10 20.91	S	11.4	AC	40.0	L	5	81	& 2.0	3/	0.03	293	MER
1985 10 21.48	K	9.0	AC	4.0	B		8	12	1			KEE
1985 10 21.71	S	9.9	WA	15.2	L	5	29					SEA
1985 10 22.94	S	10.4	AC	15.2	L	5	44	5	2			MOE
1985 10 23.34	S	8.3	WC	20.3	L	6	38	&12.2	3/			GRE
1985 10 23.37	S	8.3	WC	8.0	B		20	&16.0	0/			GRE
1985 10 24.37	S	8.4	WC	20.3	L	6	38	&13.8	4			GRE
1985 10 24.39	S	8.3	WC	8.0	B		20	&13.5	0/			GRE
1985 10 24.43	S	10.2	A	40.6	L	4	140	5	3			DUC
1985 10 25.11	B	8.9	S	10.0	B		14	7.0	2			HAS02
1985 10 25.48	K	8.4	AC	4.0	B		8	15	2			KEE
1985 10 26.16	B	8.6	AC	40.0	L	5	81	3.2	4	0.03	220	MER
1985 10 26.39	M	7.6	WC	20.3	L	6	38	&14.5	3/			GRE
1985 10 26.39	S	7.8	WC	20.3	L	6	38	&14.5	3/			GRE
1985 10 26.40	S	8.3	WC	8.0	B		20	&14	1			GRE
1985 10 26.53	S	9.8	S	25.4	L	4	64	4.0	5			MAC
1985 10 28.75	B	9.0	S	10.0	B		14	8.2	2			HAS02
1985 11 02.17	S	7.7	AA	8.0	B		20	14	2			MOR
1985 11 02.17	S	9.7	S	25.4	L	4	64	3	5			MAC
1985 11 02.75	S	9.0	AC	15.2	L	5	44	9	2			MOE
1985 11 03.22	S	8.4	A	40.6	L	4	70	7	5			DUC
1985 11 03.50	S	9.5	S	15.2	L	5	76	& 3				SEA
1985 11 03.73	B	8.6	S	10.0	B		14	7.2	2			HAS02
1985 11 03.74	B	8.9	S	12.7	T	10	31	4.8	3			HAS02
1985 11 03.79	S	8.1	S	8.0	B		20	7.8	4			KOC01
1985 11 03.80	B	8.5	S	8.0	B		20	7.8	4			KOC
1985 11 03.80	B	8.7	S	8.0	B		20	6.0	2			HAS02
1985 11 04.14				32	L	4	40	9	3			KEE
1985 11 04.15	K	7.8	AA	4.0	B		8	13	2			KEE
1985 11 04.73	S	9.5:	AC	48.5	L	4	115		2			MOE
1985 11 04.76	B	8.8	S	10.0	B		14	7.1	3			HAS02
1985 11 04.77	S	7.8	S	8.0	B		20	5.0	4			KOC01
1985 11 05.90	S	9.4	AC	15.2	L	5	44	7	3			MOE
1985 11 06.14	S	9.9	AA	15.2	L	8	76	3	3			MAC
1985 11 06.21	S	8.9	A	20.0	C	10	64	1.5	3			SPR
1985 11 06.80	S	8.7	S	5.0	B		16	7	2			NOL
1985 11 06.81	B	8.1	S	15.0	L	5	25	9.3	3			MER
1985 11 06.85	B	8.8	S	8.0	B		20	10.6	4			KOC
1985 11 06.86	B	8.8	S	10.0	B		14	7.4	3			HAS02
1985 11 07.22	S	8.2	A	14.0	S	4	28	5	4			SPR
1985 11 07.23	S	7.7	AA	8.0	B		20	16	2			MOR
1985 11 07.26	K	8.0	AA	4.0	B		8	16	2			KEE
1985 11 07.44	S	9.1	S	25.4	L	4	64	5	6			MAC
1985 11 07.73	S	8.7	AC	15.2	L	5	44	6	3			MOE
1985 11 07.78	S	8.3	AC	6.0	R	12	25	10	2			MOE
1985 11 08.92	O	8.2	A	8.0	B		20	7	4			AND01
1985 11 09.16	S	8.1	A	20.0	C	10	64	3.5	5			SPR
1985 11 09.65	S	9.1	AC	41	L	4	86	4	4			CLA

Comet Thiele (1985m) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 10.85	S	8.4	AC	15.2	L	5	44	8	3	&1	70	MOE
1985 11 10.85	B	8.1	S	15.0	L	5	25	& 5	4			MER
1985 11 11.11	S	8.0	A	8.0	R	4	19	4.5	2			SPR
1985 11 11.74	B	8.9	AA	20.3	T	10	92	4.3	4			HAS02
1985 11 11.74	B	8.6	AA	10.0	B		14	3.8	4			HAS02
1985 11 11.77	S	7.9	S	20.5	L	4	26	5.4	5			KOC01
1985 11 11.77	B	8.2	S	8.0	B		20	7.2				KOC
1985 11 11.81	B	8.0	S	15.0	L	5	25	& 6	3			MER
1985 11 12.02	S	8.0	A	40.6	L	4	70	8	5			DUC
1985 11 12.12	S	8.2	A	8.0	R	4	19	4	2			SPR
1985 11 12.12	K	7.2	AA	4.0	B		8	23	2			KEE
1985 11 12.15	S	7.9	A	8.0	B		11	6	2			SPR
1985 11 13.14	S	7.9	A	8.0	B		11	6	1			SPR
1985 11 13.14	S	8.2	A	8.0	R	4	19	3.5	1			SPR
1985 11 14.15	S	8.2	A	8.0	B		11	7	1			SPR
1985 11 14.81	B	7.8	S	15.0	L	5	25	& 8	1			MER
1985 11 15.88	S	8.2:	AA	6.3	B		9	10	3			KAM01
1985 11 16.17	K	8.1	S	4.0	B		8	15	2			KEE
1985 11 17.19	S	7.9	A	8.0	B		11	8	2			SPR
1985 11 17.42	S	8.3	AA	8.0	B		15		0			SEA
1985 11 18.17	S	8.2	A	8.0	R	4	19	5	1			SPR
1985 11 18.28	S	8.0	AA	8.0	B		20		2			MOR
1985 11 25.73	S	8.9	AC	15.2	L	5	44	6	2			MOE
1985 11 30.71	S	9.2	AC	15.2	L	5	44	8	2			MOE
1985 12 01.10	S	8.5	A	20.0	C	10	64	4.5	1			SPR
1985 12 01.76	B	9.0	AA	40.0	L	5	81	& 3	1/	0.02	75	MER
1985 12 01.80	S	9.0	AA	8.0	B		20	9.3	3			ZAN
1985 12 02.71	B	8.9	S	10.0	B		14	4.8	5			HAS02
1985 12 02.73	B	8.9	S	20.3	T	10	92	2.4	2/			HAS02
1985 12 02.76	B	9.1	AA	40.0	L	5	81	& 7	1/	0.06	105	MER
1985 12 03.80	B	9.1	AA	15.0	L	5	25	6.0	1			MER
1985 12 04.75	B	9.1	AA	40.0	L	5	81	& 3	2	0.02	72	MER
1985 12 05.74	S	9.3	AC	15.2	L	5	44	7	2			MOE
1985 12 10.78	B	9.1	AA	40.0	L	5	81	& 4	3	0.03	190	MER
1985 12 12.71	S	9.4	AC	15.2	L	5	44	7	3			MOE
1985 12 12.78	B	9.1	AA	40.0	L	5	81	& 3	2	0.02	263	MER
1985 12 15.73	S	9.1	AA	8.0	B		20	6.7	3/			ZAN
1985 12 22.72	S	9.8	AC	15.2	L	5	44	5	3			MOE
1985 12 28.71	S	9.9	AC	15.2	L	5	44	4	3			MOE
1985 12 31.72	S	10.7	AC	15.2	L	5	44	3	1			MOE

Periodic Comet Giacobini-Zinner (1984e)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 06 11.99	S	11.9	AC	20.3	T	10	80		5			COM
1985 06 14.97	S	11.7	AC	20.3	T	10	80		4/			COM
1985 06 14.98	S	12.0	AC	25.4	J	6	73	1	2			BOU
1985 06 15.28	S	12.3	AC	15	R	5	62	1.2	2			MOR03
1985 06 15.96	S	12.0	AC	20.3	T	10	80		4			COM
1985 06 15.98	S	11.5:	AC	25.4	J	6	59	& 1.5				BUS01
1985 06 28.28	S	11.6	AC	15	R	5	62	1.0				MOR03
1985 06 30.31	S	11.6	AC	15	R	5	62	1.4	2			MOR03
1985 07 06.91	S	10.4	AC	25.4	J	6	49		3			FEI
1985 07 06.91	S	10.5	AC	25.4	J	6	38		3			COM
1985 07 06.98	S	10.9	AC	25.0	L	10	100	1.3	7			LOO01

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 07 07.03	S	10.3	AC	20.3	T	10	80		3			COM
1985 07 07.15	S	11.0	AC	15	R	5	62	1.9	4			MOR03
1985 07 07.96	S	10.8	AC	25.0	L	10	100	1.5	7			LOO01
1985 07 08.13	S	11.0	AC	15	R	5	62	1.4	5			MOR03
1985 07 08.96	S	10.3	AC	20.3	T	10	80		3/			COM
1985 07 09.93	S	10.6	AC	25.0	L	10	100	& 1	6/			LOO01
1985 07 09.96	S	10.3	AC	20.3	T	10	80		3/			COM
1985 07 10.93	S	10.2:	AC	15.6	L	5	45					BOU
1985 07 10.93	S	10.5	AC	25.0	L	10	100	2	6/			LOO01
1985 07 10.95	S	10.2	AC	10.0	B		24	2	6			LOO01
1985 07 12.12	S	10.9	AC	15	R	5	62	1.6	4			MOR03
1985 07 12.92	S	10.7	AC	20.5	L	4	52	& 1.0	6			HAS02
1985 07 12.93	S	10.6	A	15.2	L	5	44	2.5	2			MOE
1985 07 12.94	S	10.5	AC	20.5	L	4	52	2.1	7			KOC01
1985 07 12.99	S	9.7	AC	25.4	J	6	49		3			FEI
1985 07 13.00	S	9.9	AC	20.3	T	10	80		3/			COM
1985 07 13.92	S	10.3	AC	20.5	L	4	52	2.8	6			KOC01
1985 07 13.92	S	10.2	AC	10.0	B		24	1	6			LOO01
1985 07 13.92	S	10.5	AC	20.5	L	4	52	1.8	6			HAS02
1985 07 13.95	S	9.5	AC	25.4	J	6	49		3/			FEI
1985 07 13.96	S	9.4	AC	20.3	T	10	80		4			COM
1985 07 13.97	S	9.6	AC	25.4	J	6	48	3	4			BOU
1985 07 13.97	S	10.6	A	15.2	L	5	44	3	2			MOE
1985 07 13.98	S	10.3	AC	25.4	J	6	48	2	4			BUS01
1985 07 14.97	S	9.4	AC	20.3	T	10	80		4			COM
1985 07 15.97	S	11.5	AA	20	T	10	77	3	4/			THE
1985 07 15.99	S	9.5	AC	25.4	J	6	49		3/			FEI
1985 07 16.14	S	10.6	AC	15	R	5	62	1.9	4			MOR03
1985 07 17.17	S	10.6	AC	15	R	5	62	1.9	5			MOR03
1985 07 17.93	S	10.6	AA	20	T	10	77	5	4/			THE
1985 07 17.95	S	9.1	AC	10.0	B		24	5	6			LOO01
1985 07 17.98	S	10.1	A	15.2	L	5	44	3	4			MOE
1985 07 18.13	S	10.2	AC	15	R	5	62	2.2	4			MOR03
1985 07 18.92	S	9.2	AC	10.0	B		24	5	5			LOO01
1985 07 19.92	S	9.2:	AC	10.0	B		24	2.5	4/			LOO01
1985 07 20.27	S	9.0	A	20.0	C	10	81	3.5	5			SPR
1985 07 20.93	S	10.1	A	15.2	L	5	44	2.5	4			MOE
1985 07 20.96	S	9.5	AC	10.0	B		24	& 2	8			LOO01
1985 07 20.96	S	8.9	AC	8.0	B		20	3	4			BOU
1985 07 20.97	S	9.2	AC	25.4	J	6	48	& 2.5	6			BOU
1985 07 21.05	S	9.5	AC	10.0	B		24	3	7			LOO01
1985 07 21.20	S	10.3	AC	15	R	5	62	2.0	5	0.07	245	MOR03
1985 07 21.28	S	8.9	A	25.0	L	5	38	3.5	6			SPR
1985 07 21.88	B	9.2	S	12.7	T	10	60	2.0	4			HAS02
1985 07 21.89	S	10.0	A	15.2	L	5	44	3.5	3			MOE
1985 07 21.95	S	8.8	AC	15.6	L	5	24	3	6			BOU
1985 07 21.95	S	8.9	AC	6.0	B		12	& 7	5			WEG
1985 07 21.96	S	8.8	AC	5.0	B		10					BOU
1985 07 21.96	B	9.0	AC	6.0	B		12					WEG
1985 07 21.98	S	10.1	AA	20	T	10	77	4	4/	0.08	252	THE
1985 07 22.87	B	9.3	S	10.0	B		14	2.5	5			HAS02
1985 07 22.87	B	9.2	S	20.5	L	4	52	2.3	5			HAS02
1985 07 22.88	S	9.3	S	20.5	L	4	52	2.3	5			KOC01
1985 07 22.93	S	9.8	AA	20	T	10	77	8	5	0.12	229	THE
1985 07 22.95	S	8.9	AC	6.0	B		12	7	4/	0.25	250	WEG

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 07 22.95	B	9.1	AC	6.0	B		12					WEG
1985 07 23.18	S	10.1	AC	15	R	5	62	1.8	6			MOR03
1985 07 23.91	S	10.0	A	48.5	L	4	115	3	5			MOE
1985 07 23.96	S	8.9	AC	15.6	L	5	36					BOU
1985 07 24.01	P	8.9	AC	7.5	A	4						KRA01
1985 07 24.17	S	10.1	AC	15	R	5	62	2.2	6			MOR03
1985 07 24.92	S	9.0	S	20.5	L	4	52	2.3	3			KOC01
1985 07 24.93	B	9.0	S	20.5	L	4	52	1.4	5			HAS02
1985 07 24.93	B	8.9	S	10.0	B		14	2.0	5			HAS02
1985 07 24.94	S	9.3	AC	10.0	B		24	2	6			LOO01
1985 07 25.05	S	9.1	AC	12.5	R		30	3	6			ZAN01
1985 07 25.88	S	9.7	A	15.2	L	5	44	3	4			MOE
1985 07 25.88	B	8.9:	S	12.7	T	10	60	2.1	4			HAS02
1985 07 25.88	B	8.9:	S	10.0	B		14	2.1	4			HAS02
1985 07 25.96	S	9.3	AC	10.0	B		24	2.5	8			LOO01
1985 07 25.99	S	8.8	AC	6.0	B		12	& 7.5	4/	0.20	240	WEG
1985 07 25.99	B	9.0	AC	6.0	B		12					WEG
1985 07 26.00	S	9.1	AC	12.5	R		30	4	3			ZAN01
1985 07 26.02	S	9.1	AC	30.0	L		40	4	5			ZAN01
1985 07 27.24	S	8.8	A	20.0	C	10	64	4.0	4			SPR
1985 07 27.33	S	9.9	AC	15	R	5	62	2.3	6			MOR03
1985 07 28.00	S	8.3	AC	15.6	L	5	24	3	6			BOU
1985 07 28.30	S	9.9	AC	15	R	5	62	1.7	6	0.07	250	MOR03
1985 07 28.39	M	9.0	AA	32	L	4	66	3	5	0.07	250	KEE
1985 07 29.01	S	8.7	AC	10.0	B		24	4	6			LOO01
1985 07 29.89	S	9.5	A	15.2	L	5	44	3.5	5			MOE
1985 07 30.35	S	10.1	AC	15	R	5	62	1.6	5			MOR03
1985 08 02.16	S	9.4	AC	15	R	5	62	2.3	4			MOR03
1985 08 02.87	S	8.9:	S	12.7	T	10	60	2.6	4			HAS02
1985 08 03.35	S	9.5	AC	15	R	5	62	1.8	5			MOR03
1985 08 03.86	S	8.8	AC	10.0	B		24	3	6/	0.17	231	LOO01
1985 08 03.86	M	9.5	AA	15	C	15	90	3	4	0.08	270	SZA
1985 08 03.89	S	9.4	A	15.2	L	5	44	3.5	5			MOE
1985 08 03.93	S	9.0	AC	15.0	R	8	36	5	6			AER
1985 08 04.11	S	9.5	AC	15	R	5	62	1.9	5			MOR03
1985 08 04.85	M	9.5	AA	10	L	9	60	2.5	3	0.05	240	SZA
1985 08 05.11	S	9.2	AC	15	R	5	62	2.0	6			MOR03
1985 08 05.22	S	8.5	A	20.0	C	10	64	3.0	5	0.05	265	SPR
1985 08 05.86	M	9.1	AA	10	L	9	60	2.5	2	0.08	250	SZA
1985 08 05.87	S	9.0	A	6.0	R	12	25	3.0	5			MOE
1985 08 05.88	M	9.5	S	30	L	3	40	3	2			TUB
1985 08 06.21	S	8.5	A	20.0	C	10	64	3.0	5	0.04	278	SPR
1985 08 06.88	S	8.7	AC	10.0	B		24	3	6	0.10		LOO01
1985 08 06.90	S	8.9	A	15.2	L	5	44	4.0	5			MOE
1985 08 06.91	P	9.0	AA	7.5	A	4						KRA01
1985 08 06.91	S	8.9	AC	20.3	T	10	65		5			COM
1985 08 06.91	S	8.2	AA	20	T	10	77	15	5	0.20	252	THE
1985 08 06.92	S	8.2	AC	15.6	L	5	29	4	4/			BOU
1985 08 07.11	S	9.0	AC	15.0	R	8	36	& 3.5	6			AER
1985 08 07.90	S	8.8	A	15.2	L	5	44	4.0	6			MOE
1985 08 07.94	S	8.9	AA	20.3	T	10	78	1.6	5			KRA01
1985 08 08.11	S	8.3	AC	10.0	B		24	7	5	0.33		LOO01
1985 08 08.87	S	8.5	AC	30.0	L		80	4	7			ZAN01
1985 08 08.89	P	8.9	AA	7.5	A	4						KRA01
1985 08 08.89	B	8.7	A	15.2	L	5	44	4.0	6	0.33	285	MOE

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 08 08.91	S	9.0	AC	15.0	R	8	64	& 4.5	5/			AER
1985 08 08.94	B	8.8	A	15.2	L	5	44	4.0	6	0.25	285	MOE
1985 08 09.86	S	8.6	A	15.2	L	5	44	3.5	7			MOE
1985 08 09.86	B	8.4	S	10.0	B		14	3.1	3			HAS02
1985 08 09.88	S	8.6	AC	30.0	L		80	4	7			ZAN01
1985 08 09.88	M	8.5	S	12.7	T	10	60	2.6	3			HAS02
1985 08 10.19	S	8.9	AC	15	R	5	62	2.3	6	0.03	252	MOR03
1985 08 10.90	S	8.8	AC	15.0	R	8	64	5	5/			AER
1985 08 10.91	S	8.9	AC	12.5	R	5	19		6/			POI
1985 08 10.94	B	8.4	AC	6.0	B		12					WEG
1985 08 10.94	S	8.3	AC	6.0	B		12	8	4/	0.22	265	WEG
1985 08 11.05	S	8.5	AC	14.5	L	8	30		5/			LAA
1985 08 11.22	S	8.2	A	20.0	C	10	64	3.5	4	0.05	270	SPR
1985 08 11.23	S	8.0	A	8.0	B		11	5	4			SPR
1985 08 11.35	S	8.8	AC	15	R	5	62	2.0	6			MOR03
1985 08 11.88	M	9.0	AA	15	C	15	90	3	1	0.07	240	SZA
1985 08 11.91	B	8.5	S	10.0	B		14	3.6	3			HAS02
1985 08 11.91	S	8.0	AC	15.6	L	5	24	4	5/			BOU
1985 08 11.91	S	8.6	AC	15.6	L	5	24	4	5	0.10	260	BUS01
1985 08 11.92	M	9.0	S	30	L	3	40	2.8	4			TUB
1985 08 11.92	B	9.0	AC	15.6	L	5	24					BUS01
1985 08 12.01	S	8.5	AC	8.0	B		15	4	2			SCH04
1985 08 12.06	S	8.0	AC	5.0	B		7	5	5	0.42		LOO01
1985 08 12.24	S	8.8	AC	15	R	5	62	2.3	6	0.06	258	MOR03
1985 08 12.86	S	8.5	A	15.2	L	5	44	4.5	5			MOE
1985 08 12.88	M	9.0	S	30	L	3	40	3	4		270	TUB
1985 08 12.89	S	8.8	AC	15.0	R		64	5	6	0.12		AER
1985 08 12.91	S	8.8	AA	10.8	L	4	24					KRA01
1985 08 12.92	M	8.9	AA	15	C	15	90	& 3	2	0.07	280	SZA
1985 08 12.92	S	8.3	AC	5.0	B		10	9	5			BUS01
1985 08 12.94	S	8.4	AC	20.3	T	10	65		5	0.25		COM
1985 08 12.97	S	8.3	AC	8.0	B		15					FEI
1985 08 12.98	S	7.8	AC	5.0	B		10	6	2			BOU
1985 08 12.99	B	8.3	AC	6.0	B		12					WEG
1985 08 12.99	S	8.1	AC	6.0	B		12	8	4/	0.25	250	WEG
1985 08 13.02	B	9.1	AC	25.4	L	6	70	2.5	8	0.06	260	KUI
1985 08 13.08	S	7.9	AC	5.0	B		7	6	6	0.42		LOO01
1985 08 13.22	S	8.1	A	20.0	C	10	64	4.5	4	0.08	275	SPR
1985 08 13.29	S	8.8	AC	15	R	5	62	2.9	6	0.07	255	MOR03
1985 08 13.40	S	8.6	A	40.6	L	4	140	5	4	0.15	260	DUC
1985 08 13.93	S	7.7	AC	5.0	B		10	7	2			BOU
1985 08 13.94	M	9.0	AA	15	C	15	90	& 2.5	4	0.07	260	SZA
1985 08 13.95	S	8.2	AC	5.0	B		10	9	5			BUS01
1985 08 13.96	B	8.5	AC	5.0	B		10					BUS01
1985 08 13.99	B	8.5	S	10.0	B		14	4.9	4			HAS02
1985 08 14.01	B	8.6	S	10.0	B		14	3.9	4			KOC
1985 08 14.01	B	8.6	S	10.0	B		14	4.9	3			KOC01
1985 08 14.02	S	9.2	S	11.4	L	9	50	2.5	6			NOL
1985 08 14.07	S	8.4	AC	8.0	B		15		2			SCH04
1985 08 14.07	M	8.9	AA	15	C	15	90	& 2.5	4	0.06	260	SZA
1985 08 14.22	S	8.0	A	20.0	C	10	64	4.0	5	0.08	275	SPR
1985 08 14.23	S	7.9	A	8.0	B		11	5.0	4			SPR
1985 08 14.35	S	8.6	AA	40.6	L	4	140	5	4	0.15	260	DUC
1985 08 14.88	B	8.9	S	8.0	B		20	4.3	4			KOC
1985 08 14.88	B	8.6	S	10.0	B		14	5.8	3			HAS02

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 08 14.88	S	8.8	AA	20	T	10	77	18	5	0.33	264	THE
1985 08 14.89	B	9.1	AC	8.0	R	15	43	3	5			CLU
1985 08 14.90	B	8.3	S	8.0	B		20	5.8	4			KOC01
1985 08 14.93	S	7.7	AC	5.0	B		10	6	2			BOU
1985 08 14.94	S	8.7	AC	15.0	R	8	43	5.5	7	0.17		AER
1985 08 14.99	S	8.7	S	11.4	L	9	50	3	6			NOL
1985 08 14.99	S	8.3	AC	20.3	T	10	65			0.23		COM
1985 08 15.00	M	9.0	AA	15	C	15	90	& 2.5	2	0.06	270	SZA
1985 08 15.04	S	8.2	AC	5.0	B		10	9	5			BUS01
1985 08 15.07	S	7.7	AC	5.0	B		7	7	6	0.57		LOO01
1985 08 15.90	S	8.8	AC	15.0	R	8	43	6	6/	0.17		AER
1985 08 15.92	B	9.4	AC	8.0	R	15	43	3	4			CLU
1985 08 16.00	S	8.1	AA	12.5	R	5	19		7			POI
1985 08 16.03	S	8.3	AC	8.0	B		15		2			SCH04
1985 08 16.03	S	8.7	AC	15.0	R	8	43	6	6	0.17		AER
1985 08 16.10	S	7.8	AC	5.0	B		7	6	6	0.67		LOO01
1985 08 16.23	S	8.3	A	20.0	C	10	64	3.0	3	0.05	270	SPR
1985 08 16.89	M	8 :	SP	6	R	5	20	& 5.5	2	0.05	300	HOR
1985 08 16.91	S	8.3	AC	8.0	B		15		2			SCH04
1985 08 16.94	S	8.1	AC	5.0	B		10	10	3			BUS01
1985 08 17.01	S	7.6	AC	5.0	B		10	7	2			BOU
1985 08 17.22	S	8.1	A	20.0	C	10	64	3.5	4	0.07	272	SPR
1985 08 17.23	S	7.9	A	8.0	B		11	5	3			SPR
1985 08 17.32	M	8.4	AC	15	R	5	62	3.2	7	0.12	274	MOR03
1985 08 17.87	S	8.2	A	15.2	L	5	44	4.5	5	0.25	290	MOE
1985 08 17.88	B	8.7	S	10.0	B		14	5.2	3			HAS02
1985 08 17.89	M	9.0	UR	8	R	4	25	3	0	0.1	285	KAR
1985 08 17.90	S	8.0	AC	5.0	B		10	10	3			BUS01
1985 08 17.90	S	7.6	AC	5.0	B		10	7	3			BOU
1985 08 17.94	B	9.2	AC	8.0	R	8	43	3	3			CLU
1985 08 18.00	S	8.2	AA	12.5	R	5	19		7			POI
1985 08 18.06	S	8.4	AC	14.5	L	8	30		5/			LAA
1985 08 18.24	S	8.1	A	20.0	C	10	64	4.0	5	0.09	275	SPR
1985 08 18.28	S	8.5	AC	15	R	5	62	3.3	5	0.05		MOR03
1985 08 18.40	S	8.5	A	40.6	L	4	140	5	4	0.15	270	DUC
1985 08 18.88	M	8.6	S	30	L	3	40	2	3	0.03	272	TUB
1985 08 18.96	S	7.6	AC	5.0	B		10	7	3	0.23		BOU
1985 08 19.08	S	7.7	AC	5.0	B		7	6	5	0.67		LOO01
1985 08 19.88	M	8.5	S	30	L	3	40	1.3	4	0.03	272	TUB
1985 08 19.89	S	8.3	AC	8.0	B		15					SCH04
1985 08 19.93	B	8.9	AC	8.0	R	15	43	2	6			CLU
1985 08 20.01	S	7.9	AC	5.0	B		10	10	3			BUS01
1985 08 20.02	S	7.5	AC	5.0	B		10		3			BOU
1985 08 20.09	S	7.8	AC	5.0	B		7	7	6	0.75		LOO01
1985 08 20.86	S	8.2	A	15.2	L	5	44	5	6	0.25	290	MOE
1985 08 20.90	S	8.8	S	11.4	L	9	50	3	5			NOL
1985 08 20.92				20.3	L	10	50	1.8	4	0.06	282	HAS02
1985 08 20.94	B	8.3	S	10.0	B		14	3.6	4			KOC01
1985 08 20.94	B	8.3	S	10.0	B		14	3.6	4			HAS02
1985 08 20.95	M	8.5	S	30	L	3	40	2	4	0.04	272	TUB
1985 08 20.96	S	7.6	AC	15.6	L	5	24	6	5			BOU
1985 08 20.96	B	8.3	S	8.0	B		20	3.6	4			KOC
1985 08 20.97	S	7.9	AC	15.6	L	5	24	6	5			BUS01
1985 08 21.04	S	8.4	S	11.4	L	9	50	3.5	6	0.5	325	NOL
1985 08 21.06	M	8.5	S	30	L	3	40	4	5	0.36	271	TUB

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 08 21.86	B	8.4	S	10.0	B		14	5.3	3			HAS02
1985 08 21.86	S	8.9		41	L	4	86	2	2	0.25	85	CLA
1985 08 21.91	B	8.7	S	8.0	B		20	4.4	4			KOC
1985 08 21.96	S	8.6	S	11.4	L	9	50	3.5	5	1	325	NOL
1985 08 22.01	S	8.4	AC	20.3	T	10	65		5	0.25	265	COM
1985 08 22.01	S	8.3	AC	15.5	L	5	30	6	3			ZAN01
1985 08 22.05	S	8.2	AC	15.0	R	8	34	7	5	0.17		AER
1985 08 22.08	S	7.5	AA	5.0	B		10		3			BOU
1985 08 22.12	S	7.7	AC	5.0	B		7		3			BUS01
1985 08 22.25	S	8.3	A	20.0	C	10	64	3.5	5	0.03	265	SPR
1985 08 22.32	S	8.6	AC	15	R	5	62	3.4	5	0.06	257	MOR03
1985 08 22.89	B	8.8	AC	8.0	R	15	43	3	4			CLU
1985 08 23.25	S	8.4	A	20.0	C	10	64	3.75	5	0.03	265	SPR
1985 08 23.33	M	8.7	AC	15	R	5	62	3.6	5	0.08	267	MOR03
1985 08 23.39	S	8.3	A	40.6	L	4	70	5	5	0.10	270	DUC
1985 08 24.07	S	7.4	AA	5.0	B		10	9	3			BOU
1985 08 24.09	S	7.6	AA	5.0	B		10	11	4			BUS01
1985 08 24.39	M	8.7	AA	32	L	4	45	3	6	0.17	270	KEE
1985 08 25.07	S	8.3	AC	14.5	L	8	30	5	4/	0.08	248	LAA
1985 08 25.11	S	8.3	AC	15.0	R	8	34	6	6	0.20		AER
1985 08 25.41	M	8.6	AA	32	L	4	45	4	6	0.27	270	KEE
1985 08 25.95	B	9.1	AC	8.0	R	15	43	2.5	4			CLU
1985 08 26.02	S	8.2	AC	20.3	T	10	80		4	0.33	270	COM
1985 08 26.04	S	7.6	AA	5.0	B		10	6	2/			BOU
1985 08 26.05	S	7.6	AC	5.0	B		10	9	5			BUS01
1985 08 26.06	S	8.3	AC	15.0	R	10	34	6	6	0.11		AER
1985 08 26.06	S	8.2	AC	8.0	B		15		3			SCH04
1985 08 26.79	S	8.2	S	8.0	B		15					SEA
1985 08 27.10	S	7.2	AC	8.0	B		15					FEI
1985 08 27.46	S	8.2	A	40.6	L	4	70	5	5	0.10	270	DUC
1985 08 28.10	S	7.7	AC	5.0	B		10	5	6	0.17		LOO01
1985 08 28.11	B	8.0	AC	6.0	B		12					WEG
1985 08 28.11	S	7.7	AC	6.0	B		12	8	4	0.28	265	WEG
1985 08 28.12	S	7.6	S	15.0	L	5	25	5.0	3	0.25	269	MER
1985 08 28.13	S	8.2	AC	15.0	R	8	34	6	6	0.12		AER
1985 08 28.37	S	9.4	AC	15	R	5	62	3.0	5			MOR03
1985 08 29.09	S	8.2	AC	15.0	R	8	34	5	6	0.05		AER
1985 08 29.13	S	8.0:	S	6.3	B		9	& 3.0				KAM01
1985 08 31.35	S	9.3	AC	15	R	5	62	3.6	4			MOR03
1985 09 08.94	S	8.5	A	48.5	L	4	115	5	5			MOE
1985 09 10.02	S	8.6	AC	8.0	B		15	6	7	0.17	260	LOO01
1985 09 10.45	S	8.5	S	25.4	L	4	32	5	6	0.15	293	MAC
1985 09 10.77	S	8.6	AC	8.0	B		15					SEA
1985 09 11.06	S	8.3	AC	8.0	B		20	6.8	2			ZAN
1985 09 11.07	B	8.0	S	10.0	B		14	6.6	4			HAS02
1985 09 11.08	S	8.7	AA	20.3	T	10	81	2.1	5			KAM01
1985 09 11.10	B	7.8	S	8.0	B		20					KOC01
1985 09 11.11	B	8.0	S	8.0	B		20					KOC
1985 09 11.37	S	9.6	WB	15	R	5	62	2.4	5			MOR03
1985 09 11.85	S	8.9	AA	31.2	L	5	49	2	4	0.2	289	PEA
1985 09 11.96	S	8.8	A	48.5	L	4	115	4	4			MOE
1985 09 12.09	S	7.4	S	6.0	B		9	5.0	3	0.5	268	MER
1985 09 12.10	M	9.0	AA	30	L	3	40	4	0			TUB
1985 09 12.12	B	8.8	S	20.3	T	10	81	2.0	5			KAM01
1985 09 12.33	S	9.5	WB	15	R	5	62	2.7	5	0.14	285	MOR03

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 09 12.45	M	8.6	NP	8.0	B		20	6	4/	0.67	295	MOR
1985 09 12.46	S	8.6	S	25.4	L	4	32	4	6	0.22	280	MAC
1985 09 13.01	O	8.3	A	25	L	6	120	6	5	0.1	270	AND01
1985 09 13.13	S	8.8	AC	8.0	B		15	4	5	0.10		LOO01
1985 09 13.39	S	9.8	WB	15	R	5	62	2.1	4			MOR03
1985 09 14.09	S	8.5	AC	8.0	B		20	6	1/	0.25	285	BOU
1985 09 14.10	S	8.4	AC	11.0	L	5	24					FEI
1985 09 14.11	S	9.0	AC	8.0	B		15	5	4	0.13	265	LOO01
1985 09 14.12	S	7.8	SC	25.4	J	6	59	6	3	0.50	330	BUS01
1985 09 14.32	S	9.6	WB	15	R	5	62	3.1	4			MOR03
1985 09 14.43	M	8.2	AA	15	L	3	24					KEE
1985 09 14.43				32	L	4	66	3	6	0.42	290	KEE
1985 09 14.51	S	8.6	NP	8.0	B		20	9	5	1.5	289	MOR
1985 09 14.85	S	9.2	AA	41	L	4	86	2.5	5	0.45	280	PEA
1985 09 15.06	S	7.2	S	6.0	B		9	&13.0	3			MER
1985 09 15.51	S	8.7	S	25.4	L	4	32	3	6	0.15	287	MAC
1985 09 15.75	S	8.4	A	8.0	B		15					SEA
1985 09 16.10	S	9.0	AC	10.0	B		14	3	6			LOO01
1985 09 16.34	S	9.5	WB	15	R	5	62	2.8	4			MOR03
1985 09 16.45	M	8.3	AA	8.0	B		20	9	4	1.5	308	MOR
1985 09 17.08	S	8.5	AA	8.0	B		20	7.1	4/	0.45	295	ZAN
1985 09 17.47	S	8.3	AA	8.0	B		20	8.5	4	0.92	295	MOR
1985 09 17.51	S	8.8	AA	25.4	L	4	32	3	6	0.25	279	MAC
1985 09 17.76	S	8.7	A	8.0	B		15					SEA
1985 09 17.82	S	9.3	AA	31.7	L	5	49	1.6	4	0.17	258	PEA
1985 09 18.10	S	9.0	AC	20.3	T	10	80	3	4	0.17		COM
1985 09 18.11	S	9.5	AC	14.5	L	8	48	3	1/			LAA
1985 09 18.11	S	8.7	AC	25.4	J	6	48	3	3	0.17	270	BOU
1985 09 18.13	B	10.2	AC	25.4	L	6	70	2.5	7/			KUI
1985 09 18.14	S	8.6	AA	8.0	B		20	6.4	4	0.43	292	ZAN
1985 09 18.85	S	9.4	AA	31.7	L	5	49	1.8	5	0.17	270	PEA
1985 09 19.04	O	8.5	A	25	L	6	120	6	5	0.1	280	AND01
1985 09 19.07	S	8.7	S	10.0	B		14	6.2	4			HAS02
1985 09 19.10	S	9.3	AC	15.0	R	8	34	8	3			AER
1985 09 19.14	S	9.3	AC	10.0	B		25	3	6			LOO01
1985 09 19.36	S	10.1	WB	15	R	5	62	3.2	5	0.06	265	MOR03
1985 09 19.47	M	8.9		15	L	3	16					KEE
1985 09 19.47				32	L	4	66	3.1	5	0.23	290	KEE
1985 09 20.12	S	8.8	S	10.0	B		14	5.7	4			HAS02
1985 09 20.45	S	8.5	AA	8.0	B		20	6.4	2			MOR
1985 09 20.47	M	8.5	AA	25.6	L	4	45	2.1	5	0.25	265	MOR
1985 09 21.47	M	8.5	AA	25.6	L	4	45	2.1	5	0.20	283	MOR
1985 09 21.47	S	8.5	AA	8.0	B		20	6.4	2			MOR
1985 09 21.49	S	8.7	S	25.4	L	4	32	4	6	0.17	264	MAC
1985 09 22.06	S	8.6	S	40.0	L	5	81	& 3.0	3	0.33	281	MER
1985 09 22.44	S	8.8	WB	8.0	B		20	6.4	1			MOR
1985 09 22.44	S	8.7	S	25.4	L	4	32	3	7	0.17	287	MAC
1985 09 22.44	M	8.7	WB	25.6	L	4	45	2.1	5	0.10	260	MOR
1985 09 22.78	S	8.9	A	15.2	L	5	29					SEA
1985 09 23.83	S	9.4	AA	41	L	4	86	2	6	0.2	80	CLA
1985 09 23.85	S	9.5	AA	31.7	L	5	49	1.5	5	0.15	264	PEA
1985 09 24.11	S	8.6	S	40.0	L	5	81	& 3.0	3	0.10	268	MER
1985 09 24.17	S	9.6	AC	25.0	L	10	100	2	2			LOO01
1985 09 25.15	S	9.0	AC	30.5	L	5	60	2.1	4/			ZAN
1985 09 25.35	S	10.1	AC	15	R	5	62	2.1	4			MOR03

Periodic Comet Giacobini-Zinner (1984e) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 09 25.44	S	9.1	S	25.4	L	4	32	3	7	0.08	272	MAC
1985 09 26.12	S	8.9	AC	8.0	B		20	4	1			BOU
1985 09 26.13	S	9.6	AC	20.3	C	10	80		4			COM
1985 10 07.38	S	11.9	AC	44.5	L	4	167	0.7	4			MOR03
1985 10 11.49	S	9.8	S	25.4	L	4	64	2	7			MAC
1985 10 12.06	S	9.4	AC	40.0	L	5	81	& 2.0	2/	0.08	274	MER
1985 10 12.36	S	8.8	AA	20.3	L	7	55	& 5.2	3/			GRE
1985 10 12.37	S	8.9	AA	8.0	B		20	& 8.4	2			GRE
1985 10 12.37	S	10.8	AC	15	R	5	62	2.1	2			MOR03
1985 10 12.47	M	9.6	AC	25.6	L	4	67	1.5	7/	0.13	270	MOR
1985 10 13.14	S	9.4	AC	40.0	L	5	81	& 2.0	3/	0.08	267	MER
1985 10 13.15	S	10.1	AC	30.5	L	5	60	1.7	6/	0.14	262	ZAN
1985 10 13.45	M	9.6	AC	25.6	L	4	67	1.7	7/	0.12	260	MOR
1985 10 15.48	S	10.0	S	25.4	L	4	32	3.0	7			MAC
1985 10 15.49	M	11.5	AC	32	L	4	100	1.5	5	0.13	280	KEE
1985 10 17.53	S	10.3	S	25.4	L	4	64	1.5	7			MAC
1985 10 18.11	S	10.3	AC	25.4	L	4	46	1.8	5	0.11	265	ZAN
1985 10 19.44	M	10.2	AC	25.6	L	4	67	1.8	7	0.08	290	MOR
1985 10 19.84	S	10.2	WA	41	L	4	86	1.75	6	0.25	83	CLA
1985 10 20.47	M	11.5:	AC	32	L	4	66	1.0	5	0.08	290	KEE
1985 10 21.37	S	10.9	AC	15	R	5	62	1.9				MOR03
1985 10 21.40	S	11.2	AC	44.5	L	4	167	0.9	4	0.02	300	MOR03
1985 10 22.17	S	10.5:	AC	25.4	L	4	91	1.9	3/			ZAN
1985 10 23.10	S	10.3	AC	25.4	L	4	91	1.5	4	0.06	265	ZAN
1985 10 23.39	S	9.4	L	20.3	L	6	116	& 4.4	4			GRE
1985 10 23.39	S	9.5	L	20.3	L	6	38	& 5.3	3			GRE
1985 10 24.41	S	9.6	L	20.3	L	6	38	& 5.9	3			GRE
1985 10 25.38	S	10.8	AC	15	R	5	62	1.7	2			MOR03
1985 10 25.51	M	11.8:	AC	32	L	4	80	0.5	5	0.03	280	KEE
1985 10 26.20	S	10.0	AC	40.0	L	5	81	& 2.0	3			MER
1985 10 26.36	S	9.9	L	20.3	L	6	38	& 5.0	2/			GRE
1985 10 26.52	S	10.3	S	25.4	L	4	64	1.5	5	0.04	270	MAC
1985 11 09.73	S	11.2	WA	41	L	4	86	0.75	3	0.08	85	CLA
1985 11 16.76	S	11.7	WA	41	L	4	86	1	2	0.03	90	CLA

Periodic Comet Ashbrook-Jackson (1985a)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 08 14.65	S	12.8	VN	31.7	L	5	149	0.5	2			PEA
1985 08 15.52	S	13.0	VN	31.7	L	5	149	0.5	3			PEA
1985 09 01.49	S	13.2	VN	31.7	L	5	149	0.4	2			PEA
1985 10 13.09	S	12.5	AC	25.6	L	4	156	1.0	3			MOR

Periodic Comet Giclas (1985g)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 16.45	S	13.4	WA	25.6	L	4	156	0.85	3			MOR
1985 10 17.33	S	13.3	WA	25.6	L	4	156	1.0	2/			MOR
1985 10 19.39	S	13.4	WA	25.6	L	4	156	1.0	2			MOR
1985 12 04.81	S	14.0	AC	40.0	L	5	170	0.6	1			MER

Periodic Comet Ciffréo (1985p)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 14.85	S	11.5	AC	40.0	L	5	81	1.2	5	0.02	291	MER
1985 11 17.38	S	11.5	WA	25.6	L	4	111	2.4	2			MOR
1985 11 19.68	S	10.9	AC	41	L	4	86	2	2			CLA
1985 12 02.83	S	12.3	AC	40.0	L	5	81	0.5	4			MER
1985 12 03.75	S	11.5:	AC	20.3	T	10	92	1.3	2			HAS02
1985 12 04.80	S	12.4	AC	40.0	L	5	170	1.0	2			MER
1985 12 12.80	S	11.6	AC	15.2	L	5	44	2	2			MOE
1985 12 12.81	S	12.5	AC	40.0	L	5	170	0.7	3	?	201	MER
1985 12 31.74	S	11.4	AC	15.2	L	5	44	2	1			MOE

Periodic Comet Halley (1982i)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 07 28.71		12.6:		41	L	4	135	0.3	1			CLA
1985 08 13.10	S	14 :	WA	40.6	L	6	126	& 0.5	5			BUS01
1985 08 13.10	S	14 :	WA	40.6	L	6	164	& 0.5				BOU
1985 08 13.90	S	13.5	AC	41	L	4	165	0.4	2			PEA
1985 08 14.86	S	13.1	WA	41	L	4	135	0.4	2			CLA
1985 08 15.11	S	13.7	WA	40.6	L	6	164	0.3	2			BUS01
1985 08 15.12	S	13.8	WA	40.6	L	6	164	0.3	2			BOU
1985 08 17.11	S	13.5	WA	40.6	L	6	102	0.3	2			BUS01
1985 08 17.12	S	13.6	WA	40.6	L	6	102		1/			BOU
1985 08 17.36	B	15.0:	WA	44.5	L	4	167					MOR03
1985 08 19.11	S	13.5	WA	40.6	L	6	126	0.3	2			BUS01
1985 08 19.12	S	13.5	WA	40.6	L	6	164	0.4	1/			BOU
1985 08 21.85	S	13.3	WA	41	L	4	135	0.3	2			CLA
1985 08 21.90	S	13.7	AC	41	L	4	165	0.3	2			PEA
1985 08 22.12	S	13.5	WA	40.6	L	6	164	0.4	1/			BOU
1985 08 22.36	B	15.0:	WA	44.5	L	4	167	& 0.2				MOR03
1985 08 23.36	S	15.0:	WA	44.5	L	4	167	& 0.2				MOR03
1985 08 24.13	S	13.3	WA	40.6	L	6	164	0.4	2			BOU
1985 08 24.13	S	13.5	WA	40.6	L	6	164	0.3	2			BUS01
1985 08 26.12	S	13.1	WA	40.6	L	6	126	0.5	4			BOU
1985 08 26.12	S	13.0	WA	40.6	L	6	126	0.6	1/			BUS01
1985 08 26.13	S	13.0	WA	25.4	J	6	90		2			BUS01
1985 08 26.13	S	13.0	WA	25.4	J	6	90					BOU
1985 08 26.50	S	13.5	A	40.6	L	4	140	1	1			DUC
1985 09 10.46	S	12.8	A	40.6	L	4	200	1	2			DUC
1985 09 11.39	S	13.3	WA	44.5	L	4	167	0.4				MOR03
1985 09 12.04	S	12.8	AC	40.0	L	5	170	0.4	3/	0.01		MER
1985 09 12.49	M	13.2	WA	25.6	L	4	156	0.68	5			MOR
1985 09 13.01	O	13 :	A	25	L	6	180	0.67	8			AND01
1985 09 13.13	S	13.2	WA	25	L	10	250	0.5	6			LOO01
1985 09 13.37	S	13.3	WA	44.5	L	4	167	0.5	3			MOR03
1985 09 14.11	S	12.6	WA	25.4	J	6	117	0.6	2			BOU
1985 09 14.11	S	12.3	WA	25.4	J	6	73	& 1	2			BUS01
1985 09 14.38	S	13.5	WA	44.5	L	4	167	0.4	2			MOR03
1985 09 14.45	S	12.6	AC	32	L	4	66	2.0	3			KEE
1985 09 14.47	M	12.8	WA	40.6	L	4	183	0.6	6			MOR
1985 09 14.49	M	12.9	WA	25.6	L	4	156	0.6	6			MOR
1985 09 14.49	M	12.9	WA	47.	L	4	204	0.6	5/			MOR
1985 09 15.02	S	12.4	AC	40.0	L	5	170	1.0	3/	0.01	271	MER
1985 09 15.53	S	12.7	A	25.4	L	4	64	1.0	3			MAC
1985 09 16.36	S	13.7	WA	44.5	L	4	167	0.5				MOR03
1985 09 16.49	M	12.8	WA	25.6	L	4	156	0.61	6			MOR

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 09 17.50	M	12.3	WA	25.6	L	4	156	0.75	5			MOR
1985 09 17.52	S	12.5	A	25.4	L	4	64	1.0	2			MAC
1985 09 18.08	S	12.5	WA	20.3	T	10	80	& 0.5	1/			COM
1985 09 18.10	S	12.4	WA	25.4	J	6	90	0.8	1/			BOU
1985 09 19.05	O	12.7	A	25	L	6	120	0.67	7/			AND01
1985 09 19.09	S	12.4	WA	15.0	R	8	150	0.4	8/			AER
1985 09 19.12	S	12.5	WB	25	L	10	147	& 1	7			LOO01
1985 09 19.38	S	13.7	WA	44.5	L	4	167	0.6	2			MOR03
1985 09 19.44	S	12.5	AC	32	L	4	66	2.0	2			KEE
1985 09 20.08	S	13.0	AC	20.5	L	4	126	0.4	6			HAS02
1985 09 20.47	M	12.4	WA	25.6	L	4	156	0.75	4			MOR
1985 09 21.05	O	12.5	A	25	L	6	120	0.75	7			AND01
1985 09 21.08	S	11.9	AC	40.0	L	5	170	1.2	2/	0.02	270	MER
1985 09 21.46	S	12.4	A	40.6	L	4	200	1	2			DUC
1985 09 21.50	S	12.2	A	25.4	L	4	64	1.2	3			MAC
1985 09 21.50	M	12.2	WA	25.6	L	4	156	0.75	4/			MOR
1985 09 21.51	S	12.8	WA	25.6	L	4	45		8			MOR
1985 09 21.51	M	12.5	WA	25.6	L	4	67	0.38	7			MOR
1985 09 21.51	S	12.3	WA	25.6	L	4	222	0.50	3			MOR
1985 09 21.52	M	12.3	WA	25.6	L	4	111	0.60	6			MOR
1985 09 22.04	S	11.6	AC	40.0	L	5	81	1.5	2/	0.03	270	MER
1985 09 22.47	M	12.2	WA	25.6	L	4	156	0.9	4/			MOR
1985 09 22.50	M	12.3	WA	12.5	T	10	122	0.76	4/			MOR
1985 09 22.50	S	12.2	A	25.4	L	4	32	1.2	2			MAC
1985 09 23.42	M	12.1	WA	25.6	L	4	156	0.9	4			MOR
1985 09 23.86	S	12.4	AC	31.7	L	5	149	0.7	3			PEA
1985 09 24.06	S	11.6	AC	40.0	L	5	170	& 1.0	3			MER
1985 09 24.16	S	12.2	WA	25	L	10	147	& 1	7			LOO01
1985 09 25.11	S	12.6	WA	30.5	L	5	94	1.3	4			ZAN
1985 09 25.38	S	12.9	WA	44.5	L	4	167	0.6	4			MOR03
1985 09 25.46	S	12.0	A	25.4	L	4	64	1.2	4			MAC
1985 09 26.10	S	11.8	WA	25.4	J	6	73	1.2	2/			BOU
1985 09 26.11	S	11.7	WA	20.3	T	10	80	& 1	3			COM
1985 09 26.49	M	11.8	WA	25.6	L	4	156	1.1	4			MOR
1985 09 26.49	M	11.4	WA	25.6	L	4	67	2.1	3			MOR
1985 09 27.15	S	11.5	WA	10	L	9	23	1.6	2			WEG
1985 09 28.39	S	13.1	WA	44.5	L	4	167	& 0.4				MOR03
1985 09 30.36	S	11.7	L	22.9	R	12	261	& 1.3	3			GRE
1985 10 06.36	S	11.9:	L	22.9	R	12	261	& 1.1	5			GRE
1985 10 07.36	S	12.2	WA	44.5	L	4	167	0.7	4			MOR03
1985 10 07.36	S	10.9	L	22.9	R	12	261	& 1.5	5/			GRE
1985 10 07.39	M	10.8	WA	25.6	L	4	67	1.6	4			MOR
1985 10 07.39	M	11.4	WA	25.6	L	4	156					MOR
1985 10 07.86	S	10.9	WA	41	L	4	86	1.5	5			CLA
1985 10 08.37	S	10.7	L	22.9	R	12	261	& 1.5	6			GRE
1985 10 08.37	M	10.5	L	22.9	R	12	261	& 1.5	6			GRE
1985 10 08.42	S	11.4	A	40.6	L	4	200	1.5	3			DUC
1985 10 08.99	S	11.3	AC	15.2	L	5	44	1.5	3			MOE
1985 10 10.15	S	11.7	WA	25	L	6	80	1	5/			LOO01
1985 10 10.54	S	11.4	AA	25.4	L	4	64	2.0	5			MAC
1985 10 10.71	S	10.6	WA	15.2	L	5	76	2				SEA
1985 10 10.94	S	11.0	AC	40.0	L	5	81	& 3.0	3/	0.01	273	MER
1985 10 11.30	S	11.5	WA	15	R	5	62	1.8	3			MOR03
1985 10 11.34	S	11.6	WA	44.5	L	4	80	1.4	5			MOR03
1985 10 11.43	M	10.3	WA	25.6	L	4	67	2.8	4			MOR

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 11.46	S	10.1	NP	8.0	B		20	4	3			MOR
1985 10 11.50	S	11.2	AA	25.4	L	4	64	2.0	5			MAC
1985 10 11.91	S	11.2	W	25.4	L	5	71	2.5	6			ZAN
1985 10 12.00	S	10.8	AC	40.0	L	5	81	& 3.0	4	0.03	270	MER
1985 10 12.01	S	10.3	AC	15.0	L	5	25	& 3.0	2			MER
1985 10 12.04	S	10.4	WA	15.6	L	5	36	2.5	3			BOU
1985 10 12.04	S	10.7	WA	20.3	T	10	80	3	2			COM
1985 10 12.04	S	10.4	WA	15.6	L	5	36	2.5	3			BUS01
1985 10 12.08	S	10.6	WA	10	L	9	23	3	2			WEG
1985 10 12.08	S	11.4:	AC	20.3	T	10	169	0.5	4			KAM01
1985 10 12.11	S	11.4	WA	31	J	6	72		4			FEI
1985 10 12.26	M	10.3	L	20.3	L	7	135	& 3.3	5/			GRE
1985 10 12.26	S	10.5	L	20.3	L	7	135	& 3.3	5/			GRE
1985 10 12.31	S	10.3	L	8.0	B		20	& 3.3	2			GRE
1985 10 12.33	M	10.2	L	20.3	L	7	55	& 3.3	6			GRE
1985 10 12.33	S	10.4	L	20.3	L	7	55	& 3.3	6			GRE
1985 10 12.35	S	11.5	WA	15	R	5	62	2.1	2			MOR03
1985 10 12.49	M	10.3	WA	25.6	L	4	67	2.8	5			MOR
1985 10 12.50	M	11.4	WA	25.6	L	4	156	1.2	5			MOR
1985 10 12.54	S	11.1	AA	15.2	L	8	76	1.5	2			MAC
1985 10 12.98	S	10.2	AC	15.0	L	5	25	& 3.0	2			MER
1985 10 12.98	S	10.7	AC	40.0	L	5	81	& 3.0	3	0.02	14	MER
1985 10 13.00	S	11.1	AC	15.2	L	5	44	2	4			MOE
1985 10 13.05	S	10.1	WA	15.6	L	5	29	2.8	3			BOU
1985 10 13.08	S	10.8	WA	25	L	6	56	2.6	6			LOO01
1985 10 13.08	S	10.3:	WA	25.4	J	6	73	2.5	3/			BUS01
1985 10 13.09	S	11.4	AC	20.3	T	10	100	1.0	4			LIN02
1985 10 13.10	S	11.5	WA	15	R	8	150	1	3			AER
1985 10 13.10	S	10.8	W	30.5	L	5	60	3.6	5/			ZAN
1985 10 13.12	S	10.7	W	8.0	B		20					ZAN
1985 10 13.12	S	10.6	WA	20.3	T	10	80	& 5	2			COM
1985 10 13.13	S	10.3	WA	10	L	9	23	3	3			WEG
1985 10 13.13	S	10.5	WA	25.4	L	6	70	2.3	6			KUI
1985 10 13.17	S	10.6	WA	25.0	L	6	80	& 2	4			LOO01
1985 10 13.39	S	10.1	NP	8.0	B		20	4	2			MOR
1985 10 13.40	M	10.1	WA	25.6	L	4	45	3.7	3			MOR
1985 10 13.42	M	10.1	WA	25.6	L	4	67	2.5	3			MOR
1985 10 13.43	M	10.5	WA	25.6	L	4	111	1.4	6/			MOR
1985 10 13.44	M	10.7	WA	25.6	L	4	156	0.9	7			MOR
1985 10 13.44	S	11.1	AC	40.6	L	4	96	2	3			DUC
1985 10 14.05	S	10.2	WA	10.0	L	9	23	3	3			WEG
1985 10 14.12	S	10.1	WA	25	L	6	56	2.5	6			LOO01
1985 10 14.12	S	11.5	WA	15	R	8	150	1	3			AER
1985 10 14.13	S	10.6	W	30.5	L	5	60	3.6	4/			ZAN
1985 10 14.14	M	11.5	AA	10.6	R	6	24	3.5	3			KES01
1985 10 14.42	S	10.7	AA	15.2	L	8	76	2.0	4			MAC
1985 10 15.39	S	10.5	AA	25.4	L	4	64	2.0	6			MAC
1985 10 15.44	S	10.8	AC	40.6	L	4	96	2.5	4			DUC
1985 10 15.44	M	10.4	AC	32	L	4	66	4	5			KEE
1985 10 16.16	S	10.3	W	30.5	L	5	60	3.1	5/			ZAN
1985 10 16.49	S	10.0	WA	25.6	L	4	45	3.1	4			MOR
1985 10 17.00	O	9.6	A	25	L	6	120	3	5			AND01
1985 10 17.35	S	9.5	L	22.9	R	12	261	& 1.6	6/			GRE
1985 10 17.35	M	9.4	L	22.9	R	12	261	& 1.6	6/			GRE
1985 10 17.39	S	9.8	NP	8.0	B		20	4.3	2			MOR

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 17.39	S	9.6	WA	8.0	B		20					MOR
1985 10 17.40	S	10.3	AA	25.4	L	4	64	2.0	5			MAC
1985 10 17.40	S	9.9	NP	25.6	L	4	45	3.7	4			MOR
1985 10 17.69	S	9.4	WA	15.2	L	5	29					SEA
1985 10 17.69	S	9.3	WA	15.2	L	5	76	4	5			SEA
1985 10 18.02	S	10.0	AC	14.0	S	4	25	2.1	5			LIN02
1985 10 18.03	S	10.0	W	25.4	L	5	46	4.5	5/			ZAN
1985 10 18.06	S	10.0:	W	8.0	B		20	5	3/			ZAN
1985 10 18.34	S	9.4	WA	8.0	B		20	7	3			MOR
1985 10 18.35	S	9.7:	WC	8.0	B		20					MOR
1985 10 18.35	S	9.8	L	8.0	B		20					MOR
1985 10 18.35	S	9.8	NP	8.0	B		20					MOR
1985 10 18.36	S	9.4	L	22.9	R	12	261	& 2.2	6/			GRE
1985 10 18.38	S	9.4	L	22.9	R	12	86	& 2.9	4/			GRE
1985 10 18.95	S	10.4	AC	15.2	L	5	44	2.5	5			MOE
1985 10 19.01	O	9.3	A	25	L	6	120	3	5			AND01
1985 10 19.03	S	9.4	WA	15.6	L	5	29	& 4	4			BUS
1985 10 19.03	S	9.3	WC	15.6	L	5	29	3.5	4			BOU
1985 10 19.04	I	13.2	WA	15.6	L	5	45	< 0.1				BOU
1985 10 19.05	S	9.8	WA	10.8	R	10	22	4	3			COM
1985 10 19.06	S	10.3	WA	25.8	L	5	50		3			FEI
1985 10 19.41	S	10.3	AA	25.4	L	4	64	2.5	6			MAC
1985 10 19.48	M	9.1	WC	25.6	L	4	45	6.1	3			MOR
1985 10 19.49	M	9.1	WC	8.0	B		20	7.7	1			MOR
1985 10 19.51	S	8.8	WC	4.0	R		12	12	0/			MOR
1985 10 19.85	S	10.2	WA	41	L	4	86	2	5	0.02	85	CLA
1985 10 19.93	S	10.5	AC	15.2	L	5	44	2	4			MOE
1985 10 19.94	S	9.9	AC	40.0	L	5	81	3.0	4	0.03	284	MER
1985 10 19.95	B	9.5	AC	15.0	L	5	75	4.0	2			MER
1985 10 20.01	S	10.6	WA	32	L	7	100	2	6/			LOO01
1985 10 20.05	S	10.3	WA	32	L	7	200	4	5			AER
1985 10 20.10	B	10.0	WA	15	R	15	88	3	4/			GEE
1985 10 20.17	B	11.0	AC	31.8	L	5	62	2.25	3			SIM01
1985 10 20.17	B	11.2	AC	31.8	L	5	62	2	3			SIM
1985 10 20.35	S	9.2:	L	22.9	R	12	261	& 2	7			GRE
1985 10 20.37	S	10.3	AA	25.4	L	4	64	2.0	7			MAC
1985 10 20.40	K	9.1	AC	4.0	B		8	11	2			KEE
1985 10 20.40	M	9.5	AC	32	L	4	40	17	5			KEE
1985 10 20.42	S	10.2	WA	15	R	5	62	2.2	4			MOR03
1985 10 20.45	S	9.1	NP	8.0	B		20					MOR
1985 10 20.45	S	9.0	WC	8.0	B		20	9	1			MOR
1985 10 20.45	M	9.2	WC	25.6	L	4	45	4.9	3			MOR
1985 10 20.65	S	9.2	WA	15.2	L	5	29					SEA
1985 10 20.65	S	9.2	WA	8.0	B		15					SEA
1985 10 20.93	B	9.7	AC	40.0	L	5	81	2.5	4	0.03	230	MER
1985 10 21.00	S	9.6	WA	11	L	5	21	3	3			FEI
1985 10 21.00	S	9.2	WC	15.6	L	5	29	4.5	3			BUS
1985 10 21.00	B	9.8	WA	15.6	L	5	29					BUS
1985 10 21.00	I	13.0	WA	25.4	J	6	90	< 0.1				BOU
1985 10 21.01	S	9.0	WC	15.6	L	5	29	4	4/			BOU
1985 10 21.04	S	9.8	WA	25.4	L	6	70	2.5	6			KUI
1985 10 21.06	S	9.5	WA	20.3	T	10	65	6	3			COM
1985 10 21.12	S	10.2	WA	15	R	8	68	4	5			AER
1985 10 21.14	S	9.4	WC	25	L	6	56	6	4			LOO01
1985 10 21.34	S	9.6	L	22.9	R	12	86	& 1.6	5/			GRE

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 21.35	S	10.0	WA	15	R	5	62	3.2	4			MOR03
1985 10 21.35	S	9.6	L	22.9	R	12	261	& 1.5	6/			GRE
1985 10 21.35	M	9.3	L	22.9	R	12	261	& 1.5	6/			GRE
1985 10 21.37	S	9.3	WA	22.9	R	12	86	& 2.5	6/			GRE
1985 10 21.37	S	9.3	L	22.9	R	12	86	& 2.5	6/			GRE
1985 10 21.37	M	9.1	L	22.9	R	12	86	& 2.5	6/			GRE
1985 10 21.37	M	9.1	WA	22.9	R	12	86	& 2.5	6/			GRE
1985 10 21.47	K	8.9	AC	4.0	B		8	11	3			KEE
1985 10 21.69	S	9.1	W	15.2	L	5	29	3	6			SEA
1985 10 21.69	S	9.1	W	15.2	L	5	76					SEA
1985 10 22.00	S	9.0:	WC	20.3	T	10	65	6				COM
1985 10 22.01	S	9.2	WC	15	R	15	31	3	4/			GEE
1985 10 22.12	S	9.1	W	25.4	L	5	46	4.5	5/			ZAN
1985 10 22.13	S	9.4	WC	25	L	6	56	5	5			LOO01
1985 10 22.15	S	9.1	W	8.0	B		20	4.2	5			ZAN
1985 10 22.17	S	10.1	WA	15	R	8	68	3	5			AER
1985 10 22.34	S	9.0	WA	22.9	R	12	86	& 2.5	6/			GRE
1985 10 22.34	M	8.9	WA	22.9	R	12	86	& 2.5	6/			GRE
1985 10 22.35	S	9.0	WC	22.9	R	12	86	& 2.5	6/			GRE
1985 10 22.35	M	8.8	WC	22.9	R	12	86	& 2.5	6/			GRE
1985 10 22.44	S	9.7	AC	40.6	L	4	70	3	5			DUC
1985 10 22.95	S	10.2	AC	15.2	L	5	44	2	5			MOE
1985 10 23.01	S	8.8	WC	15.6	L	5	24	5.5	4			BOU
1985 10 23.10	S	9.1	W	25.4	L	5	46	6	5/			ZAN
1985 10 23.11	S	9.2	W	8.0	B		20	6	5			ZAN
1985 10 23.27	S	9.1	WC	20.3	L	6	116					GRE
1985 10 23.28	M	8.8	WC	20.3	L	6	116					GRE
1985 10 23.35	M	8.5	WC	20.3	L	6	38	& 7.8	6/			GRE
1985 10 23.35	S	8.7	WC	20.3	L	6	38	& 7.8	6/			GRE
1985 10 23.36	S	8.7	WC	8.0	B		20	& 7.8	3			GRE
1985 10 23.42	S	8.9	NP	8.0	B		20					MOR
1985 10 23.42	S	8.8	WC	8.0	B		20	7	2			MOR
1985 10 23.71	S	9.3	WA	15.2	L	5	76	1.8				SEA
1985 10 24.01	S	9.7	WC	15	R	15	110	3	3			GEE
1985 10 24.05	S	9.4	WC	11	L	5	31		3			FEI
1985 10 24.06	S	9.1	WC	25	L	6	56	6	3/			LOO01
1985 10 24.10	S	8.7	WC	15.6	L	5	24	& 5	5			BOU
1985 10 24.16	S	9.6	WA	25.4	L	6	70	2.5	6			KUI
1985 10 24.17	S	10.1	WA	15	R	8	68	& 5.5	5			AER
1985 10 24.17	S	9.0	WC	10	B		14	6	3			LOO01
1985 10 24.36	S	8.8	WC	20.3	L	6	38	& 5.8	3			GRE
1985 10 24.36	S	8.8	WC	20.3	L	6	116	& 4.9	5/			GRE
1985 10 24.38	S	8.5	WC	8.0	B		20	& 8.7	4			GRE
1985 10 24.38	M	8.8	WC	20.3	L	6	38					GRE
1985 10 24.45	S	9.8	AC	40.6	L	4	140	3	5			DUC
1985 10 25.05	S	9.6	WC	20.3	T	10	81	1.5	5			KAM01
1985 10 25.10	B	9.5	AA	10.0	B		14	2.0	4			HAS02
1985 10 25.37	S	10.2	WA	15	R	5	62	2.4	3			MOR03
1985 10 25.47	K	8.4	AC	4.0	B		8	11	2			KEE
1985 10 25.49	M	8.8	AC	32	L	4	80	10	5			KEE
1985 10 25.49	S	8.8	NP	8.0	B		20					MOR
1985 10 25.49	S	8.7	WC	8.0	B		20	8	2			MOR
1985 10 26.17	S	9.1	W	8.0	B		20	6.2	5/			ZAN
1985 10 26.18	B	9.2	AA	40.0	L	5	81	4.0	4	0.03	284	MER
1985 10 26.28	S	8.3	WC	22.9	R	12	86	& 4.0	6/			GRE

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 10 26.28	M	8.2	WC	22.9	R	12	86	& 4.0	6/			GRE
1985 10 26.38	S	8.8	WC	20.3	L	6	116	& 2.5	6/			GRE
1985 10 26.41	S	8.5	WC	20.3	L	6	38	& 8	6/			GRE
1985 10 26.52	S	8.7	WC	8.0	B		20	& 8				MOR
1985 10 26.54	S	9.8	AA	25.4	L	4	64	4.0	7			MAC
1985 10 27.18	S	9.0	W	8.0	B		20	6.3	3/			ZAN
1985 10 27.37	S	8.4	WC	22.9	R	12	86	& 4	7			GRE
1985 10 27.37	M	8.2	WC	22.9	R	12	86	& 4	7			GRE
1985 10 28.36	M	8.2	WC	22.9	R	12	86	& 4	6/			GRE
1985 10 28.36	S	8.2	WC	22.9	R	12	86	& 4	6/			GRE
1985 10 28.75	S	8.2	W	8.0	B		15					SEA
1985 10 29.30	M	9.8:	AC	32	L	4	40	2	3			KEE
1985 10 29.38	S	8.6	WC	22.9	R	12	86	& 3	6/			GRE
1985 10 29.38	M	8.4	WC	22.9	R	12	86	& 3	6/			GRE
1985 10 29.38	S	8.8	WC	22.9	R	12	261	& 2	6/			GRE
1985 10 29.38	M	8.6	WC	22.9	R	12	261	& 2	6/			GRE
1985 10 29.43	S	7.8	WC	8.0	B		20	& 5	3			GRE
1985 10 30.17	S	8.1	WC	22.9	R	12	86	& 3	5/			GRE
1985 11 01.20	S	8.8:	WC	22.9	R	12	86	& 3	2/			GRE
1985 11 02.22	S	8.5:	S	8.0	B		20		3			MOR
1985 11 02.29	S	9.3	AA	15.2	L	8	76	2.5	4			MAC
1985 11 02.39	S	8.9	WA	15	R	5	62	3.5				MOR03
1985 11 02.92	S	8.8	AC	15.2	L	5	44	3	4			MOE
1985 11 03.31	S	9.1	AA	15.2	L	8	76	3	4			MAC
1985 11 03.36	S	7.5	WC	8.0	B		20	9	3			MOR
1985 11 03.36	S	7.6	AA	8.0	B		20					MOR
1985 11 03.54	S	7.5	D	8.0	B		15					SEA
1985 11 04.16	K	7.5	AA	4.0	B		8	13	3			KEE
1985 11 04.61	S	8.8	D	20	L	6	60	3	5			CLA
1985 11 04.78	B	8.9:	AA	10.0	B		14	& 3.1	4			HAS02
1985 11 04.79	S	8.8	AA	8.0	B		20	4.7	6			KOC01
1985 11 05.22	M	7.3	WC	8.0	B		20	10	4	1	302	MOR
1985 11 05.22	M	7.4	AA	8.0	B		20					MOR
1985 11 05.24	M	7.6	WC	25.6	L	4	45	8	7/	0.33	125	MOR
1985 11 05.24				25.6	L	4	45			0.20	220	MOR
1985 11 05.26	M	8.6	WC	25.6	L	4	156	2.5	8			MOR
1985 11 05.75	S	8.6	D	20	L	6	60	3.5	6			CLA
1985 11 05.89	S	8.2	W	15.2	L	5	44	4.5	6			MOE
1985 11 06.21	M	7.2	AA	8.0	B		20	11	4	0.25	150	MOR
1985 11 06.21				8.0	B		20			0.33	235	MOR
1985 11 06.23	S	6.9	A	20.0	C	10	64	5	5			SPR
1985 11 06.24	S	6.7	A	8.0	B		11	11	4	?	260	SPR
1985 11 06.28	S	8.8	S	15.2	L	8	76	5	7			MAC
1985 11 06.28	S	8.3	S	8.0	B		20	8	5			MAC
1985 11 06.42	S	8.1	AC	40.6	L	4	70	5	5			DUC
1985 11 06.82	B	8.0	AA	8.0	B		11		3			GUB
1985 11 06.86	B	8.0	AA	10.0	B		14	8.3	4			HAS02
1985 11 06.86	B	7.8	AA	5.0	B		7	12	2			MER
1985 11 06.86	B	7.8	AA	15.0	L	5	25	& 6	4	0.08		MER
1985 11 06.89	M	7.5	AA	10.6	R	6	24	6	5			KES01
1985 11 06.92	B	8.3	AA	8.0	B		20	7.1	6			KOC
1985 11 06.93	S	8.0	AA	8.0	B		20	16.1	6			KOC01
1985 11 07.20	S	6.4	A	8.0	B		11	12	5			SPR
1985 11 07.21	S	6.6	A	14.0	S	4	28	9	4			SPR
1985 11 07.22	M	7.1	AA	8.0	B		20	15	4			MOR

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 07.24				25.6	L	4	67			0.20	160	MOR
1985 11 07.24				25.6	L	4	67			0.17	225	MOR
1985 11 07.29	K	7.2	AA	4.0	B		8	13	3			KEE
1985 11 07.41	S	8.5	S	25.4	L	4	32	9	8			MAC
1985 11 07.90	S	8.1	W	15.2	L	5	44	4.5	6			MOE
1985 11 08.20	S	7.7	AA	3.5	B		7	12	3			MOR03
1985 11 08.33	S	8.4	S	15.2	L	8	76	6	7			MAC
1985 11 08.41	S	6.3:	AA	0.0	E		1	30	2			MOR
1985 11 08.43	M	6.8	AA	8.0	B		20	17	5			MOR
1985 11 08.58	I	6.7	D	2.5	B		2					SEA
1985 11 08.58	S	6.9	D	8.0	B		15		6			SEA
1985 11 08.85	O	7.3	A	8.0	B		20	7	5			AND01
1985 11 09.03	B	9.7	AA	31.8	L	5	62	4.5	3			SIM
1985 11 09.14	S	7.5	AA	3.5	B		7	12				MOR03
1985 11 09.15	B	7.3	S	9.6	L			8.5				DEA
1985 11 09.17	S	6.4	AA	8.0	B		20	&17	7			GRE
1985 11 09.17	B	6.9:	AA	8.0	B		20	&17	7			GRE
1985 11 09.18	M	6.1	AA	5.0	B		7	&22	6			GRE
1985 11 09.18	S	6.3	AA	5.0	B		7	&22	6			GRE
1985 11 09.18	B	7.5	AA	5.0	B	3	7		0			SIM01
1985 11 09.18	B	7.5	AA	5.0	B	3	7		0			SIM
1985 11 09.18	B	9.0	AA	31.8	L	5	62	4.0	7			SIM01
1985 11 09.20	M	6.5	AA	8.0	B		20	17	6			MOR
1985 11 09.21	S	6.2	A	14.0	S	4	28	8	5			SPR
1985 11 09.22	S	6.0	A	8.0	B		11	12	4			SPR
1985 11 09.23	S	6.2	A	20.0	C	20	64	8	5	0.08	265	SPR
1985 11 09.33	S	8.2	S	15.2	L	8	76	7	8			MAC
1985 11 09.53	S	6.7	D	8.0	B		15	12				SEA
1985 11 09.67	S	8.2	D	41	L	4	86	8	7			CLA
1985 11 10.28	S	7.7	S	8.0	B		20	8	5			MAC
1985 11 10.57	S	6.6	W	8.0	B		15	18	6			SEA
1985 11 10.58	S	6.5	D	8.0	B		15					SEA
1985 11 10.84	S	7.3	W	15.2	L	5	44	5	6			MOE
1985 11 10.87	O	7.4	A	8.0	B		20	8	4			AND01
1985 11 10.95	B	7.2	AA	5.0	B		7	16	3			MER
1985 11 11.15	S	5.8	A	8.0	R	4	19	11	3			SPR
1985 11 11.22	K	6.3	AC	4.0	B		8	17	4			KEE
1985 11 11.28	K	6.3	AC	4.0	B		8	22	4			KEE
1985 11 11.28	I	6.3	AC	0.9	E		1					KEE
1985 11 11.29	S	7.8	S	8.0	B		20	7	3			MAC
1985 11 11.31	S	5.7	A	8.0	B		11	12	3			SPR
1985 11 11.76	B	7.9	AA	10.0	B		14	4.5	5			HAS02
1985 11 11.77	B	7.1	AA	8.0	B		20	5.4				KOC
1985 11 11.81	B	7.1	AA	5.0	B		7	& 8	3			MER
1985 11 11.82	B	7.9	AA	3.0	B		8	5.6	5			HAS02
1985 11 11.82	B	6.6	AA	5.0	B		7	&10				MER
1985 11 11.82	S	7.8	AA	8.0	B		20	4.1	6			KOC01
1985 11 11.90	M	7.7	D	8.0	B		11	10	4			GUB
1985 11 12.06	B	9.0	AA	10.0	B	3	14		3			SIM01
1985 11 12.06	B	8.5	AA	10.0	B	3	14		3			SIM
1985 11 12.16	S	5.7	A	8.0	B		11	10	3			SPR
1985 11 12.24	K	6.2	AC	4.0	B		8	25	4			KEE
1985 11 12.26	S	7.6	S	8.0	B		20	7	5			MAC
1985 11 12.46	S	7.3	AA	8.0	B		11	9	5			DUC
1985 11 12.92	B	6.7	AA	5.0	B		7	13	3			MER

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 13.14	S	5.5	A	8.0	B		11	14	3			SPR
1985 11 13.14	S	5.6	A	8.0	R	4	19	10	3			SPR
1985 11 13.16	S	5.1:	A	0.8	E		1	20	1			SPR
1985 11 13.25	S	7.2	S	8.0	B		20	7	6			MAC
1985 11 13.29	K	6.2	AC	4.0	B		8	23	4			KEE
1985 11 13.55	S	6.3	W	5.0	B		10					SEA
1985 11 13.58	S	7.6	D	41	L	4	86	8	7			CLA
1985 11 13.60	S	7.2	D	5.0	B		7	12	5			CLA
1985 11 13.89	B	6.6	AA	5.0	B		7	10	2	0.17	236	MER
1985 11 14.23	K	6.1	AC	4.0	B		8	12	4			KEE
1985 11 14.23	S	5.6	A	8.0	B		11	16	3			SPR
1985 11 14.35	S	6.0	AA	8.0	B		20	&18	7			GRE
1985 11 14.41	S	6.9	S	5.0	R		8	8	4			MAC
1985 11 14.80	B	6.3	AA	5.0	B		7	15	3			MER
1985 11 14.83	B	6.5:	D	10.0	B		14	& 7	4			HAS02
1985 11 14.87	M	6.3	AA	10.6	R	6	24	11	3			KES01
1985 11 15.03	S	6.7	AA	3.5	B		7	16.5				MOR03
1985 11 15.15	B	6.6	AA	8.0	B		20					MOR
1985 11 15.15	M	6.3	AA	8.0	B		20	14	6			MOR
1985 11 15.23	S	6.6	S	25.4	L	4	32	12	8			MAC
1985 11 15.44	S	5.6	AA	8.0	B		20	&18	4/			GRE
1985 11 15.84	B	6.4	AA	6.3	B		9	11	7			KAM01
1985 11 15.93	M	6.6	AA	10.6	R	6	24	10	4			KES01
1985 11 16.15	K	6.1	AC	4.0	B		8	15	4			KEE
1985 11 16.20	S	5.7	AA	5.0	B		7	&20	3/			GRE
1985 11 16.33	M	5.9	AA	8.0	B		20	14	7	0.28	105	MOR
1985 11 16.34	M	6.0	AA	25.6	L	4	45	6.4	7/			MOR
1985 11 16.35	M	7.6	AA	25.6	L	4	156	4.8				MOR
1985 11 16.65	S	7.3	D	41	L	4	86	9	7			CLA
1985 11 16.66	S	7.0	D	3.0	R		6	12	5			CLA
1985 11 16.66	S	7.0	D	12.5	R	5	31	10	7			CLA
1985 11 17.20	S	5.2	A	8.0	B		11	22	5			SPR
1985 11 17.22	S	5.3	A	8.0	R	4	19	20	5			SPR
1985 11 17.24	I	6.0	AC	0.9	E		1					KEE
1985 11 17.24	K	6.1	AC	4.0	B		8	22	5			KEE
1985 11 17.30	S	5.4	A	14.0	S	4	28	18	4			SPR
1985 11 17.32	S	5.0:	A	0.8	E		1	22	2			SPR
1985 11 17.41	M	5.9	AA	8.0	B		20	14	7			MOR
1985 11 17.83	S	6.3	W	6.0	R	8	12	5	6			MOE
1985 11 18.09	K	6.1	AC	4.0	B		8	12	4			KEE
1985 11 18.15	S	5.5	A	8.0	R	4	19	18	4			SPR
1985 11 18.15	S	5.4	A	8.0	B		11	20	3			SPR
1985 11 18.21	S	6.3	S	8.0	B		20	13	6			MAC
1985 11 18.24	M	6.1:	AA	22.9	R	12	86	&14	8			GRE
1985 11 18.24	M	5.5	AA	5.6	R	10	20	&14	6/			GRE
1985 11 18.24	S	5.6	AA	5.6	R	10	20	&14	6/			GRE
1985 11 18.30	M	5.6	AA	8.0	B		20	13	7			MOR
1985 11 18.30	S	5.7	AA	8.0	B		20	&18	6/			GRE
1985 11 18.32	M	5.5	AA	5.0	R		8	14	7			MOR
1985 11 18.34				25.6	L	4	45			0.67	101	MOR
1985 11 18.52	S	5.5	W	2.5	B		2					SEA
1985 11 19.10	M	5.4	AA	8.0	B		20	&11	6/			GRE
1985 11 19.23	S	5.3	AA	5.0	B		7	&25	5			GRE
1985 11 19.24	S	5.4	AA	8.0	B		20	&22	7			GRE
1985 11 19.32	M	5.5	AA	8.0	B		20	10	7	0.67	90	MOR

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 19.43	S	6.2	S	8.0	B		20	18	7			MAC
1985 11 19.43	S	5.9	S	13.1	R	7	27	21	8			MAC
1985 11 19.46		6.0	S	0.8	E		1	45	1			MAC
1985 11 19.61	S	5.4	W	2.5	B		2					SEA
1985 11 20.36	M	5.4	AA	5.0	R		8	13	6			MOR
1985 11 20.36	M	5.5	AA	8.0	B		20	11	7			MOR
1985 11 20.41	S	5.3:	AA	8.0	B		20	&14	2			GRE
1985 11 21.07	S	5.2	AA	5.0	B		7	&22	2/			GRE
1985 11 21.36	M	5.3	AA	5.0	R		8	16	7			MOR
1985 11 22.10	S	4.9	AA	5.0	B		7	&17	4			GRE
1985 11 22.11	S	6.1	AA	3.5	B		7	17	3			MOR03
1985 11 22.16	K	5.7	AC	4.0	B		8	17	4			KEE
1985 11 22.42	M	5.3	AA	5.0	R		8	16	6			MOR
1985 11 22.43				8.0	B		20			0.08	250	MOR
1985 11 22.43	M	5.5	AA	8.0	B		20	13	7	0.33	75	MOR
1985 11 23.14	S	5.4	A	8.0	B		11	18	3			SPR
1985 11 23.99	S	5.0	AA	8.0	B		20	&15	6/			GRE
1985 11 25.14	S	4.8:	AA	8.0	B		20	&12	3			GRE
1985 11 25.94	S	5.0	AA	8.0	B		20	&12	6/			GRE
1985 11 26.29	S	8.6	S	15.2	L	8	76	3	3			MAC
1985 11 28.82	S	6.4:	SC	5.0	B	4	10					KRA01
1985 11 28.90	S	6.0	W	6.0	R	12	25	6	6			MOE
1985 11 29.28	K	5.3	AC	4.0	B		8	15	4			KEE
1985 11 29.74	B	5.4	A	5.0	B		7	25	4			MER
1985 11 29.93	S	5.9	W	6.0	R	12	25	7.5	5			MOE
1985 11 30.72	S	5.8	W	15.2	L	5	44	8.5	6	1	80	MOE
1985 11 30.74	S	6.0	SC	5.0	B	4	10	11				KRA01
1985 11 30.96	B	5.4	A	5.0	B		7	25	4			MER
1985 12 01.11	S	5.3	A	20.0	C		64	25	5	0.17	75	SPR
1985 12 01.11	S	5.0	A	8.0	B		11	30	5			SPR
1985 12 01.15	K	5.2	AC	4.0	B		8	12	4			KEE
1985 12 01.17				32	L	4	40	10	5	0.33	120	KEE
1985 12 01.70	M	6.2	D	8.0	B		11	&12	5			GUB
1985 12 01.72	B	5.9	D	10.0	B		14	10.6	3			HAS02
1985 12 01.73	B	5.3	A	6.0	B		9	25	3			MER
1985 12 01.73	G	5.2	A	0.8	E		1	30	2			MER
1985 12 01.78	B	5.8	D	3.0	B		8	18.2	3			HAS02
1985 12 01.78	S	4.8	AA	5.0	B		7	31	6/	?	65	ZAN
1985 12 01.83	B	6.5	AA	5.0	B		10					REI01
1985 12 02.70	M	6.1	D	8.0	B		11	&11.5	6			GUB
1985 12 02.72	B	6.0	D	10.0	B		14	12.6	5			HAS02
1985 12 02.73	B	6.0	D	8.0	B		20	10.5	5			KOC01
1985 12 02.76	B	5.4	D	8.0	B		20	10.5	5			KOC
1985 12 02.77	G	5.0	A	0.8	E		1	60	1	1.0	75	MER
1985 12 02.78	B	5.9	D	3.0	B		8	16.8	4			HAS02
1985 12 02.86	M	6.1	AA	10.6	R	6	24	8	6			KES01
1985 12 02.91	B	6.5	AA	5.0	B		10					REI01
1985 12 03.01	S	4.8	AA	5.0	B		7	&20	5/			GRE
1985 12 03.33	S	5.9	S	8.0	B		20	18	3			MAC
1985 12 03.71	B	5.9	D	10.0	B		14	16.8	4			HAS02
1985 12 03.72	M	6.0	D	8.0	B		11	&14	6			GUB
1985 12 03.72	B	5.8	D	3.0	B		8	18.9	4			HAS02
1985 12 03.79	G	4.9	A	0.8	E		1	70	1	1.0	80	MER
1985 12 03.81	B	6.3	AA	5.0	B		10					REI01
1985 12 03.86	M	6.0	AA	10.6	R	6	24	12	6			KES01

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 12 03.95	S	5.0	AA	5.0	B		7	&20	5/			GRE
1985 12 04.15	S	6.4	S	15.2	L	8	76	15	6			MAC
1985 12 04.15	S	6.2	S	8.0	B		20	13	4			MAC
1985 12 04.74	G	4.8	A	0.8	E		1	70	2	1.5	73	MER
1985 12 04.75	B	5.5	D	0.8	E		1		4			HAS02
1985 12 04.75	B	5.6	D	3.0	B		8	19.3	4			HAS02
1985 12 04.76	B	5.8	D	5.6	B		8	10.8	5			KOC01
1985 12 04.79	B	5.6	D	5.6	B		8	10.8	5			KOC
1985 12 04.83	M	5.9	AA	10.6	R	6	24	10	7			KES01
1985 12 04.84	B	6.1	AA	5.0	B		10					REI01
1985 12 05.12	S	4.8	AA	5.0	B		7	&20	5/			GRE
1985 12 05.24	S	5.7	S	8.0	B		20	19	5			MAC
1985 12 05.44	S	4.7	W	0.8	E		1					SEA
1985 12 05.72	B	5.6	D	3.0	B		8	19.3	4			HAS02
1985 12 05.72	B	5.7	D	10.0	B		14	17.3	4			HAS02
1985 12 05.74	S	4.9	W	15.2	L	5	44	18	7	1.5	80	MOE
1985 12 05.75	S	4.5	W	5.0	B		7	26	7	1	80	MOE
1985 12 05.77	B	6.0	AA	5.0	B		10					REI01
1985 12 05.84	M	5.8	AA	10.6	R	6	24	12	6			KES01
1985 12 05.91	G	4.8	A	0.8	E		1	60	2			MER
1985 12 06.11	S	5.7	S	25.4	L	4	32	21	8	0.38	76	MAC
1985 12 06.12	S	5.7	S	8.0	B		20	20	6			MAC
1985 12 06.12		5.4	S	0.8	E		1	10	5			MAC
1985 12 06.88	B	5.6	D	3.0	B		8	21.7	4			HAS02
1985 12 06.88	G	4.7	A	0.8	E		1	60	2			MER
1985 12 06.88	B	5.5	D	0.8	E		1		4			HAS02
1985 12 06.89	B	5.7	D	10.0	B		14	&10.2	4	0.43	75	HAS02
1985 12 07.02	S	5.2	AA	3.5	B		7	19				MOR03
1985 12 07.03				7.0	B		10	19.6	7	1.4	75	DEA
1985 12 07.03		5.3	AA	0.8	E		1					DEA
1985 12 07.67	O	6 :	A	8.0	B	4	20	10	5	0.1	85	AND01
1985 12 07.70	M	5.8	D	8.0	B		11	&13	3			GUB
1985 12 07.76	B	6.3	AA	5.0	B		10					REI01
1985 12 08.04	B	5.8	AA	7.0	B		10		7			DEA
1985 12 08.21	S	6.1	S	25.4	L	4	32	10	6			MAC
1985 12 08.44	S	4.5	W	2.5	B		2					SEA
1985 12 08.44	S	4.5	W	0.8	E		1					SEA
1985 12 08.71	B	5.3	D	5.6	B		8	10.4				KOC
1985 12 08.87	O	5.9	A	8.0	B	4	20	10	5	0.1	85	AND01
1985 12 08.99	S	4.7	AA	5.0	B		7	&20	4/			GRE
1985 12 09.00	B	5.9	AA	3.6	B		3					DEA
1985 12 09.10	S	4.4	A	8.0	B		11	25	5	0.5	70	SPR
1985 12 09.11	S	4.7	A	8.0	R	4	19	20	6	0.33	70	SPR
1985 12 09.12	S	4.8	A	0.8	E		1	45	2			SPR
1985 12 09.17	S	5.9	W	15.2	L	8	76	11	7			MAC
1985 12 09.17	B	6.3	W	15.2	L	8	76	7	8			MAC
1985 12 09.88	O	5.6	A	6.3	B	5	9	10	5	0.15	85	AND01
1985 12 09.89	B	4.7	A	5.0	B		7	45	4	1.5	70	MER
1985 12 09.94	B	5.4	AA	3.6	B		3					DEA
1985 12 10.10	S	4.4	A	8.0	B		11	25	5	0.75	70	SPR
1985 12 10.11	S	4.7	A	14.0	S	4	28	20	6	1	70	SPR
1985 12 10.13	S	4.3	AA	5.0	B		7	&22	6			GRE
1985 12 10.22	B	6.2	D	25.4	L	4	32	13	6			MAC
1985 12 10.22	S	5.7	D	25.4	L	4	32	13	6	0.28	77	MAC
1985 12 10.82	G	4.7	A	0.8	E		1	60	2			MER

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 12 10.88	B	5.8	D	10.0	B		14	14.0	4			HAS02
1985 12 10.88	B	5.5	D	3.0	B		8	21.8	4			HAS02
1985 12 11.02	B	5.4	AA	3.6	B		3					DEA
1985 12 11.21	S	5.8	D	25.4	L	4	32	9	6	0.20	77	MAC
1985 12 11.73	S	4.4	AA	5.0	B		7	25	6/			ZAN
1985 12 11.80	B	4.6	A	5.0	B		7	30	4	1.0	72	MER
1985 12 12.21	S	5.8	D	25.4	L	4	32	6	9	0.12	77	MAC
1985 12 12.69	S	4.7	W	15.2	L	5	44	20	6	2	80	MOE
1985 12 12.72	S	5.5	SC	5.0	B	4	10					KRA01
1985 12 12.73	M	5.2	D	8.0	B		11	&15	6	0.67	75	GUB
1985 12 12.73	B	5.4	D	3.0	B		8	13.4	4			HAS02
1985 12 12.74	B	5.2	D	8.0	B		20	8.4				KOC
1985 12 12.75	G	4.5	A	0.8	E		1	45	3			MER
1985 12 12.95	S	4.1	AA	5.0	B		7	&25	6			GRE
1985 12 13.04	B	5.0	AA	7.0	B		10	23.2				DEA
1985 12 13.17	S	5.6	D	8.0	B		20	12	6	0.23	79	MAC
1985 12 13.17		5.1	D	0.8	E		1	10	3			MAC
1985 12 14.01	B	5.0	AA	7.0	B		10	23.2		0.90	52	DEA
1985 12 14.89	O	5.8	A	8.0	B	4	12	8	5	0.1	80	AND01
1985 12 14.96	S	4.3	AA	5.0	B		7	&28	7/			GRE
1985 12 14.99	S	4.8	AA	8.0	B		20	&27	7/	&1		GRE
1985 12 15.00	M	4.4	AA	0.8	E		1					GRE
1985 12 15.00	B	4.9	AA	0.8	E		1					GRE
1985 12 15.02	S	5.6	AA	3.5	B		7	13	4			MOR03
1985 12 15.74	S	4.2	AA	3.0	R		6	15	6/			ZAN
1985 12 16.00	S	5.5	AA	3.5	B		7	11.5	5	0.2	70	MOR03
1985 12 16.09	S	4.5	AA	5.0	B		7	&25	5			GRE
1985 12 16.09	S	4.6	AA	8.0	B		20	&25	5			GRE
1985 12 16.21	S	5.3	D	8.0	B		20	18	5	0.22	75	MAC
1985 12 16.95	S	4.4	AA	5.0	B		7	&25	6			GRE
1985 12 17.12	S	4.9	D	5.0	R	12	13	14	4	0.30	76	MAC
1985 12 17.12	S	5.2	D	8.0	B		20	16	5	0.33	76	MAC
1985 12 17.97	S	4.4	AA	8.0	B		20	&16	4			GRE
1985 12 17.98	S	4.3	AA	5.0	B		7	&18	5/			GRE
1985 12 18.96	S	4.3	AA	5.0	B		7	&22	5			GRE
1985 12 18.97	S	4.4	AA	8.0	B		20	&22	4/			GRE
1985 12 19.14	S	5.2	W	8.0	B		20	13	6	0.18	74	MAC
1985 12 19.15	S	5.5	W	15.2	L	8	76	17	7	0.27	74	MAC
1985 12 19.96	S	4.4	AA	5.0	B		7	&17	6			GRE
1985 12 19.98	S	5.4	AA	3.5	B		7	11	4			MOR03
1985 12 20.01	M	4.6	AA	20.3	L	6	49	&12	8			GRE
1985 12 20.13	S	5.5	W	8.0	B		20	9	7	0.18	71	MAC
1985 12 21.79	B	4.9:	D	10.0	B		14	9.9	5	0.25	56	HAS02
1985 12 21.96	S	5.6	AA	3.5	B		7	15	4			MOR03
1985 12 22.09	S	4.5	AA	20.3	L	6	49	&11	5			GRE
1985 12 22.70	S	6.1	SC	5.0	B	4	10	5				KRA01
1985 12 22.71	B	5.1:	D	10.0	B		14		5			HAS02
1985 12 22.72	S	4.8	W	15.2	L	5	44	15	6	1.3	70	MOE
1985 12 23.70	M	4.9	D	8.0	B		11	&10	3	0.47	84	GUB
1985 12 23.71	M	6.0	AA	10.6	R	6	24	6	6			KES01
1985 12 23.74	S	5.2	D	5.0	B		16	9	6			NOL
1985 12 23.94	S	4.3	AA	5.0	B		7	&20	7			GRE
1985 12 23.97	S	4.4	AA	3.5	B		7	&18	6/			GRE
1985 12 24.94	S	4.5	AA	8.0	B		20	&10	4			GRE
1985 12 24.99	S	5.4	AA	3.5	B		7	8.5	5			MOR03

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 12 25.13	S	5.3	D	8.0	B		20	9	8	0.17	71	MAC
1985 12 25.72	S	5.1	SC	5.0	B	4	10	6				KRA01
1985 12 26.01	S	4.1	AA	3.5	B		7	&18	5/			GRE
1985 12 26.03	S	4.1	AA	5.0	B		7	&18	7			GRE
1985 12 26.70	O	5.6	A	8.0	B	4	12	9	5	0.2	80	AND01
1985 12 26.93	M	4.0	AA	8.0	B		20	&13	7/			GRE
1985 12 26.93	S	4.1	AA	8.0	B		20	&13	7/			GRE
1985 12 26.93	S	4.1	AA	5.0	B		7	&15	7/			GRE
1985 12 27.09	S	4.8	D	8.0	B		20	8	5	0.15	68	MAC
1985 12 27.10	S	4.9	D	15.2	L	8	76	10	6	0.22	68	MAC
1985 12 27.69	S	5.3	SC	5.0	B	4	10					KRA01
1985 12 27.69	S	5.9:	W	48.5	L	4	115	12	6	0.33	70	MOE
1985 12 27.94	S	4.0	AA	8.0	B		20	&15	7/	&1		GRE
1985 12 27.95	S	4.0	AA	3.5	B		7	&15	7	&1		GRE
1985 12 27.96	M	3.9	AA	5.0	B		7	&15	7/	&1		GRE
1985 12 27.96	S	4.2	AA	5.0	B		7	&15	7/	&1		GRE
1985 12 27.98	M	4.4	AA	20.3	L	6	38	& 9	8			GRE
1985 12 27.98	S	4.5	AA	20.3	L	6	38	& 9	8			GRE
1985 12 27.99	S	4.8	AA	22.9	R	12	86	& 7	8/			GRE
1985 12 28.70	S	4.6	W	5.0	B		7	17	7	1	70	MOE
1985 12 28.79	O	5.5	A	8.0	B	4	12	9	5	0.2	80	AND01
1985 12 28.93	S	4.4	AA	3.5	B		7	&14	7			GRE
1985 12 28.94	M	4.5:	AA	22.9	R	12	86	& 8	8			GRE
1985 12 28.94	S	4.7	AA	22.9	R	12	86	& 8	8			GRE
1985 12 28.95	S	4.2	AA	5.0	B		7	&14	7/	&1		GRE
1985 12 28.96	M	4.2	AA	8.0	B		20	&12	7/	&1		GRE
1985 12 28.96	S	4.5	AA	8.0	B		20	&12	7/	&1		GRE
1985 12 29.95	M	4.3	AA	5.0	B		7	&13	7	>1		GRE
1985 12 29.95	S	4.5	AA	5.0	B		7	&13	7	>1		GRE
1985 12 29.96	S	4.4	AA	8.0	B		20	&10	7	>1		GRE
1985 12 29.96	M	4.3	AA	3.5	B		7	&15	5/			GRE
1985 12 29.96	S	4.2	AA	3.5	B		7	&15	5/			GRE
1985 12 29.98	M	4.5	AA	20.3	L	6	38	& 6.5	8			GRE
1985 12 29.98	S	4.8	AA	20.3	L	6	38	& 6.5	8			GRE
1985 12 29.99	S	4.9	AA	22.9	R	12	86	&10	8			GRE
1985 12 30.94	S	4.2	AA	3.5	B		7	&12	6/			GRE
1985 12 30.95	S	4.4	AA	5.0	B		7	&12	7/			GRE
1985 12 30.95	M	4.2	AA	5.0	B		7	&12	7/			GRE
1985 12 30.96	S	4.3	AA	8.0	B		20	&10	7/	&2	56	GRE
1985 12 31.70	S	4.6	W	15.2	L	5	44	23	8	2	70	MOE
1985 12 31.75	O	5.4	A	8.0	B	4	12	9	5	1	80	AND01
1986 01 01.95	M	4.7	AA	0.8	E		1					GRE
1986 01 01.97	S	4.5	AA	3.5	B		7	&12	7	>1		GRE
1986 01 01.99	M	4.3	AA	5.0	B		7	&13	7/			GRE
1986 01 01.99	S	4.4	AA	5.0	B		7	&13	7/	&2		GRE
1986 01 01.99	S	4.6	AA	8.0	B		20	&13	7/	>2		GRE
1986 01 01.99	M	4.5	AA	8.0	B		20	&13	7/			GRE
1986 01 02.93	S	4.5	AA	8.0	B		20	&11	7/			GRE
1986 01 02.97	S	4.3	AA	5.0	B		7	&10	7/			GRE
1986 01 02.98	S	4.7	AA	20.3	L	6	49	& 8	7/			GRE
1986 01 02.98	M	4.6	AA	20.3	L	6	49	& 8	7/			GRE
1986 01 04.94	M	4.5	AA	5.0	B		7					GRE
1986 01 04.94	S	4.7	AA	8.0	B		20	& 9	7/			GRE
1986 01 04.94	S	4.5	AA	5.0	B		7	&10	8			GRE
1986 01 04.95	M	4.5	AA	8.0	B		20	& 9	7/			GRE

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1986 01 04.98	M	4.3	AA	3.5	B		7					GRE
1986 01 04.98	S	4.4	AA	3.5	B		7	&10	7			GRE
1986 01 05.96	S	4.5	AA	5.0	B		7	&10	7/			GRE
1986 01 05.96	M	4.3	AA	5.0	B		7					GRE
1986 01 05.97	M	4.4	AA	3.5	B		7					GRE
1986 01 05.97	S	4.6	AA	3.5	B		7	&10	6			GRE
1986 01 06.92	S	4.6	AA	3.5	B		7	& 8	7/			GRE
1986 01 06.95	M	4.4	AA	8.0	B		20					GRE
1986 01 06.95	S	4.7	AA	8.0	B		20	& 8	7/			GRE
1986 01 06.96	S	4.8	AA	5.0	B		7	& 8	7/			GRE
1986 01 06.96	M	4.6	AA	5.0	B		7					GRE
1986 01 07.95	B	4.7	AA	5.0	B		7	& 7.5	7/			GRE
1986 01 07.95	S	4.6	AA	5.0	B		7					GRE
1986 01 07.95	M	4.4	AA	5.0	B		7	& 7.5	7/			GRE
1986 01 07.96	M	4.3	AA	3.5	B		7	& 9	7/			GRE
1986 01 07.96	B	4.6	AA	3.5	B		7	& 9	7/			GRE
1986 01 07.96	S	4.4	AA	3.5	B		7					GRE
1986 01 08.96	M	4.3	AA	5.0	B		7	&10	7/			GRE
1986 01 08.96	B	4.8	AA	5.0	B		7	&10	7/			GRE
1986 01 08.96	S	4.4	AA	5.0	B		7					GRE
1986 01 08.98	S	4.6	AA	8.0	B		20	& 8.5	7			GRE
1986 01 08.98	B	4.8	AA	8.0	B		20	& 8.5	7			GRE
1986 01 09.95	B	5.1	AA	8.0	B		20	& 8.5	7/			GRE
1986 01 09.95	S	4.5	AA	8.0	B		20					GRE
1986 01 09.95	M	4.3	AA	8.0	B		20	& 8.5	7/			GRE
1986 01 09.96	M	4.5	AA	3.5	B		7	& 8.5	7/			GRE
1986 01 09.96	B	4.8	AA	3.5	B		7	& 8.5	7/			GRE
1986 01 09.96	M	4.4	AA	5.0	B		7	& 9	7/			GRE
1986 01 09.96	B	5.1	AA	5.0	B		7	& 9	7/			GRE
1986 01 09.96	S	4.6	AA	3.5	B		7					GRE
1986 01 09.96	S	4.6	AA	5.0	B		7					GRE
1986 01 10.94	S	4.5	AA	5.0	B		7	& 7	7/			GRE
1986 01 11.95	S	4.6	AA	5.0	B		7					GRE
1986 01 11.95	M	4.5	AA	5.0	B		7	&10	7/			GRE
1986 01 11.95	B	4.8	AA	5.0	B		7	&10	7/			GRE
1986 01 11.98	B	4.6	AA	0.8	E		1					GRE
1986 01 11.98	S	4.4	AA	0.8	E		1					GRE
1986 01 12.95	S	4.6	AA	5.0	B		7					GRE
1986 01 12.95	M	4.4	AA	3.5	B		7	& 9	7/			GRE
1986 01 12.95	S	4.5	AA	3.5	B		7					GRE
1986 01 12.95	B	4.7	AA	5.0	B		7	& 8	7/			GRE
1986 01 12.95	B	4.6	AA	3.5	B		7	& 9	7/			GRE
1986 01 12.95	M	4.5	AA	5.0	B		7	& 8	7/			GRE
1986 01 12.97	M	4.3	AA	8.0	B		20	& 8	7/	&2.5		GRE
1986 01 13.94	M	4.5	AA	5.0	B		7	& 7.5	7/			GRE
1986 01 13.94	S	4.6	AA	5.0	B		7	& 7.5	7/			GRE
1986 01 13.94	M	4.4	AA	8.0	B		20	& 7.5	7/			GRE
1986 01 13.94	S	4.5	AA	8.0	B		20	& 7.5	7/			GRE
1986 01 15.94	S	4.6	AA	3.5	B		7					GRE
1986 01 15.94	B	4.7	AA	3.5	B		7	& 5	7/			GRE
1986 01 15.95	B	4.7	AA	5.0	B		7	& 5	8			GRE
1986 01 15.95	S	4.6	AA	5.0	B		7					GRE
1986 01 15.96	B	4.7	AA	8.0	B		20	& 7.8	7/			GRE
1986 01 15.96	M	4.3	AA	8.0	B		20	& 7.8	7/			GRE
1986 01 15.96	S	4.5	AA	8.0	B		20	& 7.8	7/			GRE

Periodic Comet Halley (1982i) Cont.

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1986 01 16.95	S	4.6	AA	3.5	B		7	& 4	7/			GRE
1986 01 16.95	B	4.6	AA	3.5	B		7	& 4	7/			GRE
1986 01 16.95	S	4.5	AA	5.0	B		7	& 4	8			GRE
1986 01 16.95	B	4.7	AA	5.0	B		7	& 4	8			GRE
1986 01 16.96	B	4.8	AA	8.0	B		20	& 5.5	7/	>2		GRE
1986 01 16.96	S	4.6	AA	8.0	B		20					GRE
1986 01 16.96	M	4.5	AA	8.0	B		20					GRE
1986 01 18.95	B	4.4	AA	5.0	B		7	& 4	8			GRE
1986 01 18.96	B	4.3	AA	3.5	B		7	& 5	7/			GRE
1986 01 18.96	S	4.2	AA	5.0	B		7					GRE
1986 01 18.96	S	4.2	AA	3.5	B		7					GRE
1986 01 18.97	B	4.3	AA	8.0	B		20	& 4.5	7/			GRE
1986 01 18.98	S	4.0	AA	8.0	B		20	& 4.5	7/			GRE

Periodic Comet Boethin (1985n)

DATE (UT)	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 03.44	S	10.3	AA	15.2	L	5	29					SEA
1985 11 06.46	S	10.1	V	15.2	L	5	29					SEA
1985 11 10.43	S	9.7	AA	15.2	L	5	29	6	4			SEA
1985 12 02.76	S	10.0	AC	30.5	L	5	60	2.8	3			ZAN
1985 12 03.73	S	10.0	AC	20.3	T	10	92	2.0	2			HAS02
1985 12 22.72	B	8.8	S	20.3	T	10	92	2.3	3			HAS02
1985 12 22.72	B	8.7	S	10.0	B		14	4.6	3			HAS02
1985 12 31.71	S	9.2	S	15.2	L	5	44	4	3			MOE
1986 01 07.98	S	7.2	AA	20.3	L	6	49	& 5.6	2/			GRE
1986 01 08.97	S	7.4	S	20.3	L	6	49	& 5.6	2			GRE
1986 01 08.97	S	7.0	AA	20.3	L	6	49	& 5.6	2			GRE
1986 01 11.96	S	7.3	AA	8.0	B		20	& 8	4	?		GRE
1986 01 12.96	S	7.3	AA	8.0	B		20	& 8	4/			GRE

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THE LAST 20 COMETS TO RECEIVE PROVISIONAL LETTER DESIGNATIONS

Listed below, for handy reference, are the last 20 comets which have been given letter designations (1985a is the first comet to be discovered or recovered in 1985, 1985b is the second comet..., etc.). Room is given after the first "equal sign" for the "Roman numeral designation" [listed here in Arabic numeral form; not yet given for most of the last 20 comets], which gives the year of perihelion. After the second "equal sign" is given the name, preceded by an asterisk (*) if the comet is a new discovery (as opposed to a recovery from predictions of a previously-known short-period comet). Also given parenthetically are such values as the date of perihelion, T (month/date), and the perihelion distance, q (in AU).

1984u = 1984 18 = * P/Shoemaker 2 (T = 9/26, q = 1.3)
1984v = 1985 = * Hartley (T = 9/29, q = 4.0)
1985a = 1986 = P/Ashbrook-Jackson (T = 1/24, q = 2.3)
1985b = 1985 = P/Russell 1 (T = 7/5, q = 1.6)
1985c = 1985 = P/Honda-Mrkos-Pajdušáková (T = 5/23, q = 0.54)

1985d = 1985 = P/Tsuchinshan 2 (T = 7/21, q = 1.8)
1985e = 1985 = * Machholz (T = 6/28, q = 0.1)
1985f = 1985 = * P/Hartley (T = 6/11, q = 1.5)
1985g = 1985 = P/Giclas (T = 10/1, q = 1.84, P = 6.93 yr)
1985h = 1986 = P/Whipple (T = 6/25, q = 3.1)

1985i = 1986 = P/Shajn-Schaldach (T = 5/27, q = 2.3)
1985j = 1985 = P/Daniel (T = 8/4, q = 1.7)
1985k = 1985 = * P/Maury (T = 6/8, q = 2.0)
1985l = 1985 = * Hartley-Good (T = 12/9, q = 0.69)
1985m = 1985 = * Thiele (T = 12/18, q = 1.32)

1985n = 1986 = P/Boethin (T = 1/16, q = 1.11, P = 11.2 yr)
1985o = 1986 = P/Kojima (T = 4/4, q = 2.4)
1985p = 1985 = * P/Ciffréo (T = 10/29, q = 1.70, P = 7.28 yr)
1985q = 1986 = P/Wirtanen (T = 3/19, q = 1.08)
1986a = 1985 = * Shoemaker

ROMAN NUMERAL DESIGNATIONS OF COMETS IN 1984.

The following tabulation continues that on MPC 9389-9390 and ICQ 7, 72. The references below give the most recently-published orbits in the Minor Planet Circulars or IAU Circulars. [From the January 1986 batch of MPCs.]

Comet	T	Name	Year/letter	Ref.
1984 I	Jan. 6.0	P/Russell 4	1984d	MPC 9304
1984 II	Jan. 6.6	P/Taylor	1983u	IAUC 3889
1984 III	Jan. 8.7	P/Hartley-IRAS	1983v	MPC 9304
1984 IV	Feb. 20.2	P/Crommelin	1983n	MPC 9213
1984 V	Feb. 21.4	P/Smirnova-Chernykh		MK 445
1984 VI	Mar. 27.7	P/Encke		MPC 7455
1984 VII	May 24.9	P/Takamizawa	1984j	MPC 9211
1984 VIII	May 29.1	P/Clark	1983w	MPC 7658
1984 IX	May 31.8	P/Wolf	1983m	IAUC 3850
1984 X	June 7.6	P/Kowal-Mrkos	1984n	MPC 9211
1984 XI	July 9.9	P/Faye	1984h	IAUC 3956
1984 XII	July 28.5	(SOLWIND 5)		IAUC 4129
1984 XIII	Aug. 12.1	Austin	1984i	MPC 9425
1984 XIV	Aug. 20.2	P/Wild 2	1983s	IAUC 3867
1984 XV	Sept. 3.7	Shoemaker	1984r	MPC 10156
1984 XVI	Sept. 16.6	P/Shoemaker 1	1984q	MPC 9425
1984 XVII	Sept. 22.8	P/Wolf-Harrington	1984g	IAUC 3952
1984 XVIII	Sept. 26.7	P/Shoemaker 2	1984u	MPC 9351
1984 XIX	Oct. 8.2	P/Neujmin 1	1984c	IAUC 3920
1984 XX	Oct. 13.9	Meier	1984o	MPC 9212
1984 XXI	Dec. 1.4	P/Arend-Rigaux	1984k	IAUC 3972
1984 XXII	Dec. 6.5	P/Schaumasse	1984m	IAUC 3987
1984 XXIII	Dec. 14.3	Levy-Rudenko	1984t	MPC 9685

(continued from page 8)

A look at P/Halley's pre-perihelion light curve leaves one puzzled. A normal least-squares fit through the data does not yield very meaningful results for the generally-used cometary magnitude formula, $m_1 = H_o + 5 \log \Delta + 2.5n \log r$, because the comet rose so rapidly in brightness during October and November, and then levelled off dramatically in December and January. Reasonable preliminary fits to the data by the author yield $H_o \simeq 1.6$ and $n \simeq 8.6$ for $3.0 \geq r \geq 1.6$, and $H_o \simeq 4.2$ and $n \simeq 3.3$ for $1.6 \geq r \geq 0.8$ (from 273 observations by several highly experienced observers). The *Tabulation of Comet Observations* in this issue shows how steep P/Halley's increase in brightness was from September through mid-November, and how quickly the comet's brightness then levelled off for nearly two months.

Charles S. Morris and Stephen Edberg, both connected with the International Halley Watch (IHW) and located near Los Angeles, found P/Halley via naked eye on the morning of November 8, and received international media attention as being the first to do so since 1910. Many other observers quickly followed this feat with more naked-eye sightings; less than a day later (Nov. 9.07 UT), Richard J. Torpie and his son, Christopher, of Philadelphia, reported seeing the comet naked eye from Nantucket, MA, verifying their observation with a small telescope.

Comet 1982*i* showed a faint plasma tail to the visual observer during 1985 November and December, with photographic tail lengths reaching $\sim 5°$ by late December. The dust tail did not begin to contribute noticeably to the visible tail until 1986 January. Some observers were reporting a naked-eye tail up to 5° long by mid-January. The comet has been noticeably different from most comets by virtue of its rather intense central condensation, apparent visually even when the comet was fainter than $m_1 = 12$. By December and early January, the degree of condensation (and the degree to which the central condensation dominated the coma) could be seen (in binoculars) to change dramatically from night to night: one night the intense central condensation would appear nearly stellar and really dominate the coma, and the next night the central condensation would be fainter, more diffuse, and spread out into a disk more than appearing stellar.

Indeed, a 52-hr rotation period was recently reported by Zdenek Sekanina (*IAUC* 4151) from analysis of 1910 photographs, and several observers have reported variations in P/Halley's activity during the past few months which also point to a $\sim$ 2.2-day period. While it may be difficult to tie the *visual* information in with the rotation period, such variations in intensity are quite possibly an effect of the rotating nucleus. The author noted the comet appearing much more condensed on Dec. 31.0 than on the preceding night, and again on Jan. 8.0, while on Jan. 9.0 the comet appeared markedly less condensed than on the preceding night. Bright jets have also been seen, some reporting them observable periodically (*cf.* Itoh 1985, *IAUC* 4155). The coma has been very active, as shown by the accompanying drawing by Stephen J. O'Meara.

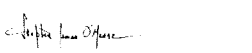
P/Giacobini-Zinner (1984*e*) faded as it moved southward in October and November, but it seems that very few observers tried finding the comet after the last week in October. The Draconid meteor shower (associated with this comet) was unusually strong for a brief period on 1985 Oct. 8, as ZHRs of 200 or more meteors per hour were reported from Japan (*IAUC* 4120). Comet 1984*e* still sported a short tail when photographed with the Cerro Tololo Schmidt telescope by William Liller in December.

Two comets have been discovered since early October on plates exposed for Halley's comet. Ulrich Thiele found comet 1985*m* on plates exposed with the Hamburg Schmidt telescope at Calar Alto, Spain, on Oct. 9 and 10; the trailed images were described as having a starlike core surrounded by a coma $\sim 25''$ in diameter (*IAUC* 4119). Jacqueline Ciffréo discovered comet 1985*p* on plates exposed with the CERGA 90-cm Schmidt telescope in France on Nov. 8, quoting the magnitude as 10; this comet turned out to be a new short-period comet with an orbital period of $\sim$ 7.2 years.

Comet Thiele 1985*m* moved northward through Auriga in November as it brightened to near $m_1 = 7.5$ and was quite large ($\geq 15'$) during the first month following discovery. The total visual magnitude was clearly much brighter than the reported photographic discovery magnitude — shortly (< 1 week) after discovery — showing again that photographic magnitudes of comets are frequently far from the true visual magnitude. Comet Thiele is now fading rapidly following its Dec. 18 perihelion.

Visual observers with large instruments are thus encouraged to look for any new comets reported as 16th magnitude or brighter. P/Giclas 1985*g* is another example of a comet not anticipated to be observed with small telescopes visually, but it was followed by Alan Hale from near Mt. Wilson, CA, with an 8-inch reflector in October while it was near 13th magnitude.

P/Ciffréo 1985*p* likely experienced an outburst at or near the time of discovery, as it was noted as a highly unusual comet from its appearance and it faded rapidly from $m_1 = 11.5$ near its discovery to apparently fainter than 13th magnitude in early 1986 January. Richard McCrosky at Oak Ridge Observatory photographed the comet on subsequent nights during the second week in January, and noted a 1- to 1.5-magnitude drop in brightness in one night! Several observers have noted a secondary condensation on photographs taken of P/Ciffréo, and it has not yet been resolved as to whether there is a secondary nucleus or it the feature is some sort of long-lived tail extension.



The inner coma of P/Halley as it appeared on 1985 Dec. 3 at 23:25 UT to S. J. O'Meara with the 9-inch Clark refractor of Harvard College Observatory in Cambridge, MA.

Periodic comet Boethin (1985*n*) was recovered on Oct. 11 as a 15th-magnitude, diffuse, condensed object by Alan C. Gilmore and Pamela M. Kilmartin with the 25-cm astrograph at Mount John University Observatory, Lake Tekapo, New Zealand. This comet has been brighter than expected in December and January, and the author found the comet brighter than $m_1 = 7.5$ on 4 nights in early January, with moderate condensation and a coma diameter $\geq 8'$. An ephemeris is provided below to encourage observers to continue following this object in the coming months.

P/Kojima was recovered (comet 1985*o*) by T. Gehrels and Jim Scotti with the 91-cm reflector + CCD at Kitt Peak as a 20th-magnitude object on Oct. 19. Gilmore and Kilmartin recovered P/Wirtanen (comet 1985*q*) on plates exposed Nov. 13, the comet described as diffuse with central condensation and with $m_2 = 19$. As Alan Hale noted in the last issue, visual observers should try locating this comet in coming weeks.

On Jan. 10, Carolyn and Eugene Shoemaker photographed comet Shoemaker 1986*a*, which they found a few days later when scanning their films obtained with the 18-inch Schmidt telescope at Palomar. This is their seventh comet discovery in only two-and-a-half years (*cf. ICQ* **7**, 3), placing them alone in fifth place among living comet discoverers with the most discoveries (behind Robert G. Harrington's 8 comet discoveries with the Palomar Sky Survey during 1949-1954, and Bradfield, Honda, and Mrkos, who are all tied for first place with 12 discoveries each; by "discoveries", we mean comets which have had the discoverers' names given to the comet by the IAU). Seki, Hartley, Wild, and Whipple have 6 discoveries each, and several more have 5 discoveries each. Comet 1986*a* was in the western edge of Leo at discovery, moving slowly northeastward, and was reported at mag 10 by the Shoemakers; other observers who located the comet in the week following discovery noted the comet as being closer to $m_1 = 13$, including Charles Morris (Jan. 18.38, 25-cm reflector), who found the comet as being slightly condensed visually and $< 1'$ across. At press time, it appeared that this is also the Shoemakers' third short-period comet, with an orbital period near 13 years.

Before the *P78-1 SOLWIND* satellite was destroyed last Sept. by the U.S. military, it discovered two more probable sungrazing comets: SOLWIND 4 on Nov. 3, 1981, and SOLWIND 5 on July 28, 1984 (*cf. IAUC* 4129). The last comet was also observed with the *Solar Max* satellite, the only one of five *SOLWIND* comets to have been seen outside of *SOLWIND*. The SMM satellite also observed comet Machholz 1985*e* on July 3, shortly after perihelion, one of only two reported positive sightings of that comet as it headed toward its apparent "dissolving".

It has been said that Pluto should no longer be called a major planet, but instead referred to as an unusual minor planet, because of its small size and its very odd orbit (which has a high eccentricity — $e = 0.25$, compared with the average value for the 8 major planets of $e = 0.06$ — and takes Pluto inside the orbit of Neptune, where it now is located). Now, based on studies of Pluto and its recently-discovered satellite, David Tholen of the University of Hawaii has calculated (*cf.* 1985, *A. J.* **90**, 2353) that the density of Pluto must be very low — quite close to that of water, so that the small object must be composed mostly of ices (perhaps including frozen methane and ammonia). This suggests that Pluto may actually be a very large comet, too far from the sun to show signs of sublimation.

The Comet Rendezvous/Asteroid Flyby mission has been vetoed by NASA for its planned 1987 start, owing to a shortness of available funds and other competing space programs. While a 1988 start is still possible for the CRAF mission, NASA may lose its experienced Galileo crew as a result of the delay (*cf.* M. M. Waldrop 1985, *Science* **230**, 526).

(1986 Jan. 18)

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EPHEMERIS FOR PERIODIC COMET BOETHIN (1985n)

Based on orbital elements by B. G. Marsden (MPC 10156). We encourage observers to follow this comet closely, as this is only its second observed apparition (the first apparition was not very good in terms of numbers of observations). Both visual photometric observations and astrometric observations are very important to obtain.

Date	ET	R. A. (1950)	Decl.	Delta	r	Elong.	Mag.
1986	01 30	00 17.56	+04 18.2	1.322	1.131	56.5	8.2
1986	02 04	00 37.71	+06 55.0				
1986	02 09	00 58.17	+09 29.1	1.340	1.164	57.7	8.4
1986	02 14	01 18.91	+11 58.2				
1986	02 19	01 39.85	+14 20.1	1.379	1.212	58.9	8.7
1986	02 24	02 00.92	+16 33.1				
1986	03 01	02 22.03	+18 35.5	1.441	1.273	59.8	9.1
1986	03 06	02 43.10	+20 26.2				
1986	03 11	03 04.04	+22 04.7	1.524	1.344	60.3	9.5
1986	03 16	03 24.76	+23 30.4				
1986	03 21	03 45.16	+24 43.4	1.627	1.423	60.1	9.9
1986	03 26	04 05.15	+25 44.1				
1986	03 31	04 24.66	+26 33.0	1.748	1.508	59.4	10.4
1986	04 05	04 43.65	+27 10.8				
1986	04 10	05 02.07	+27 38.6	1.884	1.597	57.9	10.8
1986	04 15	05 19.89	+27 57.0				
1986	04 20	05 37.10	+28 07.2	2.032	1.688	55.9	11.3
1986	04 25	05 53.67	+28 09.8				
1986	04 30	06 09.62	+28 05.9	2.188	1.782	53.4	11.7
1986	05 05	06 24.96	+27 56.2				
1986	05 10	06 39.72	+27 41.3	2.351	1.876	50.4	12.1
1986	05 15	06 53.90	+27 22.0				
1986	05 20	07 07.54	+26 58.8	2.517	1.971	47.0	12.5
1986	05 25	07 20.66	+26 32.3				
1986	05 30	07 33.28	+26 02.8	2.684	2.066	43.3	12.9
1986	06 04	07 45.43	+25 30.9				
1986	06 09	07 57.15	+24 56.8	2.850	2.161	39.2	13.3

EPHEMERIS FOR P/WIRTANEN 1985q (from T-corrected elements as per IAUC 4139).

Date	ET	R. A. (1950)	Decl.	Delta	r	Elong.	Mag.
1986	02 09	00 20.53	−03 59.4	1.689	1.195	44.0	13.9
1986	02 14	00 35.64	−01 44.3				
1986	02 19	00 51.27	+00 35.1	1.657	1.146	42.7	13.7
1986	02 24	01 07.46	+02 58.2				
1986	03 01	01 24.22	+05 23.9	1.628	1.111	42.0	13.5
1986	03 06	01 41.60	+07 51.3				
1986	03 11	01 59.62	+10 18.8	1.605	1.090	41.8	13.4
1986	03 16	02 18.32	+12 45.0				
1986	03 21	02 37.70	+15 08.1	1.592	1.085	42.2	13.4
1986	03 26	02 57.77	+17 26.2				
1986	03 31	03 18.51	+19 37.2	1.591	1.096	42.9	13.4
1986	04 05	03 39.91	+21 39.3				
1986	04 10	04 01.89	+23 30.6	1.605	1.123	43.8	13.5
1986	04 15	04 24.38	+25 09.3				
1986	04 20	04 47.24	+26 34.1	1.637	1.163	44.8	13.7
1986	04 25	05 10.33	+27 43.9				
1986	04 30	05 33.47	+28 38.2	1.686	1.216	45.5	14.0
1986	05 05	05 56.51	+29 16.8				
1986	05 10	06 19.26	+29 40.1	1.753	1.278	46.0	14.3

EPHEMERIS FOR PERIODIC COMET HALLEY (1982i), from orbital elements by D. K. Yeomans (IAUC 4156).

Date	ET	R. A. (1950)	Decl.	Delta	r	Elong.	Mag.
1986	02 19	20 43.81	−13 07.0	1.448	0.623	20.3	3.3
1986	02 24	20 35.15	−14 38.2				
1986	03 01	20 26.55	−16 18.8	1.267	0.723	34.7	3.5
1986	03 06	20 17.59	−18 12.9				
1986	03 11	20 07.53	−20 27.1	1.037	0.858	50.0	3.6
1986	03 16	19 55.18	−23 11.8				
1986	03 21	19 38.49	−26 42.5	0.785	1.008	67.7	3.5
1986	03 26	19 13.62	−31 20.5				
1986	03 31	18 32.64	−37 24.1	0.549	1.162	92.7	3.2
1986	04 05	17 19.83	−44 11.6				
1986	04 10	15 21.88	−47 23.9	0.418	1.317	131.5	3.0
1986	04 15	13 20.48	−42 04.2				
1986	04 20	12 03.90	−32 48.0	0.518	1.469	147.7	3.8
1986	04 25	11 21.97	−24 54.1				
1986	04 30	10 58.12	−19 13.5	0.774	1.618	130.2	5.0
1986	05 05	10 43.81	−15 14.5				
1986	05 10	10 34.96	−12 24.3	1.082	1.765	115.0	6.0
1986	05 15	10 29.49	−10 20.7				