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The International Comet Quarterly (*ICQ*) is a journal devoted to news and observation of comets, published by the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. Regular issues are published 4 times per year (January, April, July, and October), with an annual *Comet Handbook* of ephemerides published normally in the first half of the year as a special fifth issue. An index to each volume normally is published in every other October issue (odd-numbered years); the *ICQ* is also indexed in *Astronomy and Astrophysics Abstracts* and in *Science Abstracts Section A*.

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Group subscription rates available upon request. Back issues are $6.00 each — *except* for "current" *Comet Handbooks*, which are available for $15.00 ($8.00 to subscribers if ordered with their *ICQ* subscription; see above). Up-to-date information concerning comet discoveries, orbital elements, and ephemerides can be obtained by subscribing to the *IAU Circulars* and/or the *Minor Planet Circulars* (via postal mail and also available via computer access); for further information, contact the above e-mail address (or the *ICQ* at the above postal address).

Cometary observations should be sent to the Editor in Cambridge; all data intended for publication in the *ICQ* that is not sent via computer electronic mail should be sent on standard *ICQ* observation report forms, which can be obtained upon request from the Editor. Those who can send observational data (or manuscripts) in machine-readable form are encouraged to do so [especially through e-mail via the computer networks *SPAN* (6700::DAN) or Internet (ICQ@CFA.HARVARD.EDU), or via floppy disks that can be read on an IBM PC], and should contact the Editor for further information. The *ICQ* has extensive information for comet observers on the World Wide Web, including the Keys to Abbreviations used in data tabulation (see URL http://cfa-www.harvard.edu/cfa/ps/icq.html). In early 1997, the *ICQ* published a 225-page *Guide to Observing Comets*; only a few copies are still available (contact the Editor before sending money).

Most of the Observation Coordinators (OCs) listed below have e-mail contacts with the *ICQ* Editor; observers in the general area of such OCs who lack access to e-mail networks may send data to the OC for relay to the *ICQ* in electronic form.

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CORRIGENDA

• In the April 1996 *ICQ*, p. 59, Comet C/1995 Q1, the observation by observer KR002 for 1995 10 07.44 has the wrong instrument specified; the correct instrument was 20×80 B.

• In the April 1996 *ICQ*, p. 96, Comet 73P, the observation by observer KR002 for 1995 10 09.02 and 1995 10 12.01 have the wrong instrument specified; the correct instrument was 20×80 B.

• In the July 1996 *ICQ*, p. 177, Comet 122P, the observation by observer KR002 for 1995 11 05.04 has the wrong instrument specified; the correct instrument was 20×80 B.

Observations of Dust Halos and the Velocity of Ejecta from Comet C/1995 O1

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ABSTRACT. We present CCD images of comet C/1995 O1 (Hale-Bopp) taken between 2^h and 3^h UT on 1997 April 14, using the U.S. Air Force Academy's 61-cm telescope. These images, taken when C/1995 O1 was near perihelion, reveal the existence of five distinct halos in the comet's coma. The halos are thought to be remnants of material ejected from active spots on the rotating comet's nucleus. The images clearly show material linking the nuclear region with the innermost halo. Using the spacing between the halos and the known rotational period of the nucleus, we estimate the velocity of the nuclear ejecta to be 0.544 ± 0.009 km/sec, which is in good agreement with empirical models.

1. Introduction

Comet C/1995 O1 (Hale-Bopp) is one of only a handful of comets that has formed obvious dust halos as it approached the sun. The halos are thought to be produced when sunlight activates a region on the rotating comet nucleus. If the material ejected from the active region is well columnated, the nucleus' rotation will cause the ejecta to form halos spaced at intervals determined by the comet's rotation period. Therefore, if the velocity of the ejecta is known, it is possible to derive the rotation period of the comet. Whipple (1978) was the first to use the spacing of halos to derive the rotation period of comet C/1858 L1 (Donati; O.S. 1858 VI).

Another technique was used by Lecacheux, Jorda, and Colas (1997) to determine the rotation period of C/1995 O1. On twelve nights between 1997 January 12 and February 10, they followed the evolution of a halo emanating from the nucleus of C/1995 O1. By measuring the position angle of the halo's source over several days, they were able to infer a rotation period of 11.47 ± 0.05 hours. Given this rotation period, one can modify the Whipple technique and use the distance between halos and the known rotation period to derive the velocity of the ejecta.

The ejecta velocity is an important parameter in models used to derive the gas and dust production rates from observations (Haser 1957; Festou 1981). Numerous observations suggest that ejecta velocity depends on the distance between the comet and the sun. Whipple (1978) fit data compiled by Bobrovnikoff (1954) and obtained the relation,

$$v_e = 0.535 r^{-0.6}, \tag{1}$$

relating the ejecta velocity, v_e (in km/sec), to the comet's heliocentric distance, r (in AU). The Bobrovnikoff data, based on averages from 57 comets, and the Whipple fit are shown in Figure 1.

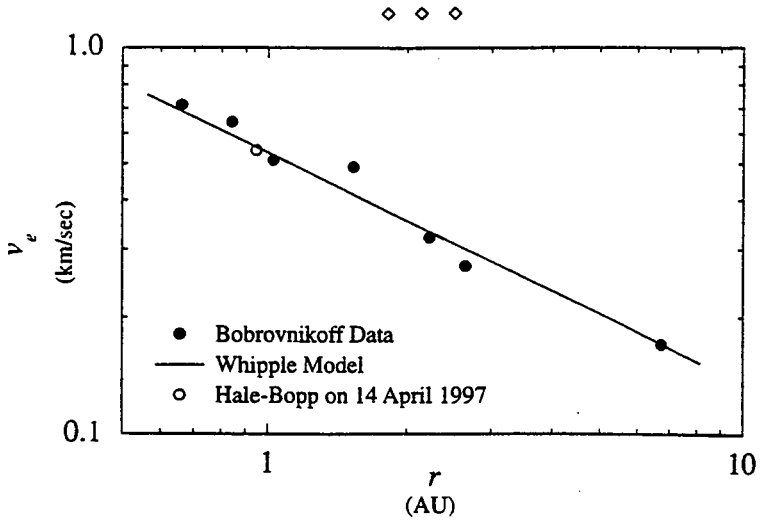

Figure 1. Plot of v_e as a function of the heliocentric distance, r. The solid line is Whipple's fit to Bobrovnikoff's (1954) data (filled circles). The open circle is our value of v_e for C/1995 O1.

In this paper, we present an analysis of several CCD images of C/1995 O1 taken at the U.S. Air Force Academy Observatory on 1997 April 14, when the comet was near perihelion. The locations of the halos seen in these images were used to estimate v_e. We compare our derived velocity with Whipple's fit and discuss its implications.

2. Observations

On 1997 April 14 between 02^h00^m and 03^h00^m UT, we took 12 images of comet C/1995 O1 through U, B, V, R, and I filters using the Academy's 61-cm telescope and a liquid nitrogen-cooled Photometrics PM512 CCD. The CCD is cosmetically perfect, has a read noise of 4.8 e^-, and zero dark current over the short exposure times (1 to 5 seconds) used for these observations.

The raw CCD images were processed in the usual way by first subtracting a bias frame and then dividing by a normalized flat-field frame. The bias frame consisted of an average of ten individual bias frames. The flat-field images, one for each filter, were median images of five twilight sky images.

Dust halos are visible in all the images, although the poor signal-to-noise ratio in the U-band and B-band images made the outer halos very difficult to see. All of the images clearly showed a jet or fan of material linking the innermost halo with the nuclear region. Fig. 2 shows one of our R-band images using two different display scalings. The image in Fig. 2a has the scaling adjusted to show the faint outer halos. Fig. 2b is adjusted to show the material connecting the nuclear region to the innermost halo.

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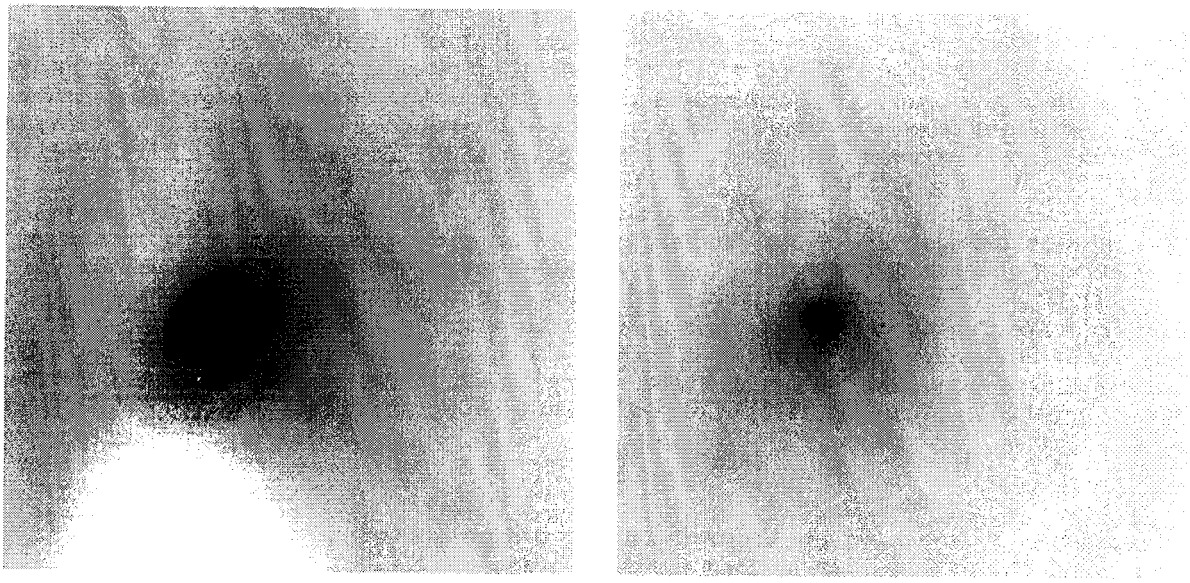

(a) (b)

Figure 2. R-band image of comet C/1995 O1. The display scaling in Fig. 2a is adjusted to show the faint halos. The scaling in Fig. 2b is adjusted to show the emission connecting the nuclear region with the first halo. Both images are 3'.67 by 3'.67. The sun is at an angle of 135° clockwise from the top of the images.

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3. Analysis

The main goal of these observations was to measure the ejecta velocity from the spacing of the halos. In order to enhance the visibility of the halos, we used our image processing software to apply a high-pass filter to the images.[1] In order to improve the signal-to-noise ratio in the filtered images, we convolved them with a gaussian of width slightly smaller than the seeing.[2] This technique proved very effective and dramatically increased the visibility of the halos.

[1] The high-pass filter passes high spatial frequencies in the image while suppressing low frequencies. This had the effect of increasing the visibility of small features such as the halos.

[2] The gaussian convolution creates an image in which each pixel value is a weighted average of nearby pixels values from the old image. The the weighting is determined by a gaussian function centered on the position of the pixel in the new image. If the width of the gaussian is smaller than the seeing, then the new image has approximately the same resolution as the old image but with a larger signal-to-noise ratio.

Figure 3 shows one of our processed R-band images. Five distinct halos are seen in this image. It should be pointed out that each one of these halos can be seen in the unenhanced images if the image display scaling is adjusted to bring out an individual halo.

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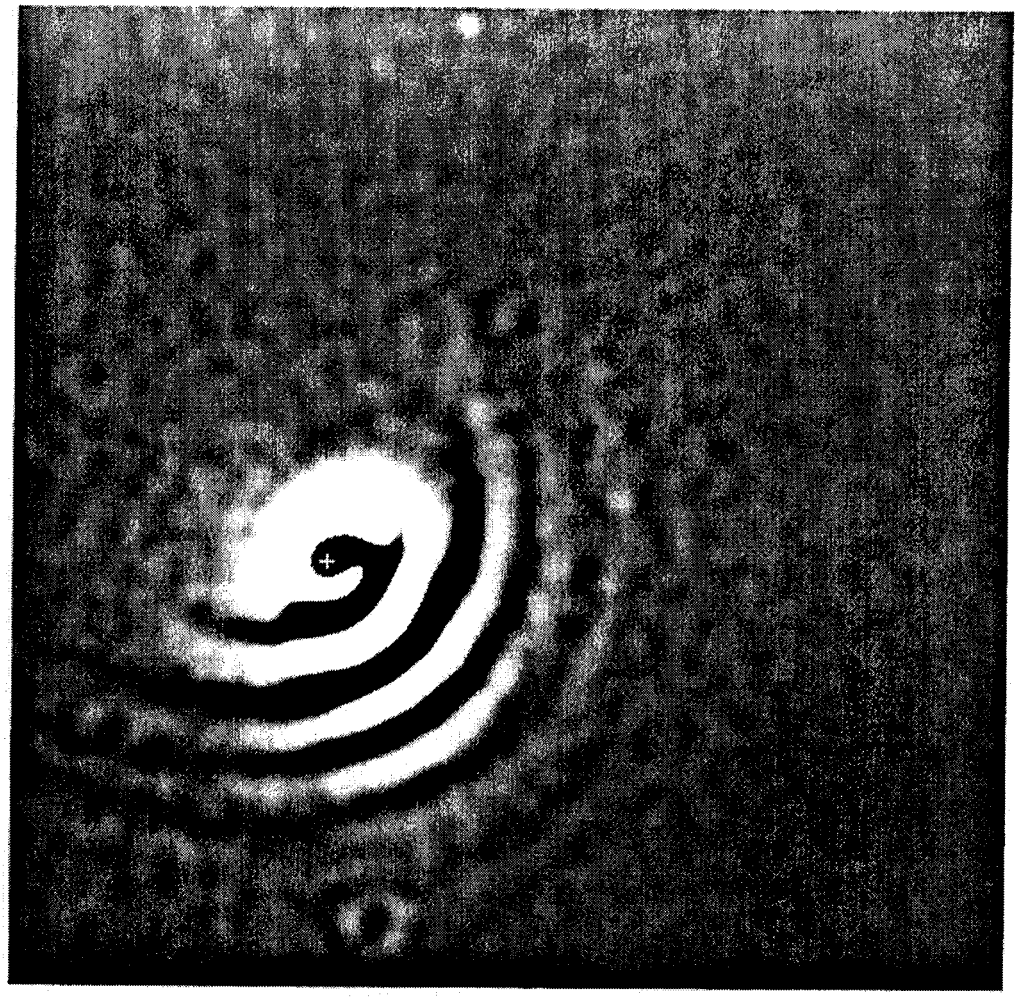

Figure 3. Enhanced R-band image showing five dust halos. The halos appear as black bands in this negative image. The white cross shows the position of the nucleus. The image is 3'.67 by 3'.67, with north toward the top and east toward the left. The sun is at an angle of 135° clockwise from the top of the image.

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Whipple (1978, 1980) has used the spacing of dust halos and an empirical model of the halo expansion velocity to determine the rotation periods of comets. This technique assumes that the halos are created when material is ejected from a single active region on the rotating nucleus as that region is exposed to solar radiation. Each halo then represents one rotation. Figure 4 is a diagram showing several halos and the direction of the sun. Material ejected toward the sun will have its expansion velocity reduced by the force of solar radiation thereby compressing the halos. By measuring the distance, d, from the nucleus to the halo along a line through the nucleus and perpendicular to the sun line (see Fig. 4) one minimizes this compression effect. Given the distance and the velocity of the ejecta it is a simple matter to compute the period.

Here we modify Whipple's technique and use the known rotation period of C/1995 O1 to determine the expansion velocity of the ejecta, v_e. Table 1 lists the distances, d, measured from one of our enhanced R-band images. We chose this particular image because it showed the halos most clearly. The distances in Table 1 were determined by measuring the number of pixels between the nucleus and the halo and then multiplying by the measured plate scale of our camera to deduce the angular separation. Given the angular separation and the geocentric distance at the time of observation ($\Delta = 1.497$ AU), we then calculated the distance in km.

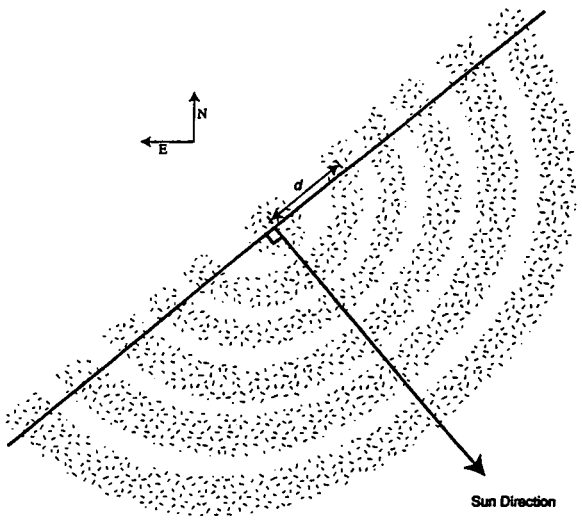

Figure 4. Sketch of the halos showing the line perpendicular to the direction of the sun. The distances from the nucleus to the halos tabulated in Table 1 were measured along this line.

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The velocities in Table 1 were calculated by dividing the distances by an integer number of rotation periods — one period for the first halo, two periods for the second halo, etc.[3] Notice that the velocities decrease slightly with distance for both the northern and southern parts of the halos. This is most likely caused by the effect of solar radiation on the dust particles' trajectories. A comparison of the velocities also reveals that for each halo the velocity estimated from the northern part of the halo is larger than the estimate from the southern part. This is explained by the fact that material ejected into the southern part of the halo must be ejected approximately one half period before or after the material ejected into the northern part.

Our best estimate of v_e is obtained by using only the data from the first halo where the effect of solar radiation is the smallest. We reduce the systematic effect of the different ejection times by averaging the velocities from the northern and southern parts of the halo. Our best estimate for v_e is then 0.544 ± 0.009 km sec^{-1}. We made no correction for any projection effects on v_e. A projection effect would occur if the direction of v_e relative to the axis of rotation was other than 90 degrees. If such a projection effect was present, then our velocity is a lower limit on the true velocity.

[text continued on page 111]

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Table 1. Distance from the nucleus to the halos and the computed velocities

Halo[a]	d (km)[b]	Velocity (km sec^{-1})
South 1	22100 ± 800	0.536 ± 0.009
North 1	23600 ± 800	0.572 ± 0.009
South 2	41200 ± 1000	0.499 ± 0.008
North 2	44700 ± 1000	0.542 ± 0.009
South 3	58800 ± 1000	0.475 ± 0.008
North 3	64900 ± 1500	0.524 ± 0.008
South 4	73400 ± 1500	0.444 ± 0.007
North 4	78400 ± 1500	0.475 ± 0.008
South 5	89500 ± 2000	0.433 ± 0.007

[a]North and south refer to the halos on the north and south side of the nucleus as seen in Fig. 3.

[b]The main source of uncertainty in these distances comes from the difficulty in determining the exact position of the halos in the image. The estimates here are based on an uncertainty of one pixel for the bright halos near the nucleus and three pixels for the halos furthest from the nucleus.

[3] We used the rotation period of 11.47 hours measured by Lecacheux, Jorda, and Colas (1997).

4. Discussion

The comet was near perihelion at a heliocentric distance of 0.943 AU at the time of our observations. Given this distance, we can compare our value for v_e of 0.544 ± 0.009 km/sec with the value predicted using Whipple's empirical model. The open circle in Figure 1 represents our value for v_e and is seen to be in excellent agreement with Whipple's model, which predicts approximately 0.55 km/sec. However, the very small difference between our measurement and the Whipple model may be somewhat coincidental given the scatter in the Bobrovnikoff data and the fact that our value has not been corrected for possible projection effects (see Section 3).

Biver *et al.* (1997) derived the expansion velocity of outgassing H_2O and CO from the gases' spectral line shapes. Their observations covered a range of heliocentric distances from 1.4 to 6.6 AU. They, like Whipple, fit these velocities with a power law and got $v = (1.16 \pm 0.08)\, r^{-0.43\pm0.02}$ km/sec. The power law index agrees fairly well with Whipple's index, but the expansion velocities are significantly higher. Extrapolating the Biver *et al.* fit for outgassing velocity to the value during our observations, we obtain 1.19 km/sec. This is substantially higher than our value for v_e. However, we measured the dust velocity not the outgassing velocities. There are several effects that could cause the H_2O and CO outgassing velocities to differ from v_e.

Whipple's empirical law is used routinely by astronomers to estimate v_e. Unfortunately, it is based on a rather sparse data set. Our single measurement agrees well with the Whipple model, but with only one night's data it is impossible to test the power-law dependence on heliocentric distance. Given the wealth of observations of C/1995 O1, the data certainly exists to allow such a test. We strongly encourage other observers to repeat the analysis described on their own data. We would be happy to assist them in any way possible.

Acknowledgements.

We would like to thank Daniel C. Franklin and Clint R. Saffo for their assistance with the observations and Charles J. Wetterer and David E. Bell for useful discussions concerning the morphology of the halos.

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THE EDGAR WILSON AWARD

On 1998 June 11, *IAU Circular* No. 6936 announced the new Edgar Wilson Award, to be given annually to those who discover new comets in an amateur capacity — or, if no comets are discovered in a given year, to the amateur astronomer(s) who have made important contributions to the observation or study of comets.

IAUC 6936 says in part:

The Award shall be allocated annually among the amateur astronomers who, using amateur equipment, have discovered one or more new comets. Only comets officially named for their discoverers shall be included in the annual count. Since particular recognition is to be given to the amateurs who discover the most comets, identical fractions of the total Award funds shall be allocated for each comet with an eligible discoverer, except that if the same comet is credited to more than one independent eligible discoverer, each discoverer shall receive a full fraction. If the discovery is made as the result of information produced or prepared by some other person, it shall not qualify for consideration. Eligible discoveries may be made by visual, photographic or electronic means.

The Award shall be administered by the Smithsonian Astrophysical Observatory (SAO), as the beneficiary under the Will of Edgar Wilson of Lexington, KY. This administration shall specifically be through the International Astronomical Union (IAU) Central Bureau for Astronomical Telegrams (CBAT), which, with the advice of the Small Bodies Names Committee (SBNC) of IAU Division III, has the responsibility for naming comets. It is anticipated that the funds available for the first annual Award shall be approximately US$20 000 (twenty thousand dollars). For the purpose of this Award, a year shall be the period of twelve months beginning and ending on June 11.0 UT. The first Award shall be for the year ending on 1999 June 11.0. The Award shall be announced and made during the month of July following the end of each period.

To be eligible for the Award an individual must demonstrate (a) that he or she is acting in an amateur capacity, at least for the purpose of discovering the comet, and (b) that only amateur, privately-owned equipment was used for the discovery. In years when there are no eligible comet discoverers, the Award shall be made instead to the amateur astronomer(s) judged by the CBAT to have made the greatest contribution toward promoting an interest in the study of comets.

The Edgar Wilson Award is international in scope, and nationals of no country are excluded from consideration. An observer who suspects he or she has discovered a comet shall ensure that his or her discovery report reaches the CBAT according to the usual procedures. The CBAT shall maintain the necessary records and may contact the discoverers for eligibility documentation. The decision of SAO (via the CBAT) is final.

Not a lot is known about Edgar Wilson, who was evidently a reclusive man who inherited a large amount of money from his father, a successful businessman in the Lexington, Kentucky, area. Wilson's will stipulated that the award for comet discoveries was to begin five years after the death of his brother, Oscar, who died on 1993 June 10 (Edgar Wilson himself had died in 1976). The rather large estate also includes donations to other groups, notably some churches. Edgar Wilson evidently loved astronomy, and wanted to encourage an awareness of the subject. However, his interest in astronomy appears to have been rather private, and there is no indication that Wilson contacted any astronomers to formulate his will.

Some examples of how The Edgar Wilson Awards may be given for comet discoveries are given at the *ICQ*/CBAT/MPC web site at `http://cfa-www.harvard.edu/iau/special/EdgarWilson.html`. — *D. W. E. Green*

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Catalogue of Comet Discoveries

Maik Meyer (Freiberger Str. 39; D-09623 Frauenstein; Germany) has informed us that he is working on extending and revising Michael Rudenko's "Catalogue of Cometary Discovery Positions" published in the October 1986 issue of this journal (*ICQ* **8**, 117). Meyer's "Catalogue of Comet Discoveries" attempts to add in such quantities as instrumentation details and country of discovery, while omitting Rudenko's information regarding the comet's geocentric and heliocentric distances, rate and direction of the comet's motion on the sky, and the number of days from full moon at the time of discovery. One of the unfortunate problems with both catalogues is the discovery magnitude: Most discoverers either are not interested in comet magnitudes or have little experience in making m_1 estimates, the result being that m_1 discovery magnitudes are almost always on the faint side (often by 1-5 magnitudes!). To make such a catalogue more meaningful, it would be helpful to include m_1 estimates by experienced observers close to the date of discovery.

Though still under construction, Meyer is making his catalogue already available — free of charge — via e-mail (`maik.meyer@mb2.tu-chemnitz.de`) or computer diskette. Meyer's catalogue now has about 1200 entries (Rudenko's catalogue had 807 entries). Meyer has taken the older discovery positions directly from Rudenko, and prior to 1992, the positions are for equinox 1950.0 (though Meyer says that he plans to convert the older 1950.0 positions into 2000.0 positions to remove the current inconsistency). Meyer also remarks that he has corrected numerous data, and has searched many other sources to add his additional information. Meyer plans regular updates of the catalogue about every 6 or 12 months. Further information and an excerpt of the catalogue can be found at Meyer's web site at `http://www.tu-chemnitz.de/~mmey/project.html`. — *D. W. E. Green*

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BOOK REVIEWS

Worlds in Interaction: Small Bodies and Planets of the Solar System, *ed. by H. Rickman and M. J. Valtonen* (Dordrecht: Kluwer Academic Publishers), 508 pages + xx (hardbound) [ISBN 0-7923-3930-4], 1996, $224.00. Reprinted from *Earth, Moon, and Planets* **72**(1-3).

This volume, the proceedings of a five-day conference held in Mariehamn (Finland) in 1994, is quite broad in its subject matter. Topics covered range from meteroids to the galaxy, a factor of 10^{27} is size! As one might expect for a conference held so soon after the Jovian comet crash of July 1994, there are several papers that discuss D/1993 F2 (Shoemaker-Levy 9). Others deal directly with the mechanics of impacts on the earth and craters. Less than 200 terrestrial impact craters are known, and their geographic distribution is very uneven. Many parts of the world have been poorly examined for impact craters, and the cratering record on the sea floor is still terra incognita.

Several papers deal with the interaction of the Oort cloud and the galactic environment. Weissman investigates stellar passages through the Oort cloud and determines the various possible end-states for comets affected by the passage. A small fraction of comets will be ejected from the solar system. With many billions of Oort cloud comets, even a small fraction equates to a large number of ejected bodies. One expects Oort clouds to be common around other stars, yet we have not seen a good candidate for an interstellar comet.

A number of papers deal with controversial topics. Gehrels and Jedicke discuss the population of Near-Earth Objects discovered by Spacewatch and claim the existence of a near-earth asteroid belt. Yabushita examines whether cratering and mass-extinction events on earth are periodic and finds evidence for only a weak periodicity. Yet Rampino and Haggerty present their evidence for periodicities as more concrete, and find as a possible cause the carousel-like motion of the solar system around the galactic center.

One of many fundamental unanswered questions regarding comets is how their physical activity varies over repeated approaches to the sun. Is there a steady gradual decrease in cometary activity with time? Or does cometary activity come and go in fits and starts? Emel'yanenko and Bailey, considering the motion of long-period comets under the influence of the Jovian planets and the possibility of comets temporarily "switching off", conclude that many long-period comets pass undetected. The recent discovery by the LINEAR program of a number of low-activity comets, that in years past would have passed unnoticed or have been classified as asteroids, lends credence to this work. A review article by Jewitt summarizes the then-current state of understanding of the processes by which objects behave as comets.

The conference is summarized in three review articles: Whipple on comets; Harris on asteroids; and Ceplecha on meteroids. Harris' article is accompanied by a rebuttal by Steel.

Can this book be recommended? Like most proceedings volumes the quality of the included papers varies from superb to dreadful. There are thankfully few of the latter in this volume, but I find myself unable to recommend this book to individuals for one reason: the outrageous price tag. At US$224, this volume is likely to appear only in institutional libraries, and that is a shame. — *Gareth V. Williams (Harvard-Smithsonian Center for Astrophysics)*

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Comets, Popular Culture, and the Birth of Modern Cosmology, *by Sara Schechner Genuth* (Princeton University Press), 367 pages + xvi (hardbound) [ISBN 0-691-01150-8], 1997, $49.50.

A hundred years ago, the Vienna astronomer Johann Holetschek produced an invaluable series of publications detailing the observational record of comets back to ancient times — but (like Alexandre Pingré's ever-useful two-volume *Cométographie* written in French two full centuries ago) copies of the Austrian catalogue are difficult to find today. Outside of the inherent usefulness of chronological compilations such as Brian G. Marsden's *Catalogue of Cometary Orbits* and Gary Kronk's forthcoming multi-volume *Cometography*, which list cometary apparitions formally in terms of observational quantities with a minimum of commentary, landmark volumes written in the first half of the twentieth century that involve comet historiography up to the early-modern era include Lynn Thorndike's multi-volume *A History of Magic and Experimental Science* and C. Doris Hellman's *The Comet of 1577: Its Place in the History of Astronomy.*

Comets are one of the more interesting 'tracers' in history for gauging the state of astronomy in regional cultures. The tendency among recent authors who have written about comets in history has been to write simplified popular analyses that lean toward deriding ancient and medieval ideas regarding comets and cometary theory, without respecting that astronomy and astrology were generally inseparable in the minds of typical educated scholars until the seventeenth and eighteenth centuries. In the past 1-2 decades, there has been an increase in more serious comet-related historical research in articles and books, covering the time from ancient Babylonia up through the 20th century, and these studies are suggesting that much fruitful historical work on comets is yet to come.

Now enters Sara Schechner Genuth with her new book, *Comets, Popular Culture, and the Birth of Modern Cosmology*, which is a developed version of her 1988 doctoral dissertation in Harvard's History of Science department that was titled "From Monstrous Signs to Natural Causes: The Assimilation of Comet Lore into Natural Philosophy". And it is obvious that she has been busy keeping up with publications regarding comets and history over the past decade. While other books simply remark that comets were taken as fearful portents, Schechner Genuth's book backs up that claim with ample scholarly proof. Her focus is clearly 17th- and 18th-century England, and the bulk of the book pertains to that setting. The reader should read the book not for a definitive history of cometary thought even in Europe, but rather as an exploration into the background of (and influence upon) the perceptions of comets by Edmond Halley, Isaac Newton, and their contemporaries. As such, her depiction of comets as signs and causes pervading early-modern society, making their mark on history and influencing future thought on comets (and astronomy in general), is amply illustrated and discussed. She spends a few pages discussing medieval and early-modern material from manuscripts and publications originating in continental Europe, but much opportunity is left for others to explore more deeply the history of cometary thought in these other countries over this period of fast-changing philosophic and scientific ideas.

The strengths of this book vastly outweigh its weaknesses, so the following remarks about any shortcomings should be viewed as relatively minor. Regarding the earliest thinking on comets (mostly covered in the ten pages of Chapter I), various ancient authors mentioned by Schechner Genuth do not have dates or places associated with their work, leading to potential confusion for the readers in placing events properly in their minds. An elaboration of the problems encountered in the ancient literature with regard to confusing comets with meteors and other atmospheric phenomena would be most useful here. As with Donald Yeomans' 1991 book, *Comets: A Chronological History of Observation, Science, Myth, and Folklore*, Schechner Genuth's new book needs a primer on what typical comets look like to naked-eye observers, and how and why they can be (and still are, amongst the general populace today) confused with meteors and fireballs. Also not discussed in this book is any detail about the inherent problems in dating comets from the ancient and medieval literature. Thus, for example, "the comet of 678" (page 30) has in recent decades been acknowledged to have been misdated (the true year probably having been 676).

Many text-supportive illustrations, well produced by Princeton University Press within Schechner Genuth's narrative, are taken from old manuscripts and tracts depicting comets. However, her explanations are often very brief, and I would

have preferred more information placing the illustrated comets in the context of what was happening at the time, particularly where a given comet appeared in the sky (and for how long), and how bright it was. In some places where the reading gets a bit slow, this would add some color and pick up the tempo.

The observational aspects are perhaps the weakest part of this book. Indeed, from Schechner Genuth's text, one would not have an idea that a lot of very useful observational data (both physical and positional/astrometric) on individual comets has been gleaned from the European medieval literature for inclusion in the catalogues by Pingré, Holetschek, Kronk, and others; such observations were important beyond the uses of modern-day astronomers who want to learn about comets, because they tell us that medieval scholars were attempting to quantify their observations of comets, measurements of which are inherently basic to any ultimate understanding of what comets really are. Later, Schechner Genuth mentions the debates between Galileo and Horatio Grassi on the comets of 1618, and I would add that their debating the meaning of telescopic views of the third 1618 comet produced some interesting insights into their assumptions regarding light and optics.

A big mystery surrounds the fact that extant European astronomical drawings — that is, reasonable depictions of the constellations (accompanied by the moving sun, moon, planets, and comets) — do not really appear until around the 15th century, when Paolo Toscanelli and others made what are evidently the first realistic drawings of comets moving with respect to the background stars; unfortunately, Toscanelli's observations remained virtually unknown until they were found in the late nineteenth century and subsequently published. With catalogues of stars — and evidently the ability to create both flat maps and globes of the constellations — dating back to ancient times (Hipparchos or earlier), why were maps of stars not widely used? Conceivably this was a huge stumbling block that prevented more rapid advances in astronomy during the middle ages; much may have been learned had the paths of comets been plotted against maps of the constellations. Schechner Genuth states one significant answer to this question when she relates Halley's attempt to construct orbits of all observed comets: "[Halley] quickly learned that most observations were unsuitable for this task" because "for centuries, Aristotle's opinion had prevailed, and astronomers had taken it for granted that comets were sublunary vapors or aery meteors", and, in Halley's own words, "no Body thought it worth while to take Notice of, or write about, the Wandring uncertain Motions" of comets. As noted above, important observations by Toscanelli remained unknown to Halley.

And, though Schechner Genuth briefly mentions the "novas" of 1572 and 1604, these Milky Way supernovae had tremendous impact on astronomy in general and on the way people perceived comets in particular. Her lack of more extensive treatment of these new stars is puzzling in light of her overall thesis that European thought in medieval times made a gradual transition from viewing comets as divine signs (with no apparent possible physical explanations to their existence) to taking them as natural causes of events on Earth (in which physical actions were postulated to explain how a comet could cause earthquakes, drought, floods, and plagues, and even nurture life and create new planets). The influential publications by Tycho Brahe and Michael Maestlin on the placement of the comet of 1577 were strongly affected by both men's earlier observations and analyses of the new star in 1572. Many scholars today wonder why the supernovae of 1006 and 1054 received so little attention in Europe prior to 1572, despite the fact that the earlier event was well chronicled by European monks. The relevance to comets is twofold: both supernovae and comets were unpredictable and transient in nature, and the lack of attention to some bright celestial "newcomers" (the daylight northern supernova of 1054 was not recorded in European or Arab annals) suggests that people were not closely watching the sky — meaning that the supernova was possibly dismissed as "merely" a planet. A comet, of course, looks very different from a pointlike star or planet, so will draw more attention. But if Europeans were not watching the sky closely enough to note the 1054 supernova, or even to forget about the 1006 supernova, then they were not making the necessary detailed observations to improve on their knowledge of comets or any other celestial objects; they probably never thought that quantitative measurement would lead to any additional knowledge — a mindframe worthy of study in itself. But none of these issues is addressed by Schechner Genuth (though novae emerge again in her discussion of Newton's theories of comets impacting stars and planets).

An author can never cover all topics and events in a book with as broad a theme as Schechner Genuth's, but I would have recommended expanding on many ideas and events, adding perhaps 50-100 pages to the book. I would surely like to know more about the 1630 "noon-day star [that] allegedly had appeared in the sky" (page 84), or about background concerning Newton's interesting remark that the Chaldeans believed the planets to revolve around the sun in nearly-concentric orbits and "comets in very eccentric orbits", with this philosophy being introduced into Greece by the Pythagoreans (page 139). Some readers will be unfamiliar with some terms used casually in *Comets, Popular Culture, and the Birth of Modern Cosmology*. In her discussion of English perceptions of comets, we come across "chapbook", "broadside ballads", "petty chapmen", and "the Civil War" on page 66-67, and "Tory High Churchmen", "nonjurors", and "Jacobite sympathies" on page 172, with no explanations of terms (even two English colleagues of mine did not know what some of these meant). Likewise, we run into Descartes' "stellar vortices" (page 111) and "solar vortex" (page 115). A little more background into astrology would also be helpful, partly to explain terms such as "succedent house" (page 56) and "magnitude" (page 58), especially considering its general importance in perceptions of celestial bodies in ancient and medieval times; and the horoscope diagrams on page 57 come with no explanation.

Many modern astronomical and astrophysical theories were mentioned hundreds of years ago by those who pondered comets, and Schechner Genuth discusses 18th-century proposals including: (1) the rings of Saturn were created by a captured and destroyed comet; (2) interstellar nebulae collapse gravitationally to form stars (and perhaps also comets and planets); (3) comet impacts on earth could be read in geological records; and (4) "conflagrations" of stellar systems dispersed matter into chaos that eventually recoalesced into new stars and new planetary systems. There are many such gems of information in this book, such as the play on the word "revolution" by Herschel; I have long been curious as to why this one term is used as a derived word from both the verbs "to revolt" and "to revolve".

At least once I was a bit disappointed to find Schechner Genuth lapse into resorting to secondary (and even tertiary) rather than primary sources for key information. Her citing of a sermon by Martin Luther (page 46) comes from a 1661 English translation that is in turn mentioned in a 1975 article on "Eschatological Thought in English Protestantism" by Bryan Ball. Consequently, the context is somewhat lost in what Schechner Genuth is expounding, namely that Luther preached a sermon on 1531 Dec. 10 (*Weimar Ausgabe* 34/II:459-482) on *Luke* **21**:25-26, in which Jesus says "And there shall be signs in the sun, and in the moon, and in the stars; and upon the earth distress of nations, with perplexity" (KJV). What Luther did then, in preaching on this topic, is similar to what preachers have done for millennia (and continue to do). And this apparently goes against what Bayle and Gassendi claimed, as Schechner Genuth relates on page 115: "because God had nowhere revealed that blazing stars would serve as warnings of extraordinary judgments"; also, in this specific discussion and numerous others in her book, I found the writing style to be confusing, as it is sometimes ambiguous as to whether the expressed opinions were historical or are in fact her own.

Schechner Genuth's bibliography list occupies more than 40 pages of her book. I'd prefer to see the footnotes on the same page as the text, rather than in the second half of the book (the page headings on the notes pages makes it difficult to find a footnote quickly). Her 13-page index is quite useful but not comprehensive; many of the comets appearing in the text are not to be found in the index list of comets (tabulated by year).

Schechner Genuth ends her book with a three-page appendix entitled "Recent Resurgence of Cometary Catastrophism", in which she brings the ideas of cometary creation and destruction full circle via collisions with the earth, noting that the scientific research in the last couple of decades that has suggested comets may continuously bombard planets over the life of the solar system, and in this way the seeds of biological life may have been sown. The inclusion of this appendix confuses me, because it leaves out so much material between 1800 and 1980, and thus appears rather random. I might add to her discussion, however, the irony that the study of comets — so prevalent in Western astronomy from the 17th century until the 1910 apparition of Halley's comet — dropped off considerably in this century until the 1950s, during a period that saw cosmology become a leading topic in the field, albeit with very little consideration as to the role of comets. We now see many recent studies that key on comets for their potential role or catalytic effect in the formation of not only the solar system, but other areas of the Milky Way as well. I wonder if perhaps there didn't arise a negative over-reaction in the astronomical community in response to historical perceptions of comets as having received too much attention: possibly because of their being viewed for so long as signs, portents, and causes, the study of comets was unfortunately inhibited (at least temporarily) from continued consideration of these objects as Rosetta Stones.

I could see this book serving as a catalyst for productive discussions in university courses in the general history of science, illustrating how a historian consults both primary and secondary sources on a general set of related themes to weave together a new, coherent thesis; the text could easily yield many ideas for research papers and interesting class discussions. This is one of the best new books on any astronomy topic that I have seen in the last decade. (Additional comments will appear in my forthcoming review of this book in the *J. Hist. Astron.*) — *Daniel W. E. Green*

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Kometen beobachten: Praktische Anleitung für Amateurbeobachter, *ed. by Andreas Kammerer and Mike Kretlow* (München: Verlag Sterne und Weltraum), 320 pages (softbound) [ISBN 3-87973-924-2], 1998, DM 48. (US$34.50). [Can be purchased with checks in U.S. dollars (drawn on a U.S. bank) via Hüthig Publishing, Inc.; 29 Macintosh Dr.; Oxford, CT 06478; USA. Orders from Canada and Mexico must add US$6 for shipping and handling.]

This book is undoubtedly the most comprehensive German-language amateur guide to observing comets ever published. Ten authors are listed as contributors, and the range of topics include history of comet science; essential references for magnitude estimates; analyses of comet observations; observation of comets via visual, photographic, and CCD techniques; astrometry and spectroscopy; calculating ephemerides and orbits of comets; and various sources of information. The *ICQ* influence is readily apparent, with keys to references, instruments, and magnitude methods listed; the *ICQ* tables for atmospheric-extinction correction are also provided. — *D. W. E. Green*

Φ Φ Φ

MOVIE REVIEW: Deep Impact

I'm not one to seek out disaster movies, but it would be difficult for a comet enthusiast to stay away from this. I knew this would be a bad movie, both from reports of non-astronomer movie critics and from colleagues who had viewed it before I did. (I waited a good month after the movie's release to see it, to escape the crowds.)

This is the first (and possibly last) movie to ever be reviewed in these pages. Normally, I would not consider reviewing even a movie about comets in the ICQ. But this movie was so bad that I think it deserves some comments. There was virtually nothing good about this movie, with perhaps the exception of the special-effects attempt at showing what the surface of a comet might look like — that was pretty good (though the comet becoming fully active as the instant of local sunrise is pretty ridiculous). Unfortunately, the script, the acting, and most of the ideas in this movie were horrendous.

I won't waste much space detailing all that was wrong with the astronomical picture presented in this movie; very little of it even *approached* reality. (When will the public ever get a true movie "picture" of how astronomers do their

work? It doesn't seem that difficult to get a reasonable "picture" of how physicians work onto film, for example...) A kid discovers a comet at a local (high-school?) star party, at a time when the comet was brighter than Alcor and Mizar (and thus naked eye, though they made it seem like a telescope had to be used to see it!), fully two years before closest approach to the earth; a professional astronomer then at some "Adrian" Observatory "near Tucson" then presumably needed a 2-m-class instrument (which looks to be the 100-inch reflector at Mount Wilson, in reality) to view the comet after getting a message from the kid Biederman's high-school teacher, and needed the computer to tell him that it was a comet, and then got instantaneous orbital calculations that determined the thing would possibly collide with the earth, and then unethically adds his own name (Wolf) to the comet (thus, "Wolf-Biederman", though people later seem to just call it "Biederman"). No Central Bureau for Astronomical Telegrams here!

Then, Wolf dies in a fiery crash (presumably with all his data) before he has a chance to tell anybody about his observation and evident "confirmation", and somehow the news gets out anyway via the U.S. President a year later that Biederman had discovered this comet — the naming of which is apparently news to Biederman himself at this presidential news conference a year after discovery — and the comet has been observed quite well over the preceding year, to nobody's knowledge except government secretists, and my head is swimming at all the nonsensical aspects of this movie script!

This "movie comet" actually seems to get much fainter as it approaches the earth in the following two years (despite its also-incredulous depiction in the movie as a ***bright*** naked-eye daylight comet for weeks prior to impact)! It is actually quite small when it is only 10 hours from impact with the earth, near the end of the movie — when in reality its coma would be engulfing the earth and its tail would be so long as to be not capturable in a small camera field-of-view. What is sad is that the crew of "Deep Impact" spent years researching this movie, and what is apparently a large number of astronomers who were consulted (including the three of us at the Central Bureau for Astronomical Telegrams and the Minor Planet Center) were not given credit (with the apparent exception of Gene and Carolyn Shoemaker) — which is just as well, considering that most of what we had to say was evidently thrown out. (I hear, though, that some engineers/theorists evidently unaware of the details of comet discovery and observation *were* consulted heavily, especiallly for the manned mission to the comet and for the special effects on the earth following impact. Any useful messages coming from these parts of the film are largely negated by the horrible script writing and logic present everywhere in this film.)

Yes, the original script by Bruce Rubin (our contact) was apparently going to show more reality as to how comets are discovered and handled, but that script was canned — in favor of "more of the same" old disaster-type plots to "ooh" and "ahh" the audience. But with so many millions of dollars spent on yet another run-of-the-mill disaster movie, the producers had a real opportunity to do something different — to make a deep impact — and they blew it. It would have been so easy (and much more believable) for the producers to have shown how a real comet discovery is made and reported (with all of its real uncertainties), then confirmed, and how accurate astrometry is used from observers worldwide — more often amateur than professional astronomers! — for (first) a preliminary orbit determination and then increasingly-refined orbital solutions, and how these solutions take time to assess close approach possibilities. I think that the public is intelligent enough to be able to discern a more plausible scenario over a poor one, and that this would make for a more enjoyable visit to the movie theater. How one can "cover up" a naked-eye comet discovery and its orbital path for a full year (the U.S. Government evidently held this information from the public that long!) is unbelievable, again a result of poor script writing in "Deep Impact". As Timothy Ferris has recently (half-sarcastically) written in *The New Yorker* (1998 July 20, p. 5), "since movie audiences are told less about how scientific facts are arrived at than Victorian youngsters were told about where babies come from it hardly matters whether the 'facts' in a film are 'scientifically accurate'"; Ferris adds that "when a scientist appears in a film, his function . . . is to make a declaration . . . that everyone immediately accepts as gospel. Nobody asks how he came to believe it." A few minutes of explaining how things ***really*** work with a comet discovery could hardly have bored the viewer — after all, the presentation of this is what a movie director or producer is there for! — and it might have made "Deep Impact" much more believable than it was.

I'd give "Deep Impact" a grade of "D" (or a "1" or "2" on a 0-10 scale, with 10 being superb). But the importance of this movie for our purposes is that it shows what is wrong with society's depictions of astronomy and of science; movie producers need to consider getting things correct, and they need to understand that getting things correct may actually make the movie more interesting for their audiences (who thus give better reviews). From my own perspective, I'd say there were two useful pictures that do appear in this movie: (1) objects can hit the earth, and we need to be aware of this; and (2) if some really big disaster is going to happen, probably all civil order will break down in panic, and the planet is likely to get trashed by mankind in the ensuing panic before any such predictable comet would actually strike the earth.

Will anything result from this movie, other than perhaps more bad films with a similar theme? One would like to think that the people controlling the purse strings to the profits from "Deep Impact" would give a small portion of their profits to those astronomers involved in the search for, and follow-up of, near-earth objects. Perhaps some U.S. government officials — elected or non-elected (and, if non-elected, probably top-secret) — will look into contingency plans for the event that a near-earth object is actually discovered and predicted to hit the earth. I somehow doubt that movies like "Deep Impact" will have much effect on the general public, other than to increase their awareness of the issue, which is of course important.

I'm not planning to see "Armageddon", given that its producers reportedly consulted no astronomers at all and were not interested much in realistic pictures of anything. My 14-year-old son did see that movie, which has a Texas-sized asteroid discovered by an astronomer who apparently looks through a telescope and says something like "what's that fiery thing?"; It doesn't help the plausibility scenario that this huge, intrinsically bright object is discovered only 18 days before collision with the earth, and the "asteroid" apparently also has a tail and surface features more expected of a comet. The producers evidently didn't even learn what an asteroid is! Kevin Zahnle (1998, *Nature* **394**, 435) has commented that "*Armageddon*'s fantasy is so complete that any resemblance to the real Universe is accidental."

I do have hopes that someday a big-screen movie will be produced that is both scientifically accurate and intriguing and thought-provoking in its plot. But I suspect that the film industry is years away from a revolution in its approaches to movie plots that will be necessary before such a film can be made. — *D. W. E. Green*

Φ Φ Φ

Tabulation of Comet Observations

Regarding the anticipated release of *Celestia 2000* (see *ICQ* **19**, 225), Sky Publishing Corporation has announced the availability of this softward as a CD-ROM for IBM-compatible personal computers using Windows 3.1/95/NT. *Celestia 2000* contains the stellar data from the Hipparcos and Tycho Catalogues in compressed binary format; Sky's advertising flyer states that "its powerful software interface allows easy access to astrometric and photometric data for each of the million-plus stars" and it allows one to "generate lists of objects that fall within user-specified ranges of celestial coordinates, brightness", etc., and "then display the results on an all-sky map". The cost is US$49.95 plus shipping from Sky Publishing Corporation (P.O. Box 9111; Belmont, MA 02178-9111; U.S.A.). A web site for *Celestia 2000* is available at `http://astro.estec.esa.nl/Hipparcos/`.

Adrián Galád (Modra-Piesok, Slovak Republic) writes concerning the Modra observations (generally listed in the *ICQ* under observer codes `PRA02` or `GAL03`): "Since we started measuring with the USNO-A1.0 catalogue (instead of GSC), there have appeared some difficulties in our estimation of total magnitudes (though we still have not used filters yet). The GSC comparison-star magnitudes are approximately V magnitudes and we have now been using the USNO R magnitudes. This is why our brightness estimates have been overestimated by about 0.5 to even 1.0 mag." Editor's comment: The Modras m_1 CCD magnitudes of comets have been among the more consistent by cometary astrometrists in the last couple of years, which is why I asked Galád and Pravda if they would send me complete details of their observations for publication in the *ICQ*; they kindly agreed, and in recent issues we have begun to include their data. The Modras example is very typical of astrometric CCD observers of comets — the usual catalogues of stellar positions do not have good magnitudes, and those catalogues that have good magnitudes generally do not have enough faint stars to perform astrometry. But it is far better to have some "reasonable" m_1 data from these astrometrists than to have little or no magnitude data at all for fainter comets. It is also for this reason that we have assigned a new code to the USNO-A1.0 catalogue (see below), despite the fact that the photometry is known to be poor. Brian Skiff calls attention to the write-up on the USNO-A1.0 magnitudes by Dave Monet at `http://aries.usno.navy.mil/ad/pmm/read.pht.htm`, where Monet says: "The photometric calibration of USNO-A1.0 is about as poor as one can have and still claim that the magnitudes mean something", and the magnitudes may be off by as much as 0.25 mag in the northern and 0.5 mag in the southern parts of the sky.

New codes for comparison-star references:

AO = USNO (S)A1.0 catalogue R magnitudes, from the first editions of this catalogue; not recommended because magnitudes may be off by 0.5 mag or more due to photographic calibration errors, but CCD astrometric comet observers are using them due to convenience

LA = Landolt photoelectric sequences (1992, *AJ* **104**, 340)

YZ = Yale Zone catalogue

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Descriptive Information, to complement the Tabulated Data (all times UT):

◇ *Comet C/1995 O1 (Hale-Bopp)* ⟹ 1996 May 21.92 and 1997 Feb. 18.10: w/ 20×110 B, central cond. of dia. 1′ [NES]. 1996 June 16.91 and 18.93: w/ 20×110 B, central cond. of dia. 2′ [NES]. June 23.94, July 10.89, and 1997 Feb. 5.14: w/ 20×110 B, central cond. of dia. 1.′5 [NES]. 1996 July 6.85 and 1997 Jan. 17.18: w/ 7×50 B, central cond. of dia. 1.′5 [NES]. 1996 Aug. 4.85 and 1997 Feb. 3.14: w/ 7×50 B, central cond. of dia. 2′ [NES].

1997 Jan. 27.18 and Feb. 10.13: w/ 5-cm R (20×), central cond. of dia. 1.′5 [NES]. Feb. 7.08 and 8.13: w/ naked eye, central cond. of dia. 2.′5 [NES]. Feb. 10.12: w/ 7×50 B, central cond. of dia. 1′ [NES].

Feb. 10.43: "regarding this morning's observations, I worked for half an hour using every recognized method for magnitude determination and taking great care to be as independent as possible; magnitudes were from the Tycho Input Catalog; regardless of instrument or method, I always saw this comet as at least marginally fainter than γ Cyg (before correction for extinction); likewise, no determinations were made before the comet was well up (*i.e.*, 19°-20°); the results were: VSS method — impossible to employ becase of the enormous brightness gradient within the coma; Morris method — to blur the 'nucleus' enough to blend it with the coma required the instrument to be defocused so far that this became the VBM method; VBM method — this worked very well as the surface brightnesses of the comet and comparison stars could easily be compared; Beyer method — works just as well (and gave the same results) as the VBM method; naked-eye in-focus method — worked surprisingly well (probably because of the coma's fairly small dia.; it was rather obvious how bright the comet was relative to the surrounding stars; actual results (all corrected for extinction) were: 10×50 B, MM = B, m_1 = 2.1; 1×50 R, MM = B, m_1 = 2.2; naked eye + eye glasses, MM = B, m_1 = 2.1; naked eye, MM = I, m_1 = 2.1; 10×50 B shows the tail to consist of two elements, an essential straight 'plume' that can be tracked for 6.°5 centered on p.a. 315° (edges at p.a. 310° and 320°), which looks very much like the 'plumes' in the tail of comet C/1975 VI (West) about 2 weeks after perihelion; also, a much fainter, slightly curving tail at least 4.°5 long with its trailing edge at p.a.

$\sim$ 285°; coma dia. 10′, DC = 8; the great fountain was just detectable with the binoculars; w/ 41-cm L (56×-174×), incredibly intense, almost stellar nucleus, from which arises a gigantic fountain spanning p.a. $\sim$ 160° to $\sim$ 235° — the edge at p.a. $\sim$ 160° is by far the brighter (it is so intense as to look solid or like a painting, rising at least 2′ from the nucleus before curving back toward the tail, where it can be followed far beyond the field); roughly opposite this feature is a much fainter, narrow, rather diffuse jet directed toward p.a. $\sim$ 5°, which creates the leading (E) side of the main tail (it is linear and can be traced $\sim$ 2′.5); the nucleus, fountain, and in fact the entire coma are distinctly yellowish in hue; immediately adjacent to the nucleus (which is of $m_2 \sim 7.8$ at 70×) and on the trailing edge of the fountain (*i.e.*, p.a. $\sim$ 235° relative to the nucleus) is an intense knot or secondary nucleus perhaps 2-3 mag fainter than the primary (it is not more than a few arcsec in dia. and certainly < 5″ from the nucleus — its edges are soft, whereas the primary nucleus is very hard and sharp, but it appears otherwise quite solid and, as twilight advances, it becomes progressively sharper and more separate from the surrounding bright material); separating this object from the nucleus is an intensely dark, minute wedge extending inward from the anti-solar direction!; the great 'plume' in the tail is seen to originate from the joining of both the jet on the tail's E boundary *and* the great fountain initially directed toward the W; the two merge into a single feature a couple of degrees behind the coma; the area between these bright streams of material is of much lower surface brightness; ahead of the bright, parabolic outline of the obvious portion of the coma is a faint but distinct hood, like that seen in the drawings of comet C/1858 L1 (Donati)" [BOR].

Feb. 15.49: [addition to *ICQ* **20**, 7] w/ 33.3-cm L (58×), "when looking exclusively at the comet's head, the two tails combined w/ the coma to form a rather distinct U-shape; between the inner edges of the two tails, the space seemed abnormally dark, w/ this darkness being most notable near the nucleus; overall, the U-shape, the bright fan of material, and the distinct blackness extending between the dust and gas tails reminded me of a painting in *Astronomy* magazine (July 1976, p. 46) of Tebbutt's Great Comet of 1881" [KRO01]. Feb. 17.48: [addition to *ICQ* **20**, 7] w/ 33.3-cm L (58×), "the wedge of material was still very bright and the bar-like nucleus was still apparent; the borders of the wedge were at 185° and 213°; the nucleus seemed to begin at the convergence of the wedge's borders and then extended $\sim$ 0′.3 along the border extending to 213°; the nucleus was definitely brightest at the point of the convergence of the two sides of the wedge; interestingly, a dark nick was cut into the wedge at the end of the bar-like nucleus (this nick was perhaps 0′.1 long); the wedge border at 213° flowed back and formed the inner border of the somewhat-fan-shaped tail at 306°, while the 185° border curved back to form the outer border of this tail at $\sim$ 280°; at 200×, the bar-like nucleus was even more distinct (length 0′.3); unlike my obs. of Feb. 15, the starlike nucleus was quite apparent; it was *not* situated perfectly at the convergence point of the two wedge borders; the nucleus was circular in appearance and was $\approx$ the size of other stars at this magnification; it was partially, but not completely, separated from the bar by a very minute nick in the bar; this nick seemed like a smaller version of the nick that cut into the wedge border at the end of the bar-like nucleus, but this smaller nick only cut into $\approx$ one-half of the bar-like nucleus; this nick more closely fell at the convergence point of the two wedge borders, as the border at 185° seemed to rise from the bar-like nucleus on the side exactly opposite to the nick; overall, rough measurements would indicate a bright, starlike nucleus perhaps 0′.1 across, w/ an only slightly fainter bar of material extending 0′.2 towards 213°; a slight nick on the anti-solar side of the bar partially separates the two, while on the sunward side of the bar, exactly opposite to this nick, a jet of material forming one border of the wedge rose toward p.a. 185°; at the end of the bar, a larger nick was apparent; the entire bar-like nucleus lay on the wedge border at 213°" [KRO02]. Feb. 19.10-Mar. 10.15: m_1 estimates made via comparison of comet w/ Arcturus (α Boo) and Vega (α Lyr) through spectacles; three shells near the cometary nucleus were observed w/ 0.7-m L during Mar. 1, 3, 9, and 10; on Mar. 3.14, distances of shells from nucleus were 7″ (second shell) and 9″ (third shell) (the diameters of these shells were 22″ and 25″) [CHU]. Feb. 25.48: "despite moonlight, the comet seems to continue a steady brightening; 7×50 B revealed the tail fanning between p.a. 284°-312°, and it contains a bright ray extending toward p.a. 293°; the 33.3-cm L reveals that the ray is directly produced by a bright jet that comes out of the nucleus close to p.a. 260°; I observed two hoods which connected the two brightest rays and basically crossed the very notable bright wedge of material; two condensations were noted where the arcs touched the second bright ray that exits almost due S of the nucleus" [KRO02]. Feb. 28.47: "the comet's naked-eye view was stunning, despite moonlight; it clearly outshone Deneb and Altair, but was still at a half-magnitude fainter than Vega; w/ 20×80 B, 2° tail in p.a. 293°; W-most border of dust tail was 3°.5 long in p.a. 287°; bright spine was 4° long in p.a. 304°, and the E-most border of the gas tail was 5° long in p.a. 323°; dust tail was the brightest part of the complete tail system for the first 1°.5, and then it rapidly decreased as it fanned out; gas tail seemed to change little in intensity from the point where it exited the coma until $\approx$ 4°, and then it dropped in brightness; it seemed obvious that the bright wedge of material was still present from previous mornings and was still bordered by jets extending S-ward and W-ward, but when seen at high power w/ the reflector, everything resolved into a different picture; w/ 33.3-cm L at 200× and 500×, an intense emission at p.a. 166°, and a fairly strong emission at p.a. 248°, which helped feed the bright tail spine on the inside of the dust tail, and a faint emission at p.a. 48° that formed the inside edge of the gas tail; the area of the 'bright wedge' seen in B was actually filled w/ three distinct hoods and one very faint one; total of four hoods decreased in brightness as you moved away from the brilliant, nearly-stellar nucleus (mag possibly 2.5, after comparison w/ stars far outside the field-of-view); hood closest to the nucleus seemed to be emitting directly out of the emission at p.a. 166°, as there was a subtle 'fountain' effect present; this hood's W side was very bright and curved back to the jet at p.a. 248°; the E side was very faint and extended to the fainter jet at p.a. 48°; second hood was fainter and more diffuse than the one closest to the nucleus; it was not connected to the first hood or the bright emission at p.a. 166° (it was also brightest on its W side and fanned out as it approached and connected w/ the emission at p.a. 248°); very faint E emission of this hood curved toward the faint emission at p.a. 48°, but never quite made it; third hood is fainter and more diffuse than the second (it is also brighter on the W side, but fanned out considerably as it curved toward the emission at p.a. 248°; the W border of this hood seemed to help form the W border of the bright tail spine; there was no apparent E extension of this hood); fourth hood was glimpsed several times, and its distance from the third hood was noted, but its outer (NW) border was never traced very far, and there was never a

hint of an E-ward extension" [KRO02].

Mar. 3, 6, 11, 12, 26, April 2, and 8: "photographic obs. w/ 26-inch telescope by A. A. Kiselev, O. V. Kiyaeva, K. L. Maslennikov, L. G. Romanenko, and N. A. Shakht show spiral-arm structure and three arc-like dust shells in the comet's head; on Mar. 5 they were centered at 6″.9, 15″.8, and 27″.9 from the nucleus, respectively; on Apr. 2, these distances were 12″.9, 28″.1, and 44″.0; the arc structure of the shell nearest to the nucleus turned through a right angle at ~ 12″ from the nucleus; the apex of shells on Mar. 26 was to be 20000, 30000, and 40000 km (corresponding to the positions of dust envelopes measured for comet 1P/Halley by the Vega 2 outbound); following the Vega experiment, we estimate the mass range of dust particles as 3×10^{-13} to 3×10^{-14} g; the shell structure allows us to suggest a shell rotation period of ~ 25 days (see *IAUC* 6583); the angular extensions of shells were ≈ 150°, 110°, and 90°, and they varied with time; the p.a. of the central radius of shells was ~ 200° [Yu. N. Gnedin and T. P. Kiseleva, Central Astronomical Observatory, Pulkovo].

Mar. 3.47: the p.a. represents the bright ray, while the tail fanned in p.a. 284°-312° (naked eye) [KRO02]. Mar. 4.47: a bright ray extended 3° in p.a. 305°, while the dust tail extended 6° in p.a. 288° (naked eye) [KRO02]. Mar. 6.47: "despite bright moonlight, w/ naked eye, a bright ray extended 2° in p.a. 307°, while the dust tail extended 3° in p.a. 289°; at ~ 10°.5 from the coma (next to a 4th-mag star), the tail was lost from sight (brief use of the 7×35 B confirmed that I was seeing the gas tail for that length and also revealed that the gas tail nearly maintained a width of around 1° for most of its length); meanwhile, the view through the 33.3-cm L showed little change in the structure of the hoods since the Mar. 3 and 4" [KRO02]. Mar. 7.04: first detected the comet w/ 20×80 B; comet's alt. 7° when first seen via naked eye (only dust tail was seen) [KRO02]. Mar. 7.47: "woke up later than I wanted and had little time for precise tail measurements; obs. the comet w/ 33.3-cm L well into twilight; on Mar. 7.502, w/ sun 4°.7 below horizon, two main hoods were visible, as well as an ill-defined brightening where the third hood had been in darkness; the ill-defined brightening flowed back toward the direction of the bright tail spike and ended at 2′ from the nucleus; this brightening was all that could be seen of the tail spike; on Mar. 7.506, w/ sun 3°.8 below horizon, the main hood was still distinct, but the ill-defined brightening now extended out to ≈ 1′, and the second hood could not be detected; on Mar. 7.509, w/ sun 2°.8 below horizon, only hood nucleus and first hood were visible; on Mar. 7.514, w/ sun 1°.4 below horizon, the nucleus and the bright emission extending W-ward were all that was detected; on Mar. 7.5167, w/ sun 0°.7 below horizon, nucleus was becoming very difficult to see; on Mar. 7.5174, w/ sun 0°.5 below horizon, nucleus was last detected" [KRO02]. Mar. 8.46: "a bright ray extended 4° in p.a. 310°, while the dust tail extended 6° in p.a. 290° (naked eye); w/ 33.3-cm L, bright emission was distinctly coming from the S side of nucleus; just as on Feb. 28, the nucleus seemed almost isolated from this emission; starting from the W-most portion of the emission it extended E-ward, passing just to the left (S) of the nucleus and then abruptly faded at an imaginary line connecting the nucleus to the abrupt fading points of the two bright hoods (this 'line' seems to be the direction of the sun); anyway, as w/ the two hoods, a faint arc can be seen E of the imaginary line, which seemed to be a poorly illuminated extension of the emission; the bright emission seemed to slightly touch the nucleus as it passed the S side and, as on Feb. 28, the emission took on a fountain-like appearance, w/ the point of origin being the S side of the nucleus" [KRO02]. Mar. 10.04: only dust tail seen because of low alt. [KRO02]. Mar. 10.45: w/ naked eye, gas tail extends 13° in p.a. 330°, bright ray extends 3° in p.a. 310°, and dust tail extends 8° in p.a. 289°; w/ 33.3-cm L, a new inner hood seemed shifted from a southerly point of emanation to a SW-erly point since Mar. 8.46 [KRO02]. Mar. 11.48: bright ray extended 2° in p.a. 314°, while dust tail extended 5° in 290°; gas tail fanned in p.a. 330°-340° [KRO02]. Mar. 12.04: "observing in the evening sky w/ 33.3-cm L at 200×, there was an arc on the N side (the dark zone) of the nucleus; the nucleus was almost at the apex of an egg-shaped structure that was formed by the newest bright emission, which arced around through the 'dark zone' N of the nucleus and connected to the first bright 'hood'; the feature was visible in a lower-power eyepiece, as well as at 500×" [KRO02]. Mar. 12.45: w/ 33-cm L, "the spiral structure from last evening was gone, but I noted the brightest 'hood' could be followed much further E and N of the nucleus than ever before; I could never follow the faint E-ward extensions of the hoods very far clockwise in the past, but this extension enabled the first hood to be traced through ≈ 200°; the bright emission and the second hood out from the nucleus both exhibited the faint E-ward extensions, which basically ended where they always ended in the past (≈ 30° E-ward of the sunward direction), but the faint extension of the first hood was at least 20° further in a clockwise direction; near the end of my session, just before the beginning of astronomical twilight, I suspected a very faint brightening N of the coma in the 'dark zone'; this brightening seemed to cover the whole region out to where the extension from the first hood might have been continued in a clockwise direction, but it didn't seem to continue through the region NW of the nucleus, so no connection w/ any other hood was suspected; there was no sharp border indicating a definite continuation of the first 'hood' — just this hint of a brightening" [KRO02]. Mar. 16.44: "a new 'hook' has appeared on the E side; meanwhile, the 'hood' closest to the nucleus, which is also the brightest, can be traced for a full 250°, of which 70° are extremely faint and still not observable at my highest magnification of 500× (33.3-cm L)" [KRO02]. Mar. 19.46: W-most edge of dust tail extended 6° in p.a. 317°; bright tail spine extended ≈ 3° in p.a. 336°; E-most edge of ion tail extended 13° in p.a. 348°; the ion tail fanned out very little and was perhaps 1°.5 wide at the point where it seemed to end (naked eye) [KRO02]. Mar. 20.45: naked eye revealed 9° long dust tail [KRO02]. Mar. 21.08, 22.04, and 23.06: w/ moonlight [KRO02]. Mar. 27.06: tail represents E edge of dust tail; W edge extended towards p.a. 331°; gas tail had faded from previous evening obs., but was still 7°.5 long, extending towards p.a. 5° [KRO02]. Mar. 30.06 and 31.06: three hoods were plainly visible [KRO02].

Apr. 26.70: w/ 20-cm *f*/7.5 L (83×), coma dia. 15′, DC = 8 [COO02]. May 5.08 and 6.08: two hoods seen w/ difficulty in 33.3-cm L [KRO02]. May 10.08: w/ 33.3-cm L, hoods no longer visible, but three definite (and one possible) jets emanated from the nucleus [KRO02]. May 16.08: "comet was 5°.5 above the horizon when I stopped observing (it was still barely visible to the naked eye, despite some twilight); comet is obviously fainter than Betelgeuse (which has m_v = +0.4) [KRO02]. May 17.08: twilight and clouds [KRO02]. May 19.09: battled clouds, and got 15-min peek at comet between clouds; final alt. ≈ 5° [KRO02]. May 20.09: very clear night; despite some twilight, the comet was apparently seen w/ the naked eye when the alt. was 3°.3; it was then barely visible after knowing exactly where to look, using

landmarks on the horizon [KRO02]. May 22.09: "comet first detected while sweeping w/ the 20×80 B (≈ 3°.1 above the horizon); once again I was able to use a utility pole as a guide; however, tonight the comet actually passed behind the pole instead of above it, as on the last two evenings; the 33.3-cm L was immediately moved to view the comet, which then appeared as a rather bright nuclear region w/ a wedge-like emission w/ borders to the SW and S-SE" [KRO02]. Sept. 30.44: "zenithal mag 6.6, so even though comet was 4° above horizon, I did not apply atmospheric extinction correction; comet was small, roundish blob just above treetops" [KRO02].

1998 Mar. 24.38: interference from star of mag 8 [SEA01]. Apr. 13.50: obs. made with moon visible in E sky; however sky at comet's location still relatively dark [PEA]. Apr. 17.46: interference from star of mag 7 [SEA01]. May 17.51: "uncertain if the 'tail' was a genuine tail w/ unusual geometry, or some odd extension of the coma; there are no catalogued deep-sky objects behind C/1995 O1 tonight; this 'tail' appears as a faint wedge of diffuse matter bounded by p.a. 0° and 50° — brightening slightly towards its apex; however, this apex is located ~ 4′ S of the coma's center, as though it were originating from the coma's southern edge and spreading *over* the coma, rather than *away* from the coma — strange!" [FAR01].

◇ *Comet C/1995 Q1 (Bradfield)* ⟹ 1995 Nov. 27.93: w/ 10.8-cm *f*/4 L (15×), coma dia. 4′.7, DC = 2 [GET].

◇ *Comet C/1996 B1 (Szczepanski)* ⟹ 1996 Feb. 17.95: see comments on modified Sigwick method under descriptive notes in this issue for C/1996 B2 (1996 Mar. 19.92) [MIL02].

◇ *Comet C/1996 B2 (Hyakutake)* ⟹ 1996 Mar. 13.09-13.10: w/ 20-cm L, coma dia. ~ 10′ (moonlight); w/ 7×50 B, $m_1 = 4.8$; diffuse tail ~ 25′ long in p.a. 284° [Giuseppe Marino and Fabio Salvaggio, Catania, Italy]. Mar. 19.92: "I made the estimate comparing the surface brightness of the in-focus comet with stars defocused at the maximum diameter allowed by the binoculars; as the defocused stars were smaller than the in-focus comet, I then applied a correction in order to compute the total brightness of the comet, which is the modified Sidgwick method also described by Charles Morris on his comet webpage [no longer given there]; both Roberto Haver and Charles Morris appear to have developed this method for comet C/1983 H1 (IRAS-Araki-Alcock), which can be applied expecially to binocular estimates when the in-focus comet is larger than the defocused star images (defocused to their maximum extent); one must at first estimate the apparent diameter of the in-focus comet and the diameter of the defocused stars; then one makes the estimate of the average surface brightness of the in-focus comet, using as reference the defocused stars; in this way, one has a magnitude estimate for a hypothetical comet with the same average surface brightness of the true comet and the same diameter of the defocused stars; to obtain the true total magnitude of the comet, one must add a correction for the different diameter, the correction in magnitudes being $k = 2.5 \log (C/S)$, where C and S and the comet's and defocused-star's diameters, respectively; as one can easily experience, the method leads to good results only if the comet is not too much larger than the defocused stars, say ~ 1.5 times larger; if the comet is very large compared w/ the defocused stars, the method becomes *very approximate*; in fact, with the increase of the apparent cometary size, a little error in the estimated diameter causes a large error in the value of the correction, k; so I think that this method can be recommended only for comets slightly larger than the defocused stars" [MIL02]. Mar. 21.03: from La Laguna, Tenerife, Spain; impossible to defocus binoculars enough to make a really reliable estimate; very bright, starlike false nucleus; w/ naked eye, star-like nucleus clearly visible; Harvard Revised photometry for comparison stars from *Bright Star Catalogue* [KID]. Mar. 22.04 and 22.96: intense blue color in 10×50 and 11×80 B [KID]. Mar. 22.96: w/ binoculars, first 10° of tail very bright; disconnection event halfway along tail [KID]. Mar. 23.26: coma dia. 1°.3 w/ 10×50 B [SCO01]. Mar. 23.96: much brighter than Arcturus, but difficult to estimate m_1 because of the lack of comparisons [KID]. Mar. 26.36: "after moonset last night, we were amazed to see the tail go so far, right past the zodiacal light, which we traced clear into the Gegenschein and down into Corvus!; visually we could see a tail curve off towards the W of the main tail and some other detail w/in ~ 15°-30° of the coma; w/ David Levy's 16-inch telescope, we could see a fountain-shaped sector of sunward material spread over ~ 70° of p.a. w/ short-term variability in the structure — small, brighter regions appearing w/in the sunward fan at different p.a.s at slightly different times; even more amazing was the tailward spike activity; in what I called near-real-time, I could see rapid changes in the tail, even believing that I saw a broiling kind of appearance as material jetted out into the tail; certainly, I could see the tail change from sharp to slightly broader, to distinctly bifurcated and back to sharp over a period of just a couple minutes; considering that 1″ is ~ 80 km at the nucleus, perhaps this kind of detail and rapid variability in the tail is not too surprising?; the nucleus was very sharp w/ a bright region immediately surrounding it, probably ~ 4″ or 5″ in diameter; very spectacular!"; coma dia. 1°.5 in 10×50 B [SCO01]. Mar. 26.93: w/ naked eye, central cond. of dia. 3′.5 [NES]. Mar. 26.94: w/ 7×50 B, central cond. of dia. 4′ [NES]. Apr. 4.00: during lunar eclipse, w/ 5-cm R (20×), central cond. of dia. 3′.5 [NES]. Apr. 5.74, 7.75, and 10.71: w/ naked eye, central cond. of dia. 1′ [NES]. Apr. 5.82: w/ 7×50 B, central cond. of dia. 2′.5 [NES]. Apr. 8.76: w/ 7×50 B, central cond. of dia. 3′ [NES]. Apr. 9.73: w/ 7×50 B, central cond. of dia. 2′ [NES].

◇ *Comet C/1996 J1 (Evans-Drinkwater) — nucleus B* ⟹ 1998 Jan. 23.84, Feb. 21.80, and Mar. 21.78: seeing 3″.5-4″ [A. Galad and PRA02].

◇ *Comet C/1997 D1 (Mueller)* ⟹ 1998 Jan. 23.81: four 60-sec exposures; seeing 4″.3 [A. Galád and PRA02].

◇ *Comet C/1997 J1 (Mueller)* ⟹ 1998 Jan. 23.99, Feb. 3.89, 17.92, and Mar. 21.83: seeing 2″.6-3″.2 [A. Galád and PRA02].

◇ *Comet C/1997 J2 (Meunier-Dupouy)* ⟹ 1998 Mar. 21.12: seeing 3″.8 [A. Galád and PRA02]. Apr. 23.48: central cond. of mag 14.5 and dia. ≈ 2″; coma strongly asymmetrical toward p.a. 330°, where it blended into a broad, diffuse tail that showed no substructure [ROQ]. May 3.04: four 40-sec exposures; seeing 3″.6 [A. Galád and PRA02]. May 17.99: comet involved w/ star of mag 12 [MEY]. June 14.32: central cond. of mag 13.9 and dia. ≈ 3″; coma symmetrical

w/ some jet activity at p.a. 160° and 240° [ROQ]. June 21.00: the Northumberland refractor at Cambridge, used for these observations and for those of C/1998 K5, is actually *f*/20 rather than *f*/18 (as reported in previous observations) [SHA02]. June 24.41: central cond. of mag 13.5 and dia. ≈ 3″; coma strongly asymmetrical toward p.a. 290° w/ some jet activity w/in the region between p.a. 103° and 190° [ROQ]. June 26.056: "CCD image processed with ESO-MIDAS (European Southern Observatory-Munich Image Data Analysis System); magnitude determined using inner applications of MIDAS with reference to the Tycho catalogue stars on the same frame of the comet to avoid perturbations due to atmospheric extinction; 1024×1024 Thomson CCD; stellar nucleus; coma slightly elongated" [COZ]. July 4.28: central cond. of mag 13.8 and dia. ≈ 2″; coma asymmetrical toward p.a. 132° w/ a concentration of jet activity encompassing that location and bounded by p.a. 90° and 147° [ROQ]. July 26.35: CCD image + IRB filter through 10-cm R shows the comet to have a strongly condensed coma [SPR]. July 26.38 and 27.52: w/ 25.6-cm *f*/5 L (169×), faint 2′ and 1′.5 tails in p.a. 265° and 205° [BIV].

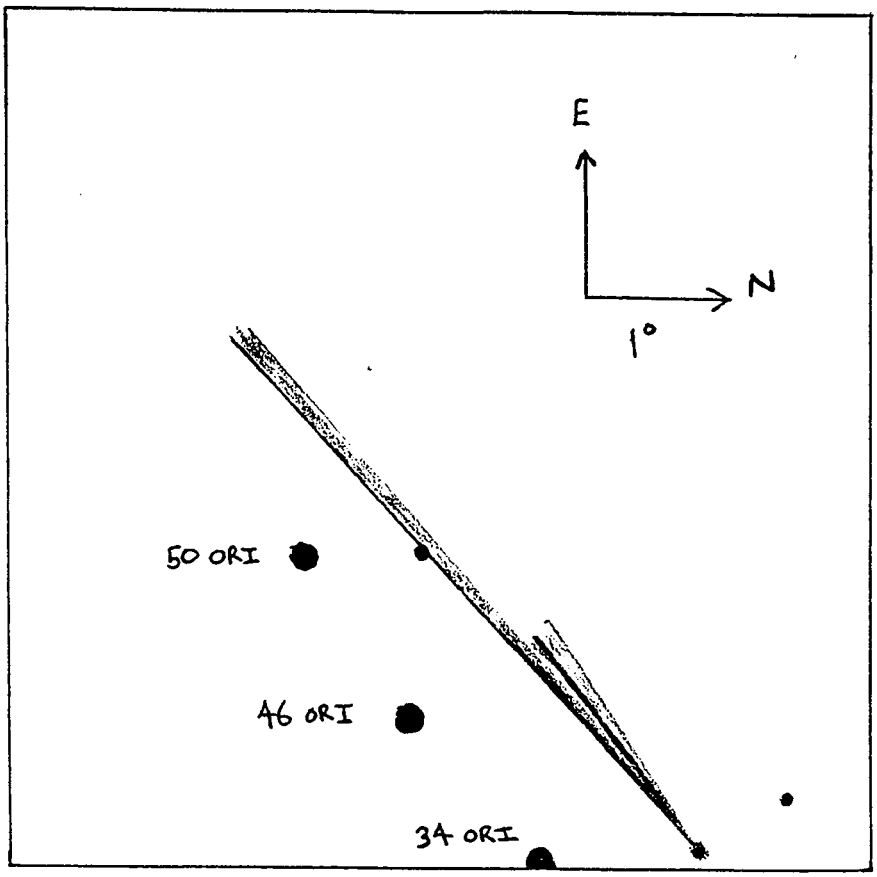
◇ *Comet C/1997 N1 (Tabur)* ⟹ 1997 Sept. 7.84 and 8.84: uncertain detection, as conditions were poor; w/ 20-cm *f*/14 R (40×), $m_1 = 9.6$: and 9.8: (MM = S, ref = HS), coma dia. 3′.6 and 3′.7, and DC = 3 and 2, respectively [SHA02].

◇ *Comet C/1997 O1 (Tilbrook)* ⟹ 1997 July 31.4: w/ 20-cm *f*/6 T (50×), $m_1 \simeq 10.3$: (MM = B), coma dia. ∼ 1′.3, DC = s3; w/ 40-cm *f*/5 T (120×), coma dia. ∼ 1′.5, DC = s4 [TIL]. 1998 Feb. 4.02, 18.16, and Mar. 23.09: seeing 2″.2-3″.5 [A. Galád and PRA02].

◇ *Comet C/1997 T1 (Utsunomiya)* ⟹ 1997 Oct. 11.39: w/ 0.25-m L, faint outer coma with a slightly brighter central cond. (tab. data in *ICQ* 105) [DID]. Oct. 12.19: "w/ 101.6-cm R at Yerkes; comet appeared slightly less condensed than in my 33.3-cm L, but this was probably because we were basically limited to the central cond.; interestingly, there were two 'tails'; the tab. one was the longest, but a much shorter tail existed in p.a. 115°; these 'tails' were extending from each side of the coma; they would have been lost w/in the coma in the 33.3-cm L; the moon was 80° away" [KRO02]. Oct. 14.13: w/ 33.3-cm L, moonlight [KRO02]. Oct. 19.06: w/ 33.3-cm L, large, diffuse outer coma, w/ small, elongated inner coma [KRO02]. Oct. 22.09, 28.05, and Nov. 2.07: w/ 33.3-cm L, comet distinctly elongated [KRO02]. Oct. 23.79: w/ 15-cm R, NT-10AS photographic plate (60-min exp.) shows comet w/ inner coma dia. 36″, DC = 4, no tail [BOR04]. 1998 June 17.53: "becoming faint very quickly" [NAK01].

◇ *Comet C/1998 H1 (Stonehouse)* ⟹ 1998 Apr. 26.99: motion obvious w/in minutes; diffuse and not easy [MEY]. Apr. 27.89 and May 6.09: photometry obtained w/ 36-cm *f*/6.7 T (+ *V* filter + CCD) [MIK]. Apr. 28.20: central cond. w/ dia. ≈ 2″ and mag 13.9; tail appeared broad, diffuse, and essentially featureless [ROQ]. Apr. 30.15: *V* sequence by Howard Landis and Brian Skiff, via CH Cyg AAVSO chart from July 1996; comet moderately condensed w/ coma edges rather ill-defined [PER01]. Apr. 30.99: no enhancement w/ a Lumicon Swan Band Filter [MEY]. May 2.16: central cond. of mag 14.0 and dia. ≈ 2″; coma generally symmetrical and blended into a well-defined diffuse tail [ROQ]. May 2.94: four 10-sec exposures; seeing 3″ [A. Galád and PRA02]. May 3.29 and 5.21: strong moonlight [SPR]. May 4.21: strong moonlight and very strong aurora [SPR]. May 4.72: obs. made slightly difficult by the fact that comet was located close to 4th-mag star [PEA]. May 14.91: comet only 3′ from star of mag 7.6 [BOU]. May 16.15: central cond. of dia. ≈ 2″ and mag 15.3; tail appeared broad and diffuse w/ no readily-apparent substructure [ROQ]. May 27.15: central cond. of dia. ≈ 2″ and mag 15.4; coma showed the expected progressive asymmetry toward where it smoothly merged into the broad, diffuse tail [ROQ]. June 8.06: central cond. of mag 16.3 and dia. ≈ 2″; faint, irregularly-formed tail appeared diffuse and featureless [ROQ]. June 17.54: "becoming faint very quickly" [NAK01]. June 20.22: central cond. of dia. ≈ 2″ and mag 15.5; coma showed some asymmetry toward p.a. 355° [ROQ]. June 26.87: for processing details, see notes for C/1997 J2 on 1998 June 26.06, above [COZ]. July 2.18: central cond. of dia. ≈ 2″ and mag 17.6; very diffuse, faint, irregularly-shaped tail, showing no apparent structure [ROQ].

◇ *Comet C/1998 J1 (SOHO)* ⟹ 1998 May 9.81: not visible in bright twilight; searched for the comet within the period when the sun was 4° to 7° below, and the comet 5°.5 to 2°.5 above, horizon; at the end of the search, Bellatrix was clearly visible [KAM01]. May 11.23 and 13.24: w/ 25.6-cm *f*/5 L (42× and 84×), obs. in strong twilight (sun alt. −6° to −9°), but comet highly condensed and easily seen; main comparison star Aldebaran (later, when at a similar alt.); brightness uncertain by 0.5 mag or more; faint 5′ tail in p.a. 70° on May 11.24; short obs. on May 13.242 (4 min), due to interfering clouds [BIV]. May 16.240-16.249: comet alt. +1°.9; w/ 25.6-cm *f*/5 L (42×), comet still strongly condensed (but not stellar) and bluish; comparison stars 53, 9, and 4 Ori when observed at similar alt. [BIV]. May 16.36: "comet at low alt. over sea horizon, w/ some thin cirrus and twilight interfering; comparison stars β Tau (1.7) and ζ Tau (3.0); comet was naked-eye visible (once you knew where to look), but the tail required binoculars; w/ 15-cm L, (pseudo)nucleus is a distinctly brighter disc of dia. ≈ 5″ w/in the coma, and appears pure white even at this low alt.; coma color is a dull white (similar to Mercury naked-eye); main tail is faint grey, thin (< 15′ wide) and straight (ion tail?); coma merges into a broad fan-like secondary tail, which extends ∼ 20′ from nucleus between p.a. 50° and 150°; this was bounded by slightly brighter edges or 'rays' extending to ∼ 25′ from nucleus; no other tail structure seen" [FAR01]. May 17.241: w/ a 25.6-cm *f*/5 L (42× and 169×), comet 12′ in p.a. 190° from 6 Ori; other nearby comparison stars incl. 9, 4, and 7 Ori; blue non-stellar coma; comet set in clouds at May 17.2528 (alt. +1°.05, from Kahe-P., Oahu, HI) [BIV]. May 17.36: w/ 40-cm L, "coma appeared as a lovely blue-green mist, which became brighter and whiter towards the nucleus; outer boundary of the coma was well defined on the sunward side, and merged indistinctly into the tail on the other side; coma slightly elliptical (≈ 15′ × 16′), w/ the major axis directed toward the sun; surprisingly, there was no sign of the fan-like secondary (dust?) tail that was so evident yesterday; the (pseudo)nucleus was a pure white disc ≈ 3″ in dia., centered in the coma; at first glance, the comet's head resembled a small telescope's view of 47 Tuc — but colored blue-green!; at 80×, coma dia. 16′, DC = D6/; the color in 7×50 B remains a dull white (not enough photons for my color vision); the longer tail tonight is probably due to better sky conditions; w/ B, the tail is still faint and straight; the width increases slightly from 10′-15′ near the coma to 15′-20′ at 4° from the coma" [FAR01]. May 18.240-18.253: comet alt. +1°.1; w/



Drawing of comet C/1998 J1 (SOHO) by John Seach [SEA01] from Chatsworth Island, N.S.W., Australia, with 15×80 binoculars on 1998 May 22.35 (see description below).

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◇ *Comet C/1998 J1 (SOHO) [text continued from page 121]* ⟹
25.6-cm *f*/5 L (42×), comparison stars 34, 28, 31, 14, 16 Ori — observed at similar alt. [BIV]. May 18.33: "fleeting obs. through break in clouds; little more than a guess; almost certainly would have been estimated much brighter under darker sky; comet appeared very intense and blue in color" [SEA]. May 18.69: comet bright and easy in 10×50 B, w/ very bright condensed central cond. and thin, spike-like tail, traced to 45′ under poor, hazy conditions; nevertheless, the comet was just visible to naked eye [COO02]. May 19.236-19.253: comet lost at alt. +1°, sun −13°; w/ 25.6-cm *f*/5 L (42×), same comparison stars as on May 18.25; diffuse tail in p.a. 100°-130° [BIV]. May 19.35: "through 25.4-cm L (71×), comet little changed using Swan Band filter, although coma may have been marginally larger w/ filter; through 25×100 B, strong plasma tail to 5° in p.a. 120°, w/ a fainter dust tail emerging to the N and ≈ 1° long" [SEA]. May 19.36: photo shows tail 10° long, with a slight kink to the N (change of ∼ 5° in p.a.), ≈ 3° beyond the head [MCN]. May 20.35: "through 25×100 B, comet appeared blue-green in color and was unchanged in both appearance and mag using Swan Band filter; tail visible to ∼ 8° in p.a. 130°; there was an extended 'cloud' in the tail (disconnection event?), ∼ 6° from head and slightly brighter than the average tail intensity at that distance; through 25.4-cm L (71×), there seemed to be considerable fine ray structure in tail (w/in ∼ 1° of coma) close to the limit of vision; plasma tail very intense; comet was easily visible via naked eye, w/ tail to ∼ half the distance as measured in 25×100 B" [SEA]. May 20.35: "w/ 10×50 B, there is a straight, narrow, intense tail w/ broadening visible at 0°.75 to 1°.2 from the coma; the coma is green in color; w/ 24.4-cm *f*/6 L (61×), there is no change in appearance of comet through Lumicon Swan-band filter" [SEA01]. May 21.35: "w/ 10×50 B, tail shorter and less intense than last night" [SEA01]. May 22.35: w/ 15×80 B, two tails are visible, incl. a straight, thin tail 5°.0 long in p.a. 130° (w/ two bright spikes 2° long); fainter fan-shaped tail 2° long in p.a. 123°-130° (see drawing above) [SEA01]. May 22.90: comet has blue color [DES01]. May 23.34: w/ 10×50 B, the main-tail intensity drops off at 1°.6-6°.4 from coma; short, fainter fan-shaped tail 1°.5 long in p.a. 110°-120° [SEA01]. May 23.69: "guided 24-min exp. w/ 200-mm *f*/2.8 lens and ISO 200 film shows 5°.5 tail in p.a. 131°; the Horsehead Nebula is visible in the image, so conditions were pretty good" [Louis Barendse via COO02]. May 25.35: w/ 25.4-cm *f*/6 L (61×), still definite green color [SEA01]. May 26.36: tail appeared considerably fainter than when previously obs. on May 23 [SEA]. May 27.33: blue-green color still evident; comet slightly fainter when obs. through Swan Band filter; still faintly glimpsed via naked eye [SEA]. May 28.33: "comet still visible via naked eye; at times I had the impression that the central cond. may have been elongated or even multiple, but I suspect that this was a spurious effect" [SEA]. May 28.9623, 29.9568, and 31.9672: CCD photometry of the inner coma yields V = 6.87, 6.96, and 5.87, respectively, in a 75″ × 75″ square aperture; calibration done w/ Tycho/Hipparcos stars; "May 31.967 image was saturated (a correction

◇ *Comet C/1998 J1 (SOHO) [text continued from page 121]* ⟹
to the magnitude of that saturated image is 0.081; because it is not so large, the correction should be reliable); all the measurements are good to an estimated ± 0.04 mag; nearly all of the brightness increase took place in the inner 20″ of the coma; the tail stretched right off the frame" [W. Liller, Viña del Mar, Chile]. May 29.33: tail quite fan-shaped, but p.a. refers to the longest segment [SEA]. May 29.33-June 10.33: moonlight [SEA01]. May 30.89-June 5.89: comet was very distinctly blue [DES01].

June 1.36: comet in outburst; w/ naked eye and 10×50 B, m_1 = 3.7; w/ 25-cm *f*/4.1 L (+ CCD), m_2 = 10.8-11.0 (the central region continuing the increase in brightness first noted the previous night) [Gordon J. Garradd, Loomberah, N.S.W., Australia]. June 4.34: "bright moonlight and drifting cloud; 'extreme' VBM method used, whereby comet and comparison stars were placed well out of focus to ensure large, low-intensity images more readily comparable with each other; tail now much fainter than in May, not seen in 10×50 B but faintly visible in 25×100 B; in 25×100 B, comet still appeared intense, but the color was now blue in contrast to the green color evident in May; it now appeared slightly, but clearly, brighter when viewed through Swan Band filter, also contrasting with the May observations; presumably the dust content of coma has decreased" [SEA]. June 6.33: tail almost invisible in very clear, but brightly moonlit sky [SEA]. June 9.34: "bright moonlight; blue color of comet still evident, but total brightness was virtually unchanged using Swan Band filter, although the coma may have been slightly enhanced and the comet did appear a little less condensed with the filter; both comet and comparison stars were placed well out of focus for estimate ('extreme VBM' method), but the stars were placed slightly further out until their image matched the size of the out-of-focus comet image; this procedure was also followed for the obs. on June 6" [SEA]. June 12.34: in dark sky, tail very faint, and only certain with averted vision; possibly blended with a broad and possible fan-shaped tail pointing E from coma, but this not certain; however, coma did appear extended in that direction [SEA]. June 19.35: comet appeared slightly fainter using Swan Band filter [SEA]. June 20.28: "coma appeared more diffuse and larger than of late; however estimates may have been affected by nearby star (SAO 198518, mag 7.9)" [RAE]. June 22.43: difficult obs. due to close proximity to star of mag 8.0 [MAT08]. June 25.34: comet has had a brightness outburst of 1.0 mag over the past two days; it is just below naked-eye threshold; w/ 25.4-cm L (61×), faint tail of length 40′ [SEA01]. June 28.28: hurried obs. due to cloud moving in [RAE]. July 3.30: severe moonlight interference [RAE].

◇ *Comet C/1998 K1 (Mueller)* ⟹ 1998 May 25.15: central cond. of dia. ≈ 2″ and mag 15.4; coma asymmetrical toward p.a. 65°, suggesting the possible existence of a very short, faint, diffuse tail [ROQ]. June 15.16: central cond. of mag 16.2 and dia. ≈ 4″; coma symmetrical w/ no propensity toward tail formation [ROQ].

◇ *Comet C/1998 K2 (LINEAR)* ⟹ 1998 June 16.55 and 17.62: GUIDE ver. 6 software was used [NAK01]. July 21.54: comet faint, but possibly elongated as seen at both 71× and 114× [SEA].

◇ *Comet C/1998 K3 (LINEAR)* ⟹ 1998 May 27.70: w/ 1.03-m *f*/4.8 L (+ CCD), m_1 = 17.5, coma dia. 12″, tail 15″ long in p.a. 100° [M. Yamanishi, Saji Observatory, Japan]. June 2.16: observer Jeff Larsen [SCO01].

◇ *Comet C/1998 K5 (LINEAR)* ⟹ 1998 June 17.68: this comet "is amazing! — it's becoming bright quickly, has a faint coma, and the tail is now obvious" [NAK01]. June 21.94: motion obvious w/in minutes; completely stellar [MEY]. June 22.97: comet stellar and at least 2′ off track (in relation to ephemeris from *MPC* 31894); definite identification not possible because of incoming cirrus clouds, but reality of object confirmed on June 25 [BOU]. June 25.99: comet virtually stellar, but image 'softer' than that of stars of similar brightness; occasionally hint of very faint coma < 0′.2 in dia.; comet definitely off track, being about $0^m.2$ E in α of the ephemeris position; rapid motion very evident over a 15-min period [BOU]. June 29.74: comet has a hint of coma [NAG08]. July 3.74: another faint tail 1′.6 long in p.a. 260° [NAK01]. July 16.99: comet stellar; occasionally hint of some nebulosity, but not certain because of interference from moonlight [BOU]. July 22.00: comet basically stellar (coma < 0′.1), but some very faint nebulosity suspected [BOU]. July 23.01: comet virtually stellar at 77×, but at 200×, a very faint 0′.4 coma was evident [BOU]. July 25.00: comet nearly stellar at 88×, but at 150×, there was a hint of a very faint 0′.3 coma [BOU]. July 25.58 and 26.53: w/ 25.6-cm *f*/5 L (507×), quasi-stellar coma (dia. 2″-4″), but clear tail 16″ long in p.a. 270° [BIV].

◇ *Comet C/1998 M1 (LINEAR)* ⟹ 1998 June 17.58: tail curves anti-clockwise and extends to the SW [NAK01].

◇ *Comet C/1998 M5 (LINEAR)* ⟹ 1998 July 4.66: photograph w/ 60-cm *f*/3.5 reflector yields m_1 = 13.5, tail 1′ long in p.a. 215° [T. Seki, Geisei, Japan]. July 13.05269: middle of 5-min exp., processed w/ IRAF from Observatoire de Genève; comparison w/ 8 stars between mag 11.9 and 15.1 [JAM01].

◇ *Comet 4P/Faye* ⟹ 1998 May 24.40: essentially stellar; faint tail; on May 24.46, another measurement yields m_1 = 20.8 [SCO01]. May 26.72 and 27.72: w/ 1.03-m *f*/4.8 L (+ CCD), m_1 = 20.2-20.3, coma dia. 6″, slightly diffuse [M. Yamanishi, Saji Observatory, Japan]. May 28.41: nearly stellar [SCO01].

◇ *Comet 21P/Giacobini-Zinner* ⟹ 1998 May 16.02: seeing 2″.9 [A. Galád and PRA02]. June 16.62: GUIDE ver. 6 software was used [NAK01].

◇ *Comet 29P/Schwassmann-Wachmann 1* ⟹ 1998 Jan. 24.17: seeing 3″.5; very faint coma [A. Galád and PRA02]. Feb. 4.15: seeing 4″.3; 'overexposed' disklike (very bright) coma [A. Galád and PRA02]. Feb. 6.14 and 18.09: seeing 4″.5 [A. Galád and PRA02]. Feb. 21.09: seeing 4″.2; faint coma [A. Galád and PRA02]. Feb. 23.11: seeing 3″.1; very faint coma [A. Galád and PRA02]. Mar. 21.04: seeing 4″.5; jet long 20″ in p.a. 340°, it rotates in clockwise direction [A. Galád and PRA02]. Mar. 26.29 and Apr. 19.33: magnitudes derived via photometry software in CCDSoft computer program, comparing this comet (and others) to comparison stars in M67 [JOH04]. May 15.87: seeing 3″.9 coma slightly extended in p.a. 50° [A. Galád and PRA02]. June 17.51: almost-stellar coma indicates that a small outburst occurred

very recently [NAK01]. July 22.99: observation at European Southern Observatory with Dutch 91-cm $f/13.75$ reflector; coma a little elongated in p.a. 110°; image processed (and magnitude determined) w/ ESO-MIDAS (Munich Image Data Analysis System) [COZ].

◇ *Comet 43P/Wolf-Harrington* ⟹ 1998 Jan. 26.04-22.88: seeing 3″.2-4″ [A. Galád and PRA02]. Apr. 19.15: central cond. of mag 16.2 and dia. ≈ 2″; low-brightness coma showed some asymmetry toward p.a. 75° [ROQ]. May 2.14: central cond. of mag 16.0 and dia. ≈ 2″; the coma was symmetrical, but very faint [ROQ]. May 26.15-26.17: other measurements yield $m_1 = 17.1$ and 17.3 [SCO01].

◇ *Comet 45P/Honda-Mrkos-Pajdušáková* ⟹ 1996 Feb. 18.09: see comments on modified Sigwick method under descriptive notes in this issue for C/1996 B2 (1996 Mar. 19.92) [MIL02].

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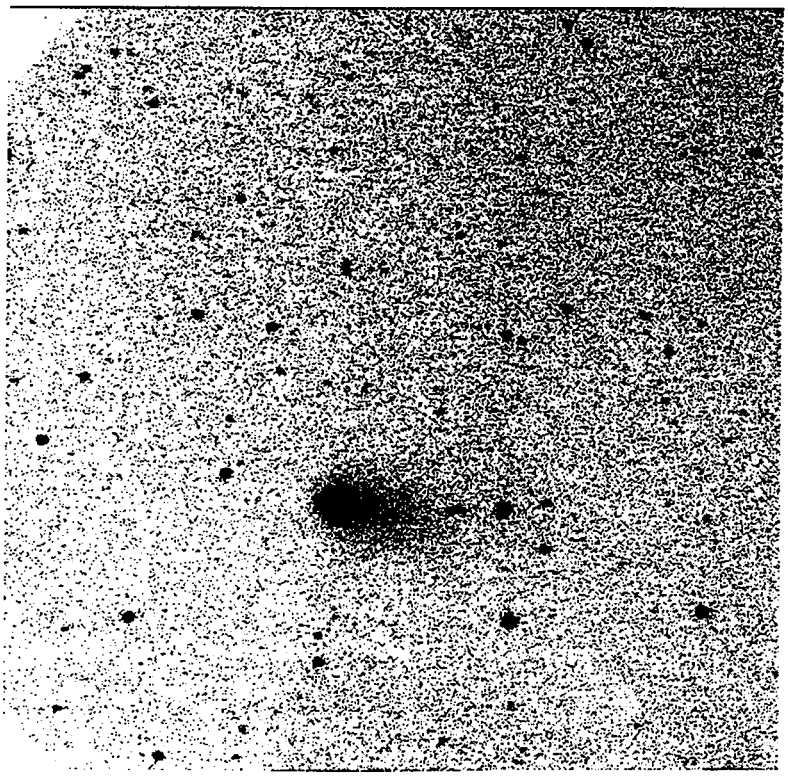

CCD image of comet 52P taken on 1998 July 22.469 UT by R. Greimel and D. D. Balam, University of Victoria, with the 1.82-m Plaskett reflector (+ V filter); 40-sec exposure. North is up (± 0°.13) and east is to the left (9′.2 × 9′.2 field) [see descriptive information below].

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◇ *Comet 52P/Harrington-Abell* ⟹ 1998 July 22.04: difficult obs.; comet only 19°-20° above horizon; interference from twilight (sun at −15°) [BOU]. July 22.07: photometry obtained w/ 36-cm $f/6.7$ T + V filter + CCD [MIK]. July 22.47: w/ 1.82-m Plaskett reflector of the National Research Council of Canada (+ CCD + V filter), $V \sim 11$, broad fan-shaped tail extending 1′.2 at p.a. 250° (see image above); obs. made in response to request by D. W. E. Green for confirmation of an outburst of this comet reported by A. Maury at Obs. de la Côte d'Azur [R. Greimel and D. D. Balam, University of Victoria]. July 25.02: comet alt. 17°, but fairly easily visible; very close to star of mag 13 [BOU]. July 25.56, 26.56, and 27.56: w/ 25.6-cm $f/5$ L (169×), "clearly elongated and diffuse, 1′ × 2′ in p.a. 240° (tail?)" [BIV].

◇ *Comet 55P/Tempel-Tuttle* ⟹ 1998 Jan. 1.35: extremely diffuse, vague object, circular in outline; Lumicon Swan-band comet filter strongly enhances comet's visibility [BOR]. Jan. 10.43: comet observed during the brief interval between moonset and dawn [BOR]. Jan. 25.99: w/ 10×50 B, "large, faint, very diffuse object, which is fairly dense toward the center; w/ 41-cm L (70×), the coma is somewhat elongated in p.a. 95°-275°, w/ a small, ill-defined knot of brighter material offset somewhat east of center; there is some suggestion that there are additional extensions of the coma toward p.a. 275°; a Lumicon Swan-band comet filter noticeably enhances comet; at 114×, a definite, very small cond. is situated E of coma's center" [BOR]. Jan. 26.74: seeing 2″.2 [L. Kornos, P. Koleny, and PRA02]. Jan. 30.00: w/ 41-cm L (70×), coma appears circular, dense, and moderately condensed, w/ suggestions of a separate, weak central cond.; employing 114×, there seems to be a very faint stellar or nearly stellar nucleus of mag 13.5 or so [BOR]. Feb. 3.75: seeing 3″.2 [A. Galád and PRA02]. Feb. 15.02: w/ 41-cm L (70×), the coma of dia. 2′.6 and DC = 5 is rather suddenly condensed near

the center, but its outer regions are very vague; the coma appears moderately condensed overall; Lumicon Swan-band comet filter only slightly enhances the coma now; w/ 114×, there is no indication of the former stellar nucleus [BOR]. Feb. 22.02: w/ 41-cm L (70×), the coma is circular and well condensed, but with a very diffuse outer region; the coma condenses steadily right up to the center; no nucleus or separate central cond. evident [BOR]. Feb. 27.03: w/ 20×80 B, comet situated within the bright portion of the Zodical Light cone, hampering the object's visibility [BOR]. Feb. 28.01: "comet located in the midst of the brightest portion of the Zodical Light and just a couple of degrees from Saturn's position; with 114×, there appears to be a minute, very faint nucleus, which is slightly non-stellar" [BOR].

◇ *Comet 62P/Tsuchinshan 1* ⟹ 1998 Mar. 1.74 and 22.82: seeing 3″-3″.5 [A. Galád and PRA02]. May 15.84: four 30-sec exposures; seeing 3″.2 [A. Galád and PRA02].

◇ *Comet 69P/Taylor* ⟹ 1998 Jan. 24.12: seeing 2″.4; coma slightly extended in p.a. 220° [A. Galád and PRA02]. Feb. 5.11: seeing 2″.9; coma slightly extended in p.a. 235° [A. Galád and PRA02]. Feb. 18.04: seeing 3″; very faint tail [A. Galád and PRA02].

◇ *Comet 74P/Smirnova-Chernykh* ⟹ 1998 Jan. 23.73: seeing 4″.6 [A. Galád and PRA02].

◇ *Comet 78P/Gehrels 2* ⟹
Comet Gehrels 2 (78P) 1998 Jan. 25.98: seeing 3″; coma 1′.5 × 2′.5 elongated in p.a. 325° [A. Galád and PRA02]. Feb. 3.92: four 40-sec exposures; seeing 3″; very small, diffuse tail [A. Galád and PRA02]. Feb. 19.97: seeing 3″.2; slightly extended coma in p.a. 60° [A. Galád and PRA02]. Mar. 21.88: seeing 2″.5; slightly extended coma in p.a. 42° [A. Galád and PRA02]. Apr. 17.88: seeing 3″; coma ~ 20″ × 35″ in p.a. 87° [A. Galád and PRA02]. Apr. 24.16: central cond. of mag 17.5 and dia. ≈ 2″; coma appeared very faint and irregularly shaped [ROQ].

◇ *Comet 81P/Wild 2* ⟹ 1997 Jan. 29.06: w/ 0.25-m *f*/4.5 L (46×), noticable increase in cond. toward the NW part of coma; fleeting scintillation (stellar nucleus of mag 12.5-13) w/in the cond. [DID]. Jan. 29.97: w/ 0.25-m *f*/4.5 L (46×), comet less resolved yet still not difficult; faint coma with a noticable cond. toward the NW region of the coma; high cirrius clouds [DID]. Feb. 7.22: w/ 0.25-m *f*/4.5 L (46×), fairly bright central cond. located at the SE region of the coma [DID]. May 28.14: w/ 0.25-m *f*/4.5 L (46×), difficult w/ no defined shape [DID]. June 5.09: w/ 0.25-m *f*/4.5 L (46×), faint w/ no defined shape or central cond.; 15′ W of M95 [DID].

◇ *Comet 88P/Howell* ⟹ 1998 Mar. 21.09: seeing 3″.8 [A. Galád and PRA02]. May 2.99: four 60-sec exposures; seeing 4″.7 [A. Galád and PRA02]. July 21.42: comet very diffuse [SEA].

◇ *Comet 103P/Hartley 2* ⟹ 1997 Aug. 25.90-30.89: "obs. are of low reliability, being at the instrument threshold, though I was reaching a stellar mag of 15" [SHA02]. Aug. 27.88: w/ 33-cm *f*/5 L (150×), m_1 = 13.9: (MM = S, ref = VB), coma dia. 0′.4, DC = 3; uncertain detection [SHA02]. Aug. 30.87-30.89: w/ 33-cm *f*/5 L (150×) and 30-cm *f*/18 R (170×), m_1 = 13.7: (MM = S, ref = VB), coma dia. 0′.7, DC = 3; uncertain detection [SHA02]. 1998 Feb. 7.78: four 20-sec exposures; seeing 3″.9; coma consists of a dense part in p.a. 70° [A. Galád and PRA02]. Feb. 20.82: four 24-sec exposures; seeing 2″.9; coma 2′.5 × 3′.5 extended in p.a. 70° [A. Galád and PRA02]. Apr. 13.48: hurried obs. made between breaks in the cloud [PEA]. Apr. 17.84: four 40-sec exposures; seeing 4″; coma ~ 30″ × 40″ in p.a. 80° [A. Galád and PRA02].

◇ *Comet 104P/Kowal 2* ⟹ 1998 Feb. 20.76 and Mar. 22.78: four 30-sec exposures; seeing 3″.9-4″ [A. Galád and PRA02]. Feb. 27.76: three 25-sec exposures; seeing 4″.2 [A. Galád and PRA02].

◇ *Comet 118P/Shoemaker-Levy 4* ⟹ 1998 May 26.18: another measurement yields m_1 = 20.5 [SCO01].

◇ *Comet 119P/Parker-Hartley* ⟹ 1998 Feb. 5.06 and 23.07: seeing 2″.5-3″.5; very faint tail [A. Galád and PRA02].

◇ *Comet 128P/Shoemaker-Holt 1 (nucleus B)* ⟹ 1998 Jan. 23.92: seeing 2″.6; coma ~ 10″ × 20″ extended in p.a. 60° [A. Galád and PRA02]. Feb. 20.91: seeing 3″; coma ~ 10″ × 20″ extended in p.a. 70° [A. Galád and PRA02].

◇ *Comet 129P/Shoemaker-Levy 3* ⟹ 1998 Jan. 26.01, Feb. 3.96, and 22.99: seeing 2″.5-2″.6 [A. Galád and PRA02].

◇ *Comet 132P/Helin-Roman-Alu 2* ⟹ 1998 Feb. 20.83: seeing 2″.9 [A. Galád and PRA02].

◇ *Comet P/1997 BA$_6$ (Spacewatch)* ⟹ 1998 Jan. 24.09, Feb. 5.01, 23.04, and Mar. 22.93: seeing 2″.5-3″ [A. Galad and PRA02].

◇ *Comet P/1997 G1 (Montani)* ⟹ 1998 May 24.18: broad, diffuse tail; second m_1 estimate yields 20.2 [SCO01].

◇ *Comet P/1997 V1 (Larsen)* ⟹ 1998 Jan. 23.76: seeing 3″ [A. Galád and PRA02].

◇ *Comet P/1998 G1 (LINEAR)* ⟹ 1998 Apr. 15.88 and 17.92: seeing 2″.3-2″.7 [A. Galád and PRA02].

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CORRIGENDUM

In the January 1998 *ICQ*, page 41, the top line of data (*i.e.*, 1997 11 22.37, mag 10.2, observer ROQ) is to be deleted; this observation was revised to the data in the second line of data, and the first line was supposed to have been omitted.

TABULATED DATA

The headings for the tabulated data are described in the April issue (p. 59) and January issue (p. 14).

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Key to observers with observations published in this issue, *with 2-digit numbers between Observer Code and Observer's Name indicating source [07 = Comet Section, British Astronomical Assn.; 16 = Japanese observers (c/o Akimasa Nakamura, Kuma, Japan); 23 = Czech group (c/o P. Pravec and V. Znojil); 32 = Hungarian group (c/o K. Sarneczky); 37 = Ukrainian Comet Section (c/o A. R. Baransky and K. I. Churyumov); 42 = Belarus observers, c/o V. S. Nevski, Vitebsk; 47 = Archives of Ukrainian Comet Section (c/o A. R. Baransky); etc.]. Those with asterisks (*) preceding the 5-character code are new additions to the Observer Key:*

*AMO01	35	Alexandre Amorim, Brazil
BAL02	33	Ricardas Balciunas, Lithuania
BAR06	37	Alexandr R. Baransky, Ukraine
BEG01	15	Mike Begbie, Harare, Zimbabwe
BIV		Nicolas Biver, France
BOR		John E. Bortle, NY, U.S.A.
BOU		Reinder J. Bouma, The Netherlands
BUR04	18	Wojciech Burzynski, Poland
CHE03	33	Kazimieras T. Cernis, Lithuania
CHO01	18	Franciszek Chodorowski, Poland
CHR	18	Antoni Chrapek, Pikulice, Poland
CHU		Klim Churyumov, Kiev, Ukraine
CLA	07	Maurice L. Clark, Australia
COM	11	Georg Comello, The Netherlands
COO02		Tim P. Cooper, South Africa
*COZ		Elia Cozzi, Mozzate, Italy
DES01		Jose G. de Souza Aguiar, Brazil
DID		Richard Robert Didick, MA, U.S.A.
DRA02	18	Michal Drahus, Krakow, Poland
ERO	42	Alexei Viktorovich Erohin, Russia
*EVA01	15	Tom Lloyd Evans, South Africa
FAR01		Fraser Farrell, South Australia
FIL04	18	Marcin Filipek, Poland
FIL05	37	Alexander V. Filatov, Kiev, Ukraine
FRE01	45	Jose Rodriguez Freitas, Uruguay
GET	07	Stephen Getliffe, Suffolk, England
GIL01	11	G. Gilein, Noordwijk, Netherlands
HAS02		Werner Hasubick, Germany
*HOL03	15	Bill Hollenbach, S. Africa
HOR02	23	Kamil Hornoch, Czech Rep.
ISH03	37	Andriy S. Ishchenko, Kiev, Ukraine
IVA03	37	Vladimir Ivanov, Russia
*JAM01		Luc Jamet, Switzerland
JOH04		Tom Johnston, CO, U.S.A.
JON		Albert F. Jones, New Zealand
KAM01		Andreas Kammerer, Ettlingen, Germany
KID		Mark Kidger, Canary Islands
KID01	18	Krzysztof Kida, Elblag, Poland
KON07	18	Marcin Konopka, Rogozno, Poland
KOS		Attila Kósa-Kiss, Salonta, Romania
KRO02		Gary W. Kronk, IL, U.S.A.
KWI	18	Maciej Kwinta, Krakow, Poland
KYS	23	J. Kysely, Czech Republic
MAR02	13	Jose Carvajal Martinez, Spain
MAT08		Michael Mattiazzo, S. Australia
MCK	07	Richard McKim, England
MCN		Robert Houston McNaught, Australia
MEY	28	Maik Meyer, Germany
MIK		Herman Mikuz, Slovenia
MIL02		Giannantonio Milani, Italy
MIY01	16	Osamu Miyazaki, Tsukuba, Japan
MOE		Michael Moeller, Germany
MOR03		Warren C. Morrison, Canada
NAG08	16	Yoshimi Nagai, Matsumoto, Japan
NAK01	16	Akimasa Nakamura, Kuma, Ehime, Japan
NEK		Andrey N. Nekrasov, Baran, Belarus
NES	17	Yurij V. Nesterov, Russia
NEV	42	Vitali S. Nevski, Vitebsk, Belarus
NOW		Gary T. Nowak, VT, U.S.A.
OKS	07	Gabriel Oksa, Trnava, Slovak Rep.
OSS	18	Piotr Ossowski, Poland
PEA	14	Andrew R. Pearce, Australia
PER01		Alfredo Jose Serra Pereira, Portugal
PLE01	18	Janusz Pleszka, Poland
PLS	23	Martin Plšek, Czech Republic
PRA02		Alexander Pravda, Modra, Slovak Rep.
*PRI04	15	David Pringlewood, Harare, Zimbabwe
PRY		Jim Pryal, WA, U.S.A.
*RAE		Stuart T. Rae, New Zealand
RES	18	Maciej Reszelski, Szamotuly, Poland
ROQ		Paul Roques, AZ, U.S.A.
SAD	18	Piotr Sadowski, Poland
SAR02	32	Krisztián Sárneczky, Hungary
SCH04	11	Alex H. Scholten, The Netherlands
SCO01		James V. Scotti, AZ, U.S.A.
SCO04	37	Borys Skorichenko, Ukraine
SEA	14	David A. J. Seargent, Australia
SEA01	14	John Seach, Australia
SHA02	07	Jonathan D. Shanklin, England
SHA04		Gregory T. Shanos, U.S.A.
SHU	42	Sergey E. Shurpakov, Baran, Belarus
*SLO02	15	Auke Slotegraaf, South Africa
SMI08	15	Theo Smith, Keetmanshoop, Namibia
SOU01	35	Willian Carlos de Souza, Brazil
SPR		Christopher E. Spratt, BC, Canada
SWI	18	Mariusz Swietnicki, Poland
TAY	07	Melvyn D. Taylor, Yorkshire, England
TIC		Milos Tichy, Czech Republic
*TIL		Justin Tilbrook, Clare, S. Australia
TRY	18	Pawel Trybus, Lajsce, Poland
*TUR	15	Cliff Turk, Cape Town, S. Africa
*VEI		Christian Veillet, Mauna Kea, HI
VER04		Danielle Verde, Canary Is.
*VIT02	35	Helio C. Vital, Brazil
*WIN02	15	John Winterbottom, Harare, Zimbabwe
YOS04	16	Seiichi Yoshida, Ibaraki, Japan

Comet C/1990 K1 (Levy)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1991 03 03.80		E	10.4:	AA	10	M	7	33	3	6/			SC004
1991 03 04.74		E	10.8:	AA	10	M	7	33	3	6			SC004
1991 03 09.85		E	10.7	AA	10	M	7	33	2.4	6			SC004
1991 03 10.86		E	10.6	AA	10	M	7	33	2.4	7			SC004
1991 03 11.75		E	10.6	AA	10	M	7	33	2.5	7			SC004

Comet C/1990 N1 (Tsuchiya-Kiuchi)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 10 18.12		E	8.5:	AA	10	M	7	33	3				SC004
1990 10 19.09		E	8.3	AA	10	M	7	33	3				SC004
1990 11 15.11		E	8.0	AA	10	M	7	33	6				SC004
1990 11 16.11		E	8.4	AA	10	M	7	33	5				SC004
1990 11 17.09		E	8.5	AA	10	M	7	33	5				SC004
1990 11 22.09		E	8.7	AA	10	M	7	33	5				SC004
1990 11 23.09		E	8.7	AA	10	M	7	33	5				SC004

Comet C/1995 O1 (Hale-Bopp)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1996 05 21.92		B	7.8:	HD	11.0	B		20	3.5	4			NES
1996 06 16.91		B	7.2	HD	11.0	B		20	4	4			NES
1996 06 18.93		B	7.0	HD	11.0	B		20	4	5			NES
1996 06 23.94		B	6.9	HD	11.0	B		20	3.5	4			NES
1996 07 06.85		B	6.4	HD	5.0	B		7	3.5	4			NES
1996 07 10.89		B	6.2	HD	11.0	B		20	3.5	5			NES
1996 07 15.98		S	5.7	TT	5.0	B		10	20	3			MCK
1996 07 16.94		S	5.8	TT	5.0	B		10	20	3			MCK
1996 07 17.98		S	5.5	TT	5.0	B		10	20	3			MCK
1996 08 04.85		B	6.2	HD	5.0	B		7	4	5			NES
1996 11 04.74		M	5.2	AA	6.0	R	13	40	7.5	7	0.7	90	BEG01
1996 11 05.72		M	5.1	AA	5.0	B		10	12	6			BEG01
1996 11 05.72		M	5.3	AA	3.5	B		9	15	6			BEG01
1996 11 08.72		M	5.4	AA	3.5	B		9	15	6	1.7	90	BEG01
1996 11 08.72		M	5.4	AA	5.0	B		10	12	6	2.0	90	BEG01
1996 11 08.73		M	5.5	AA	6.0	R	13	40	7.5	6	0.75	85	BEG01
1996 11 09.72		M	5.3	AA	0.0	E		1	12	3			BEG01
1996 11 09.72		M	5.6	AA	3.5	B		9	15	6	2.0	110	BEG01
1996 11 09.72		M	5.6	AA	5.0	B		10	15	6	2.0	110	BEG01
1996 11 09.73		M	5.7	AA	6.0	R	13	40	7.5	6	38 m	85	BEG01
1996 11 11.71		M	5.6	AA	5.0	B		10	10	6			BEG01
1996 11 12.71		M	5.6	AA	5.0	B		10	10	5			BEG01
1996 11 13.71		M	5.6	AA	5.0	B		10	10	5			BEG01
1997 01 17.18		B	3.0	HD	5	R		20	4	8			NES
1997 01 17.18		B	3.0	HD	5.0	B		7	4	8			NES
1997 01 27.18		B	2.5	HD	5.0	B		7	3.5	8			NES
1997 01 27.18		B	2.7	HD	5	R		20	3.5	8	0.5		NES
1997 02 03.14		B	2.5	HD	5.0	B		7	4	8	1		NES
1997 02 05.14		B	2.7	HD	11.0	B		20	3.5	8	5		NES
1997 02 07.08	G	E	2.5	HD	0.0	E		1	6	8	3		NES
1997 02 08.13	G	E	2.4:	HD	0.0	E		1	6	8	1		NES
1997 02 08.14		B	2.3:	HD	11.0	B		20	4	8	3		NES
1997 02 10.12		B	2.1	HD	5.0	B		7	6	8	3		NES
1997 02 10.12	G	E	2.1	HD	0.0	E		1	4.5	8	3		NES
1997 02 10.13		B	2.1	HD	5	R		20	3.5	8	5		NES
1997 02 10.14		B	2.1	HD	11.0	B		20	3.5	8	5		NES
1997 02 18.07	G	E	2.0	HD	0.0	E		1	3	8	0.5		NES
1997 02 18.10		B	1.9	HD	11.0	B		20	3	8	5		NES
1997 02 18.11		B	1.9	HD	5.0	B		7	3.5	8	3.5		NES
1997 02 18.13		B	1.9	HD	5	R		20	3.5	8	3.5		NES
1997 02 19.10		S	0.5	HI	0.0	E		1			>7		CHU
1997 02 21.16		S	0.4	HI	0.0	E		1			8		CHU
1997 02 23.11		S	0.3	HI	0.0	E		1			9		CHU
1997 03 01.12		S	0.1	HI	0.0	E		1			>11		CHU
1997 03 03.14		S	-0.1	HI	0.0	E		1			12		CHU

Comet C/1995 O1 (Hale-Bopp) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 03 03.47		S	0.4	SC	0.0	E		1		8	5	293	KR002
1997 03 04.10		S	-0.2	HI	0.0	E		1			12		CHU
1997 03 04.47		S	0.3	SC	0.0	E		1		8	9	321	KR002
1997 03 06.47		S	0.1	SC	0.0	E		1		8	7	327	KR002
1997 03 07.04		S	0.3:	SC	0.0	E		1		8	0.5		KR002
1997 03 07.47		S	0.0	SC	0.0	E		1		8	10		KR002
1997 03 08.46		S	0.0	SC	0.0	E		1		8	12	331	KR002
1997 03 09.08		S	-0.4	HI	0.0	E		1			15		CHU
1997 03 10.04		S	-0.1	SC	0.0	E		1		8	2		KR002
1997 03 10.15		S	-0.6	HI	0.0	E		1			17		CHU
1997 03 10.45		S	-0.2	SC	0.0	E		1		8	13	330	KR002
1997 03 11.04		S	-0.2	SC	0.0	E		1		8	3		KR002
1997 03 11.48		S	-0.2	SC	0.0	E		1		8	10	335	KR002
1997 03 12.04		S	-0.2	SC	0.0	E		1		8	4		KR002
1997 03 12.45		S	-0.3	SC	0.0	E		1		8	11		KR002
1997 03 15.05	a	S	-0.4	SC	0.0	E		1		8	4		KR002
1997 03 15.45		S	-0.4	SC	0.0	E		1		8	15		KR002
1997 03 16.05		S	-0.5	SC	0.0	E		1		8	4		KR002
1997 03 16.44		S	-0.5	SC	0.0	E		1		8	15		KR002
1997 03 19.46	a	S	-0.6	SC	0.0	E		1		8	13	348	KR002
1997 03 20.05	a	S	-0.6	SC	0.0	E		1		8	6		KR002
1997 03 20.45	a	S	-0.7	SC	0.0	E		1		8	14		KR002
1997 03 21.08	a	S	-0.7	SC	0.0	E		1		8	4		KR002
1997 03 22.04	a	S	-0.7	SC	0.0	E		1		8	7		KR002
1997 03 23.06	a	S	-0.7	SC	0.0	E		1		8	9		KR002
1997 03 25.06	a	S	-0.7	SC	0.0	E		1		8	5		KR002
1997 03 26.06	a	S	-0.8	SC	0.0	E		1		8	10		KR002
1997 03 27.06	a	S	-0.7	SC	0.0	E		1		8	9	350	KR002
1997 03 29.06	a	S	-0.8	SC	0.0	E		1		8	10		KR002
1997 03 30.06	a	S	-0.8	SC	0.0	E		1		8	10		KR002
1997 03 31.06	a	S	-0.7	SC	0.0	E		1		8	15		KR002
1997 04 01.06	a	S	-0.6	SC	0.0	E		1		8	15		KR002
1997 04 02.06	a	S	-0.6	SC	0.0	E		1		8	15		KR002
1997 04 03.09	a	S	-0.5	SC	0.0	E		1		7	13		KR002
1997 04 04.09	a	S	-0.5	SC	0.0	E		1		7	14		KR002
1997 04 06.09	a	S	-0.5	SC	0.0	E		1		7	15		KR002
1997 04 09.08	a	S	-0.5	SC	0.0	E		1		7	10		KR002
1997 04 10.08	a	S	-0.4	SC	0.0	E		1		7	10		KR002
1997 04 14.09	a	S	-0.4	SC	0.0	E		1		7	5		KR002
1997 04 15.08	a	S	-0.4	SC	0.0	E		1		7	6		KR002
1997 04 15.68		M	-0.3	AA	0.0	E		1	5	8			BEG01
1997 04 15.69		M	-0.3	AA	5.0	B		10	15	8	1.0	45	BEG01
1997 04 16.09	a	S	-0.5	SC	0.0	E		1		7	6		KR002
1997 04 17.07	a	S	-0.5	SC	0.0	E		1		8	6		KR002
1997 04 17.69		M	-0.3	AA	0.0	E		1	3	8	0.5	45	BEG01
1997 04 17.70		M	-0.4	AA	5.0	B		10	15	8	1.4	50	BEG01
1997 04 18.68		M	-0.3	AA	0.0	E		1	12	8	1.3	50	BEG01
1997 04 18.69		M	-0.3	AA	5.0	B		10	12	8	1.0	50	BEG01
1997 04 19.68		M	-0.4	AA	0.0	E		1	16	8	2.8	50	BEG01
1997 04 19.69		M	-0.3	AA	5.0	B		10	8	8	4.2	55	BEG01
1997 04 20.68		M	0.7	AA	0.0	E		1	8	8	0.25	50	BEG01
1997 04 20.69		M	0.7	AA	3.5	B		9	5	8	0.5	55	BEG01
1997 04 20.69		M	0.7	AA	5.0	B		10	14	8	0.75	55	BEG01
1997 04 21.69		M	0.7	AA	0.0	E		1	14	8	0.25	50	BEG01
1997 04 21.69		M	0.7	AA	5.0	B		10	14	8	0.75	55	BEG01
1997 04 22.69		M	0.1	AA	0.0	E		1	8	8	0.33	55	BEG01
1997 04 22.69		M	0.1	AA	5.0	B		10	8	8	0.7	55	BEG01
1997 04 22.70		S	0.2	S	5.0	B		10		9			C0002
1997 04 23.07	a	S	-0.1	SC	0.0	E		1		8	4		KR002
1997 04 23.68		M	-0.3	AA	0.0	E		1	16	8	1.0	55	BEG01
1997 04 23.69		M	-0.2	AA	5.0	B		10	8	8	2.0	55	BEG01
1997 04 24.07	a	S	-0.1	SC	0.0	E		1		8	4		KR002
1997 04 24.68		M	1.1	AA	0.0	E		1	16	8	1.1	55	BEG01
1997 04 24.69		M	1.1	AA	5.0	B		10	8	8	2.0	55	BEG01
1997 04 24.70		S	0.5	S	5.0	B		10		9			C0002

Comet C/1995 O1 (Hale-Bopp) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 04 25.68		M	1.2	AA	0.0	E		1	16	8	4.5	55	BEG01
1997 04 25.69		M	1.2	AA	5.0	B		10	8	8	4.5		BEG01
1997 04 26.70		S	0.8	S	5.0	B		10					C0002
1997 04 27.68		M	0.6	AA	0.0	E		1	15	8	4.6	55	BEG01
1997 04 27.69		M	0.6	AA	5.0	B		10	8	8	3.1		BEG01
1997 04 28.69		M	0.5	AA	0.0	E		1	16	8	3.4		BEG01
1997 04 28.69		M	1.0	AA	5.0	B		10	17	8	7.5		BEG01
1997 04 29.07	a	S	0.2	SC	0.0	E		1		8	4		KR002
1997 04 29.69		M	0.3	AA	0.0	E		1	16	8	2.8	45	BEG01
1997 04 29.69		M	1.1	AA	5.0	B		10	25	8	3.8		BEG01
1997 04 30.08	a	S	0.2	SC	0.0	E		1		8	6		KR002
1997 04 30.69		M	0.9	AA	0.0	E		1	16	8	2.5	55	BEG01
1997 04 30.69		M	1.1	AA	5.0	B		10	8	8	1.3	55	BEG01
1997 05 02.69		M	0.8	AA	0.0	E		1	16	8	2.0	57	BEG01
1997 05 02.70		M	0.9	AA	5.0	B		10	8	8	3.7		BEG01
1997 05 03.68		M	0.8	AA	0.0	E		1	16	8	2.0	57	BEG01
1997 05 03.69		M	0.9	AA	5.0	B		10	8	8	3.5		BEG01
1997 05 04.08	a	S	0.3	SC	0.0	E		1		7	5		KR002
1997 05 04.70		M	0.7	AA	0.0	E		1	16	8	1.9	58	BEG01
1997 05 04.70		M	0.8	AA	5.0	B		10	16	8	4.8		BEG01
1997 05 05.08	a	S	0.2	SC	0.0	E		1		7	4		KR002
1997 05 05.69		M	0.8	AA	5.0	B		10	8	8	1.8		BEG01
1997 05 05.69		M	1.2	AA	0.0	E		1	8	8	1.8		BEG01
1997 05 06.08	a	S	0.2	SC	0.0	E		1		7	5		KR002
1997 05 06.69		M	0.9	AA	0.0	E		1	8	8	2.0	63	BEG01
1997 05 06.69		M	1.2	AA	5.0	B		10	17	8	2.9		BEG01
1997 05 07.69		M	0.9	AA	0.0	E		1	8.8	8	1.4	60	BEG01
1997 05 07.69		M	1.4	AA	5.0	B		10	24	8	2.0		BEG01
1997 05 08.69		M	0.9	AA	0.0	E		1	4	8	0.5	70	BEG01
1997 05 08.69		M	1.1	AA	5.0	B		10	7	8	1.5		BEG01
1997 05 09.69		M	1.0	AA	0.0	E		1	10	8	1.5	60	BEG01
1997 05 09.70		M	1.7	AA	5.0	B		10	17	8	2.5		BEG01
1997 05 10.08	a	S	0.4	SC	0.0	E		1	9	7	2		KR002
1997 05 10.69		M	1.1	AA	0.0	E		1	10	8	1.5	60	BEG01
1997 05 10.69		M	1.8	AA	5.0	B		10	17	8	2.5		BEG01
1997 05 11.08	a	S	0.5	SC	0.0	E		1	9	7	1		KR002
1997 05 12.68		M	1.2	AA	0.0	E		1	13	8	1.1	65	BEG01
1997 05 12.68		M	2.0	AA	5.0	B		10	23	8	2.7		BEG01
1997 05 13.68		M	1.1	AA	0.0	E		1	16	8	0.8	65	BEG01
1997 05 13.69		M	1.4	AA	3.5	B		9	8	8	0.67		BEG01
1997 05 13.69		M	1.7	AA	5.0	B		10	15	8	1.7		BEG01
1997 05 14.69		M	1.7	AA	0.0	E		1	6	8	0.4	70	BEG01
1997 05 14.69		M	2.1	AA	3.5	B		9	12	8	1.7	75	BEG01
1997 05 14.70		M	2.2	AA	5.0	B		10	8	8	1.7		BEG01
1997 05 15.08	a	S	1.1	SC	0.0	E		1		7	1		KR002
1997 05 15.68		M	1.7	AA	5.0	B		10	8.5	7	1.2		BEG01
1997 05 15.68		M	2.0	AA	0.0	E		1	9.6	8	0.63	90	BEG01
1997 05 16.08	a	S	1.1	SC	3.5	B		7			1		KR002
1997 05 16.08	a	S	1.2	SC	0.0	E		1		7	1		KR002
1997 05 16.68		M	1.9	AA	0.0	E		1	6.4	8	0.43	90	BEG01
1997 05 16.69		M	2.1	AA	3.5	B		9	10	7	1.3		BEG01
1997 05 16.69		M	2.2	AA	5.0	B		10	10	7	1.3		BEG01
1997 05 17.08	a	S	1.3	SC	8.0	B		20		6			KR002
1997 05 17.68		M	1.9	AA	0.0	E		1	6.4	8	1.1	77	BEG01
1997 05 17.69		M	1.8	AA	3.5	B		9	10	8	1.5		BEG01
1997 05 17.69		M	1.9	AA	5.0	B		10	9	8	1.5		BEG01
1997 05 18.68		M	1.8	AA	0.0	E		1	6.4	8	19 m	80	BEG01
1997 05 18.68		M	1.9	AA	3.5	B		9	8	8	1.5		BEG01
1997 05 18.69		M	1.8	AA	5.0	B		10	9.6	8	1.5		BEG01
1997 05 19.09	a	S	1.6	SC	3.5	B		7		6			KR002
1997 05 19.68		M	1.9	AA	0.0	E		1	9.6	8			BEG01
1997 05 19.69		M	1.9	AA	5.0	B		10	8	8	1.3		BEG01
1997 05 20.09	a	S	1.6	SC	3.5	B		7		6			KR002
1997 05 20.68		M	2.3	AA	0.0	E		1	6.4	8			BEG01
1997 05 20.69		M	2.2	AA	5.0	B		10	20	8	1.4		BEG01

Comet C/1995 O1 (Hale-Bopp) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 05 21.09	a	S	1.8	SC	8.0	B		20		6			KR002
1997 05 22.09	a	S	2.1	SC	8.0	B		20		7			KR002
1997 05 23.68		M	2.1	AA	0.0	E		1	6.4	7			BEG01
1997 05 23.69		M	2.2	AA	3.5	B		9	9.6	7	1.4		BEG01
1997 05 23.69		M	2.2	AA	5.0	B		10	9.6	8	1.4		BEG01
1997 05 24.69		M	2.1	AA	0.0	E		1	6.4	7			BEG01
1997 05 24.69		M	2.1	AA	3.5	B		9	9.6	7	1.0		BEG01
1997 05 24.70		M	2.1	AA	5.0	B		10	9.6	7	1.3		BEG01
1997 05 25.68		M	1.7	AA	0.0	E		1	16	8	0.7	70	BEG01
1997 05 25.68		M	1.7	AA	3.5	B		9	18	8	1.7		BEG01
1997 05 25.69		M	1.8	AA	5.0	B		10	18	8	2.1		BEG01
1997 05 26.68		M	2.2	AA	0.0	E		1	5	7			BEG01
1997 05 27.68		M	1.2	S	5.0	B		10		8			C0002
1997 05 27.68		M	1.8	AA	0.0	E		1	9.6	8	1.1	80	BEG01
1997 05 27.69		M	1.8	AA	3.5	B		9	16	7	1.3		BEG01
1997 05 27.69		M	1.8	AA	5.0	B		10	13	7	1.3		BEG01
1997 05 28.68		M	2.0	AA	0.0	E		1	6.4	8			BEG01
1997 05 28.69		M	1.9	AA	3.5	B		9	11	7	56 m	85	BEG01
1997 05 28.69		M	2.0	AA	5.0	B		10	11	7	56 m		BEG01
1997 05 30.68		M	2.0	AA	0.0	E		1	10	7			BEG01
1997 05 30.69		M	1.8	AA	5.0	B		10	13	7	1.1		BEG01
1997 06 01.68		M	2.2	AA	0.0	E		1	9.6	8			BEG01
1997 06 01.68		S	1.2	S	5.0	B		10		8			C0002
1997 06 01.69		M	1.8	AA	5.0	B		10	14	7	0.8		BEG01
1997 06 02.68		S	1.5	S	5.0	B		10		8			C0002
1997 06 02.69		M	2.1	AA	5.0	B		10	11	7	53 m		BEG01
1997 06 03.68		M	2.4	AA	5.0	B		10	9.6	7	44 m		BEG01
1997 06 04.68		M	2.4	AA	5.0	B		10	8.4	6	22 m	75	BEG01
1997 06 05.68		M	2.4	AA	5.0	B		10	10	6			BEG01
1997 06 07.68		M	2.6	AA	5.0	B		10	8.8	6	26 m	110	BEG01
1997 06 08.68		M	2.8	AA	5.0	B		10	7	6	14 m	110	BEG01
1997 06 09.68		M	2.8	AA	3.5	B		9	7	6			BEG01
1997 06 09.68		M	3.0	AA	5.0	B		10	10	6	16 m	110	BEG01
1997 06 09.68		M	3.6	AA	6.0	R	13	40	7.5	6			BEG01
1997 06 10.68		M	2.7	AA	0.0	E		1	3	6			BEG01
1997 06 10.68		M	3.2	AA	5.0	B		10	7	5	14 m	115	BEG01
1997 06 11.68		M	2.6	AA	3.5	B		9	7	5			BEG01
1997 06 11.68		M	2.7	AA	5.0	B		10	7	6			BEG01
1997 06 12.68		M	2.8	AA	5.0	B		10	7	6			BEG01
1997 07 15.16		S	3.0	S	5.0	B		10		8			C0002
1997 07 15.16		S	3.0	S	11.2	L	8	72		7	0.5		C0002
1997 08 08.15		M	4.3	S	15	L	9	80	10	6			SMI08
1997 08 10.13		S	4.2	S	0.0	E		1					C0002
1997 08 10.14		S	4.4	S	5.0	B		10		5			C0002
1997 08 10.14		S	4.4	S	11.2	L	8	72	5	6	26 m		C0002
1997 08 12.14		S	4.2	S	5.0	B		10		5			C0002
1997 08 12.15		S	4.4	S	11.2	L	8	72	5	7	0.5	226	C0002
1997 08 15.15		S	4.4	S	5.0	B		10		6			C0002
1997 09 30.44		S	5.1	SC	8.0	B		20	12	4			KR002
1997 10 01.44		S	5.1	SC	8.0	B		20	12	4			KR002
1997 10 07.15		S	5.5	S	5.0	R	8	50		4			C0002
1997 10 07.15		S	5.6	S	11.2	L	8	72	3	6	10 m		C0002
1997 11 10.62		S	7.1	TT	4.5	R	6	13	4				JON
1997 11 24.94		S	6.5	S	11.2	L	8	72		6			C0002
1997 12 05.96		M	7.3	S	15	L	9	80	6.5	5		225	SMI08
1997 12 25.80		S	8.0	S	11.2	L	8	72	3	6			C0002
1998 01 21.82		S	7.5	S	11.2	L	8	72		4			C0002
1998 02 15.55		S	8.4	TT	8.0	B		20	5	5	0.2	70	PEA
1998 02 16.58		S	8.5	TT	8.0	B		20	5	5	0.2	70	PEA
1998 02 18.61		S	8.4	TT	8.0	B		20	4.8	4/			PEA
1998 02 19.43		S	8.5	TT	7.8	R	8	30	2				JON
1998 02 19.61		S	8.6	TT	8.0	B		20	4.5	4/			PEA
1998 02 22.56		S	8.6	TT	8.0	B		20	4.5	5			PEA
1998 02 23.57		S	8.6	TT	8.0	B		20	4.0	5			PEA
1998 02 23.86		M	7.5	S	15	L	9	50	5	5			SMI08

Comet C/1995 O1 (Hale-Bopp) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 02 24.58		S	8.7	TT	8.0	B		20	4.0	4/			PEA
1998 02 25.58		S	8.7	TT	8.0	B		20	4.2	4/			PEA
1998 02 26.02		S	8.7	AC	8.0	B		15	& 4	6			COM
1998 02 26.49		S	8.3	TT	7.8	R	8	30	2				JON
1998 02 26.63		S	8.7	TT	8.0	B		20	4.5	4/			PEA
1998 03 00.01		S	8.5	AC	12.0	B		20	5	6	0.5		COM
1998 03 03.47		S	8.6	TT	7.8	R	8	30	2.5	1			JON
1998 03 03.78		S	8.4	S	20	L	8	83		3			C0002
1998 03 17.73		S	8.8	S	20	L	8	83		3			C0002
1998 03 19.35		S	11.0	TT	31.7	L	5	64	1				JON
1998 03 22.26		S	8.9	TJ	5.0	B		7	5	5			BIV
1998 03 22.35		S	8.7	AA	4.0	B		8	& 8	1			SCH04
1998 03 22.40		S	10.3	TT	31.7	L	5	64	1				JON
1998 03 23.25		S	8.9	TJ	5.0	B		7	4	5			BIV
1998 03 23.39		S	10.1	TT	31.7	L	5	64	0.7				JON
1998 03 23.98		S	9.0	TT	23.0	L	5	68	3	4/			DES01
1998 03 24.38		S	8.6	AA	8.0	B		15	4	1	40 m	77	SEA01
1998 03 24.99		S	9.0	TT	23.0	L	5	68	3	4/			DES01
1998 03 25.99		S	9.0	TT	23.0	L	5	68	3	4			DES01
1998 03 26.53		S	8.6	AA	8.0	B		15	3	2	0.5	95	SEA01
1998 03 26.99		S	9.1	TT	23.0	L	5	68	3	4			DES01
1998 03 27.42		M	8.4	AA	8.0	B		15	4.5	5	1.0	75	SEA01
1998 03 28.42		M	8.6	AA	8.0	B		15	5	4	20 m	78	SEA01
1998 03 29.37		S	10.7	TT	31.7	L	5	64	0.8	3			JON
1998 03 29.38		S	8.5	AA	8.0	B		15	4.5	4			SEA01
1998 03 30.38		S	8.5	AA	8.0	B		15	4.5	4	15 m	75	SEA01
1998 03 30.49		S	7.8	GA	5.0	B		10					SEA
1998 03 31.33		S	8.5	AA	4.0	B		8	&15	2/			SCH04
1998 03 31.34		S	10.5	TT	31.7	L	5	64	0.7	3			JON
1998 03 31.38		S	8.5	AA	8.0	B		15	6	2			SEA01
1998 03 31.98		S	9.1	TT	23.0	L	5	68	& 3	4/			DES01
1998 04 01.98		S	9.1	TT	23.0	L	5	68	& 3	4/			DES01
1998 04 03.38		S	8.5	AA	8.0	B		15	6	2			SEA01
1998 04 03.99		S	9.1	TT	23.0	L	5	68	& 3	4			DES01
1998 04 04.98		S	9.2	TT	23.0	L	5	68	& 2	3/			DES01
1998 04 05.99		S	9.2	TT	23.0	L	5	68	& 2	3/			DES01
1998 04 06.98		S	9.2	TT	23.0	L	5	68	& 2	3/			DES01
1998 04 13.50		S	9.2	AA	8.0	B		20	4	3			PEA
1998 04 17.46		S	8.8	AA	8.0	B		15	4	1			SEA01
1998 04 18.33		S	10.4	TT	31.7	L	5	64	1	1			JON
1998 04 18.35		M	8.5	AA	8.0	B		15	4	5	15 m	95	SEA01
1998 04 18.43		S	8.4	AA	5.0	B		10					SEA
1998 04 19.35		S	8.6	AA	8.0	B		15	4	3			SEA01
1998 04 19.48		S	9.2	AA	8.0	B		20	3.8	3			PEA
1998 04 19.97		S	9.3	TT	23.0	L	5	68		2			DES01
1998 04 20.50		S	9.2	AA	8.0	B		20	3.6	3			PEA
1998 04 20.97		S	9.3	TT	23.0	L	5	68		2			DES01
1998 04 21.33		S	10.0	TT	31.7	L	5	64	1	2			JON
1998 04 21.98		S	9.3	TT	23.0	L	5	68		2			DES01
1998 04 22.46		M	9.1	TI	20	L	7	45	2	6	3.0m	75	MAT08
1998 04 24.35		S	8.4	AA	8.0	B		15	5.5	3			SEA01
1998 04 25.35		S	8.3	AA	8.0	B		15	3.8	2			SEA01
1998 04 26.34		S	8.3	AA	8.0	B		15	4	2			SEA01
1998 04 26.98		S	9.3	TT	23.0	L	5	68		2/			DES01
1998 04 27.36		S	8.5	AA	8.0	B		15	4	2	0.25	95	SEA01
1998 04 27.42		S	8.5	AA	4.0	B		8	5	4			SEA01
1998 04 27.98		S	9.4	TT	23.0	L	5	68		2/			DES01
1998 04 28.35		S	8.6	AA	8.0	B		15	4	3/	0.33	98	SEA01
1998 04 29.38		S	8.6	AA	8.0	B		15	4.5	3			SEA01
1998 04 30.35		S	8.6	AA	8.0	B		15	4.5	3			SEA01
1998 04 30.98		S	9.4	TT	23.0	L	5	68		2			DES01
1998 05 01.99		S	9.4	TT	23.0	L	5	68		2			DES01
1998 05 02.98		S	9.4	TT	23.0	L	5	68		2/			DES01
1998 05 05.42		S	8.3	AA	8.0	B		15	3	1			SEA01
1998 05 05.98		S	9.5	TT	23.0	L	5	68		2			DES01

Comet C/1995 O1 (Hale-Bopp) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 06.35		S	8.6	AA	8.0	B		15	3	2			SEA01
1998 05 15.31		S	9.9	TT	31.7	L	5	64	0.7	5			JON
1998 05 16.35		M	8.6:	AA	8.0	B		15	3.5	5			SEA01
1998 05 17.51		B	9.7	TJ	40.0	L	6	80	7	s5	0.1	25	FAR01
1998 05 17.92		S	9.6	TT	23.0	L	5	68		2/			DES01
1998 05 18.41		M	8.8:	AA	8.0	B		15	3	7			SEA01
1998 05 18.47		S	8.4	AA	5.0	B		10					SEA
1998 05 18.88		S	9.6	TT	23.0	L	5	68		2/			DES01
1998 05 19.37		S	9.8	TT	31.7	L	5	64	1	3			JON
1998 05 19.50		M	9.5	TI	20	L	7	45	1	5			MAT08
1998 05 20.36		M	9.6	VN	25.4	L		61	2.5	7	7 m		SEA01
1998 05 21.35		M	9.5	VN	25.4	L		61	2.5	7	0.33		SEA01
1998 05 22.34		S	8.7	AA	5.0	B		10	4	3			SEA01
1998 05 23.34		M	9.5	VN	25.4	L		61	2.5	5/			SEA01
1998 05 24.34		M	9.4	VN	25.4	L		61	2.4	7	5 m		SEA01
1998 05 24.35		S	9.8	TT	31.7	L	5	64	1	5			JON
1998 05 25.36		M	9.6	VN	25.4	L		61	2.5	6/	5 m		SEA01
1998 05 25.73		S	9.0	S	20.0	L	8	83		3			C0002
1998 05 26.35		M	9.7	VN	25.4	L		61	2.4	5			SEA01
1998 05 26.35		S	9.0	AA	5.0	B		10	3	3			SEA01
1998 05 27.34		M	9.5	VN	25.4	L		61	2	6			SEA01
1998 05 27.34		S	8.5	AA	5.0	B		10	3.5	3			SEA01
1998 05 28.34		M	9.8	VN	25.4	L		61	2.3	6			SEA01
1998 05 28.34		S	8.6	AA	5.0	B		10	3.5	3			SEA01
1998 05 29.33		S	10.0	VN	25.4	L		61	2.0	6			SEA01
1998 05 30.33		S	10.1	VN	25.4	L		61	2.0	5			SEA01
1998 05 31.35		S	10.0	TT	31.7	L	5	64	1.5				JON
1998 06 03.29		S	10.2	TT	31.7	L	5	64	0.8				JON
1998 06 03.36		S	9.4	VN	25.4	L		61	1.8	5			SEA01
1998 06 04.34		S	9.8	VN	25.4	L		61	1.6	5			SEA01
1998 06 07.34		S	10.4	VN	25.4	L		61	1.2	5			SEA01
1998 06 08.34		S	10.3	VN	25.4	L		61	0.6	4			SEA01
1998 06 11.34		S	9.8	VN	25.4	L	6	61	2.2	4			SEA01
1998 06 12.33		S	10.1	VN	25.4	L	6	61	2.0	5			SEA01
1998 06 12.35		S	9.2	AA	5.0	B		10	3	2			SEA01
1998 06 14.35		S	10.0	VN	25.4	L	6	61	2.0	4			SEA01
1998 06 15.43		S	9.8	TI	20	L	7	45	1	5			MAT08
1998 06 17.37		S	10.0	VN	25.4	L	6	61	2	5			SEA01
1998 06 17.38		S	9.8	TI	20	L	7	45	2	5			MAT08
1998 06 19.80		S	10.1	AA	25.4	L	6	61	2	4			SEA01
1998 06 20.79		M	10.0	AA	25.4	L	6	61	2	4			SEA01
1998 06 22.44		S	9.8	TI	20	L	7	45	2	4			MAT08
1998 06 23.34		M	10.0	VN	25.4	L	6	61	2	5			SEA01
1998 06 23.81		S	9.5	AA	8.0	B		15	2.5	4			SEA01
1998 06 24.33		S	10.2	VN	25.4	L	6	61	1.9	3			SEA01
1998 06 24.77		S	9.4	AA	8.0	B		15	2.5	2			SEA01
1998 06 25.33		S	10.3	VN	25.4	L	6	61	1.7	5			SEA01
1998 06 25.77		S	9.3	AA	5.0	B		10	2	2			SEA01
1998 06 26.33		S	10.2	VN	25.4	L	6	61	1.6	5			SEA01
1998 07 29.77		S	9.1	AA	5.0	B		10					SEA

Comet C/1995 Q1 (Bradfield)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1995 10 25.13		S	9.2	AA	6.3	R	13	52	6	2			KOS
1995 10 26.13		S	8.8	AA	6.3	R	13	52	8	1			KOS
1995 10 27.13		S	8.9	AA	6.3	R	13	52	7	1			KOS
1995 11 10.15		S	10.4	AC	6.3	R	13	52	3	1			KOS
1995 11 21.86		S	10.8	AC	6.3	R	13	52	4	1			KOS
1995 11 27.97		S	10.7	CM	15.0	L	8	30	3.1	2			GET

Comet C/1996 B1 (Szczepanski)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1996 02 17.95		S	7.7	NP	8.0	B	5	20	14	2			MIL02

Comet C/1996 B2 (Hyakutake)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1996 03 19.92		S	2.5	AA	8.0	B	5	20	45	6			MIL02
1996 03 21.03		S	2.4	Y	5.0	B		10		5			KID
1996 03 21.04		S	1.7	Y	0.0	E		1	>30				KID
1996 03 22.04		S	0.3	Y	0.0	E		1			15		KID
1996 03 22.04		S	0.4	Y	0.0	E		1					VER04
1996 03 22.96		S	-0.4	Y	0.0	E		1			30		KID
1996 03 23.26		M	0.6	AE	0.0	E		1			40	250	SC001
1996 03 23.96		S	-0.6	Y	0.0	E		1					KID
1996 03 26.34		M	0.3	AE	0.0	E		1			100	205	SC001
1996 03 26.93	G	E	-0.3	HD	0.0	E		1	45	7	45		NES
1996 03 26.94		E	-0.3	HD	5.0	B		7	90	7	60		NES
1996 04 04.00		B	2.3	HD	5	R		20	5.2	7	4	335	NES
1996 04 05.74	G	E	2.5	HD	0.0	E		1	3	8			NES
1996 04 05.82		B	3.1:	HD	5.0	B		7	6.5	7	7		NES
1996 04 07.75	G	E	2.8	HD	0.0	E		1	2	8			NES
1996 04 08.76		B	2.5	HD	5.0	B		7	7	8	7		NES
1996 04 10.71	G	E	2.8	HD	0.0	E		1	2	8			NES

Comet C/1996 J1 (Evans-Drinkwater)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 08 09.00		S	13.3:	AC	25.0	L	6	116	0.8	1			RES
1997 08 10.03		S	13.7	AC	25.0	L	6	116	0.5	2			RES

Comet C/1996 J1 (Evans-Drinkwater) [component B]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 23.84		C	15.8	AO	60	P	6	a180	< 0.3	d7			PRA02
1998 02 21.80		C	15.6	AO	60	P	6	a120	& 0.16	d5			PRA02
1998 03 21.78		C	16.7	AO	60	P	6	a 90	& 0.16	d5			PRA02

Comet C/1996 Q1 (Tabur)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1996 10 05.82		S	5.4	TT	5.0	B		7	7	5			SHA02
1996 10 13.80		S	5.7	TT	8.0	B		10	6	5	1	310	SHA02
1996 10 25.20		S	7.2	TT	8.0	B		20	6	3			SHA02
1996 10 25.76		S	7.2:	TT	8.0	B		20	6	2			SHA02
1996 10 29.76		S	9.9:	TT	20	R	14	40	6.9	3			SHA02

Comet C/1997 BA6 (Spacewatch)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 24.09		C	17.0	AO	60	P	6	a120	& 0.16	d7/	&20 s	3	PRA02
1998 02 05.01		C	16.7	AO	60	P	6	a120	< 0.16	d7/	>20 s	360	PRA02
1998 02 23.04		C	16.4	AO	60	P	6	a 90	< 0.16	d7	>20 s	15	PRA02
1998 03 18.54		C	17.1	GA	60.0	Y	6	a240	0.35			48	NAK01
1998 03 22.93		C	16.2	AO	60	P	6	a 90	& 0.16	d7	&30 s	30	PRA02
1998 04 19.50		C	16.9	GA	60.0	Y	6	a240	0.35			65	NAK01

Comet C/1997 D1 (Mueller)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 10 10.36		S	13.8	AC	44.5	L	4	167	0.8	2			MOR03
1997 10 12.07		S	11.9	AC	25.0	L	6	61	1.5	2			RES
1997 11 11.06		S	11.6	AC	25.0	L	6	61	1.8	2			RES
1997 12 03.21		S	13.1	AC	44.5	L	4	167	1.1	4			MOR03
1997 12 21.07		S	13.0	AC	44.5	L	4	167	1.2	1			MOR03
1998 01 02.91	!	S	13.3:	VB	30	R	18	170	0.6	2			SHA02
1998 01 15.81		S[	13.3:	VB	30	R	18	170					SHA02
1998 01 23.81		C	13.5	AO	60	P	6	a360	< 1	d6	& 5 m	60	PRA02

Comet C/1997 J1 (Mueller)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 05 26.16		S	13.1	AC	44.5	L	4	167	1.0	2			MOR03
1998 01 23.99		C	16.2	AO	60	P	6	a 60	& 0.5	d8			PRA02
1998 02 02.59		C	15.8	GA	60.0	Y	6	a120	0.8				NAK01
1998 02 03.89		C	16.0	AO	60	P	6	a 60	& 0.33	d8			PRA02
1998 02 17.92		C	16.7	AO	60	P	6	a 90	& 0.2	d3			PRA02
1998 03 02.52		C	16.4	GA	60.0	Y	6	a240	0.8				NAK01
1998 03 18.47		C	17.3	GA	60.0	Y	6	a240	0.45				NAK01
1998 03 21.83		C	17.2	AO	60	P	6	a120	< 0.16	d1			PRA02
1998 04 19.47	a	C	17.7	GA	60.0	Y	6	a240	0.3	1/			NAK01

Comet C/1997 J2 (Meunier-Dupouy)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 05 26.16		S	13.0	AC	44.5	L	4	167	0.8	2			MOR03
1997 06 28.13		S	13.1	AC	44.5	L	4	167	0.8	3			MOR03
1997 07 06.13		S	12.9	AC	44.5	L	4	167	0.9	3			MOR03
1997 07 09.92		S	12.4	AC	25.0	R	10	100	1.4	2			RES
1997 07 10.16		S	12.9	AC	44.5	L	4	167	0.9	3			MOR03
1997 07 10.91		S	12.0	AC	25.0	R	10	100	1.2	1			RES
1997 07 11.92		S	12.2	AC	25.0	R	10	100	1.2	2/			RES
1997 07 12.93		S	12.5	AC	25.0	R	10	100	1.4	1			RES
1997 07 13.93		S	12.4	AC	25.0	R	10	100	1.0	2/			RES
1997 07 25.15		S	12.9	AC	44.5	L	4	167	1.0	3			MOR03
1997 08 05.88		S	11.9	AC	25.0	L	6	61	1.8	2/			RES
1997 08 06.14		S	12.6	AC	44.5	L	4	167	1.0	3			MOR03
1997 08 06.92		S	12.0	AC	25.0	L	6	61	1.4	1/			RES
1997 08 08.93		S	12.0	AC	25.0	L	6	61	1.5	2			RES
1997 08 09.93		S	11.8	AC	25.0	L	6	61	1.8	1			RES
1997 08 12.28		S	12.5	AC	44.5	L	4	167	1.0	3			MOR03
1997 08 23.15		S	12.3	HS	33.3	L	4	200	1.6	2			KRO02
1997 08 24.11		S	12.5	HS	33.3	L	4	200	1.5	1			KRO02
1997 09 04.16		S	12.3	HS	33.3	L	4	200	1.3	1			KRO02
1997 09 22.07		S	12.4	AC	44.5	L	4	80	1.2	3			MOR03
1997 09 24.04		S	12.2	AC	44.5	L	4	80	1.1	3			MOR03
1997 09 25.83		S	11.6	AC	25.0	L	6	61	1.8	2			RES
1997 09 27.04		S	12.1	AC	44.5	L	4	80	1.0	3			MOR03
1997 09 27.80		S	11.4	AC	25.0	L	6	61	2.0	3			RES
1997 10 21.01		S	12.3	AC	44.5	L	4	80	1.0	4			MOR03
1997 11 04.65	a	S	11.1	SE	25	L	4	64	3	2			SHU
1997 11 25.01		S	12.2	AC	44.5	L	4	167	0.7	5			MOR03
1997 12 17.97		S	12.9	AC	44.5	L	4	167	0.6	4			MOR03
1998 01 01.01		S	12.8	AC	44.5	L	4	167	0.8	4			MOR03
1998 01 02.76		S	11.7:	VB	20	R	14	110	1.3	s1			SHA02
1998 01 06.22		S	12.7	VB	20	T	10	75	1.3	2			SHA02
1998 01 14.79		S	12.6:	VB	30	R	18	100	0.7	2			SHA02
1998 01 15.77		S	12.8	VB	30	R	18	170	0.8	2			SHA02
1998 01 19.80	!	S	12.7	VB	30	R	18	170	0.9	2			SHA02
1998 01 24.77		S	12.5	VB	30	R	18	170	0.8	s2			SHA02
1998 02 07.45		S	12.7	AC	44.5	L	4	167	0.4	5			MOR03
1998 03 21.12		C	13.5	HS	60	P	6	a 80	& 1.3	D6	> 3	m 335	PRA02
1998 03 23.10		S	11.5	TI	35	L	5	92	1.5	2			HOR02
1998 03 25.09		S	11.5:	HS	25.0	L	5	120	1.5	3			CHE03
1998 03 26.09		S	11.5:	HS	25.0	L	5	120		3			CHE03
1998 03 28.08		S	11.3:	VF	15	L	6	50	2	1/			ISH03
1998 03 28.09		S	11.2	VF	15	L	6	50	2	2			BAR06
1998 03 28.09		S	11.3	VF	20	L	5	70	2	1			BAR06
1998 03 28.16		S	11.4	HS	20.3	T	10	93	0.6	4			HAS02
1998 03 30.12		S	11.4	TI	35	L	5	92	2.0	2			HOR02
1998 03 31.11		M	11.3	TI	35	L	5	92	2.0	3			HOR02
1998 04 03.82	a	C	12.3	GA	60.0	Y	6	a120	1.8		> 5.2m	327	NAK01
1998 04 04.80		S	11.4	HS	31.7	L	6	59	1	2			MIY01
1998 04 21.09		M	11.7	TI	35	L	5	158	2.5	2			HOR02
1998 04 23.06		M	11.3	TT	35	L	5	92	2.2	2/			HOR02
1998 04 23.07		S	11.9	HS	40.6	T	10	56	1.5	4/			CHE03
1998 04 23.07	x	S	11.4	TT	25.4	J	6	88	1.4	3			BOU

Comet C/1997 J2 (Meunier-Dupouy) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 23.48	!	J	11.8	SC	25.4	T	5	a 60	1.21	s3	2.1m	330	ROQ
1998 04 24.07		M	11.1	TT	35	L	5	92	2.1	2			HOR02
1998 04 26.08		M	11.2	TT	35	L	5	92	1.9	2/			HOR02
1998 04 26.08		S	12.0	HS	38.5	L	5	116	1	s4			SAR02
1998 04 26.11		S	12.9:	HS	20	T	10	135	0.8	2			SHA02
1998 04 26.59		S	11.9	HS	25.6	L	5	84	1.5	4			BIV
1998 04 28.11		S	12.8	HS	30	R	18	170	0.7	1			SHA02
1998 04 28.60		S	11.7	HS	25.6	L	5	84	1.8	4			BIV
1998 04 29.00	s	S	11.8	NP	30	L	5	100	0.8	2			NEV
1998 04 29.02		S	11.4	HS	40.6	T	10	56	& 2	4			CHE03
1998 04 30.00		B	11.5	HS	40.6	T	10	56	1.5	3			CHE03
1998 05 01.04		S	11.0	AC	25.4	L	5	65	1.4	1/			MEY
1998 05 02.04		M	10.9	TI	13	L	8	69	2.3	2/			HOR02
1998 05 02.04		S	11.6	AC	25.4	L	5	104	1.4	2			MEY
1998 05 03.04		C	12.5	HS	60	P	6	a160	< 2	D5	> 4 m	335	PRA02
1998 05 06.10	!	V	12.7	YF	36.0	T	7	a120	+ 1.3	7	& 6 m	330	MIK
1998 05 17.99		S	11.4	AC	25.4	L	5	104	1.4	2			MEY
1998 05 18.00	x	S	11.4	TJ	25.4	J	6	115	1.2	3			BOU
1998 05 19.04		S	12.0	HS	20	T	10	135	0.5	3			SHA02
1998 05 23.00	x	S	11.4	TJ	25.4	J	6	100	1.5	2/			BOU
1998 05 23.02		S	11.4	HS	44.5	L	4	82	2	3			SAR02
1998 05 24.53		S	11.5	HS	25.6	L	5	42	1.5	3			BIV
1998 05 26.52		S	11.4	HS	25.6	L	5	42	1.5	3			BIV
1998 05 27.02		M	11.1	TI	35	L	5	92	2.2	2/			HOR02
1998 05 28.99	x	S	11.4	TJ	25.4	J	6	88	1.5	3			BOU
1998 05 30.01		S	12.5:	VB	30	R	18	170	0.6	3			SHA02
1998 05 30.56		S	11.7	HS	25.6	L	5	42	1.5	4			BIV
1998 05 30.94		S	11.6	HS	44.0	L	5	156	0.7	3			HAS02
1998 05 31.57		S	11.7	HS	25.6	L	5	42	1.5	5			BIV
1998 06 01.02		S	10.9	TI	35	L	5	92	2.2	2/			HOR02
1998 06 01.51		S	11.8	HS	25.6	L	5	84	1.0	5			BIV
1998 06 03.78		C	12.1	GA	60.0	Y	6	a120	2.2		> 5.5m	335	NAK01
1998 06 03.98		S	10.7	AC	25.0	L	6	61	2.5	2			RES
1998 06 04.59		S	11.4	HS	25.6	L	5	42	1.5	5			BIV
1998 06 14.32	!	J	10.7	SC	25.4	T	5	a 60	2.43	s6			ROQ
1998 06 17.47		S	11.5	TJ	25.6	L	5	42	1.7	4			BIV
1998 06 17.69		C	12.3	GA	60.0	Y	6	a120	1.8				NAK01
1998 06 17.98		S	10.7	AC	25.0	L	6	61	2.2	2/			RES
1998 06 20.52		S	11.4	TJ	25.6	L	5	42	1.8	4			BIV
1998 06 20.65		B	12.3	HS	31.7	L	6	59	2	4			MIY01
1998 06 20.67		S	10.8	HS	31.7	L	6	59	1.7	4			YOS04
1998 06 20.98		M	11.2	TI	35	L	5	92	2	2/			HOR02
1998 06 21.00		S	13.0	VB	30	R	20	170	0.6	3			SHA02
1998 06 21.95		M	11.0	TI	35	L	5	92	2	3			HOR02
1998 06 21.96		S	11.4	AC	25.4	L	5	65	1	1/			MEY
1998 06 21.97		S	10.8	AC	25.0	L	6	61	1.8	2/			RES
1998 06 24.41		J	10.5	SC	25.4	T	5	a 60	1.73	s3			ROQ
1998 06 24.95		S	10.8	AC	25.0	L	6	61	2.2	2			RES
1998 06 25.48		S	11.5	TJ	25.6	L	5	42	1.8	3			BIV
1998 06 25.94		M	10.9	TI	35	L	5	92	1.9	3			HOR02
1998 06 25.98		S	12.9	VB	30	R	20	170	0.8	2			SHA02
1998 06 26.00	x	S	11.6	TT	25.4	J	6	100	1.7	2			BOU
1998 06 26.06		V	12.1	HV	152	L	8	a300	1.7			230	COZ
1998 06 27.07		V	12.1	HV	152	L	8	a300	1.7				COZ
1998 06 27.56		S	11.3	TJ	25.6	L	5	42	2.0	3			BIV
1998 06 28.44		S	11.4	TJ	25.6	L	5	42	1.5	3			BIV
1998 06 28.95		S	10.7	AC	25.0	L	6	61	2.5	1/			RES
1998 06 28.97		M	10.8	TI	35	L	5	92	2.3	3			HOR02
1998 06 28.99		S	12.8:	HS	30	R	20	170	0.7	3			SHA02
1998 06 29.68		S	11.8	HS	40.0	L	6	133	1.1	5			NAG08
1998 06 29.92		M	10.8	TI	35	L	5	92	2.1	2/			HOR02
1998 06 30.52		S	11.7	TJ	25.6	L	5	42	1.8	4	0.03	250	BIV
1998 07 01.96		S	10.6	AC	25.0	L	6	61	2.8	2/			RES
1998 07 02.50		S	11.5	TJ	25.6	L	5	42	1.8	5			BIV
1998 07 02.76		C	12.0	GA	60.0	Y	6	a120	2.3		> 5.7m	334	NAK01

Comet C/1997 J2 (Meunier-Dupouy) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 02.90		M	10.8	TI	35	L	5	92	2.1	2/			HOR02
1998 07 02.96		S	10.8	AC	25.0	L	6	61	3	3			RES
1998 07 03.59		S	11.4	TJ	25.6	L	5	42	2.0	3			BIV
1998 07 04.28	!	J	10.6	SC	25.4	T	5	a 60	2.18	s3/			ROQ
1998 07 16.95		S	11.6	AC	25.4	J	6	88	1.9	2			BOU
1998 07 17.96		S	11.5	GA	25.4	J	6	72	2.0	2/			BOU
1998 07 18.98		S	11.5	GA	25.4	J	6	88	2.0	2/			BOU
1998 07 19.91		M	10.8	TI	35	L	5	92	2.4	3/			HOR02
1998 07 19.95		S	11.1	TT	44.0	L	5	63	1.4	4			HAS02
1998 07 21.01		S	10.6	TI	20	L	4	34	3.0	3			KYS
1998 07 21.04		M	10.7	TI	35	L	5	92	2.8	3			HOR02
1998 07 21.88		M	10.7	TI	35	L	5	92	2.9	3			HOR02
1998 07 21.98	x	S	11.4	TJ	25.4	J	6	72	2.0	3			BOU
1998 07 22.97	x	S	11.4	TJ	40.0	L	5	118	1.6	4			BOU
1998 07 24.94		M	10.7	TI	35	L	5	92	2.5	3			HOR02
1998 07 24.98		S	11.4	GA	25.4	J	6	72	2.2	3			BOU
1998 07 25.45		S	11.4	HS	25.6	L	5	42	2.0	4			BIV
1998 07 25.90		S	10.8	AC	25.0	L	6	61	2.2	3/			RES
1998 07 25.96		S	11.4	GA	25.4	J	6	72	2.2	3/			BOU
1998 07 26.37		S	11.5	HS	25.6	L	5	42	1.7	3	0.03	270	BIV
1998 07 26.90		S	10.9	AC	25.0	L	6	61	2.0	3			RES
1998 07 27.51		S	11.4	TJ	25.6	L	5	42	1.7	4			BIV
1998 07 28.94		S	10.9	AC	25.0	L	6	61	2.5	3			RES
1998 07 29.24		S	11.3	AC	20.0	T	10	102	2.0	3/			SPR
1998 07 30.94		S	10.5	HS	20.3	T	10	77	1.9	2/			KAM01
1998 07 30.98		S	11.0	AC	25.0	L	6	61	2.5	2/			RES

Comet C/1997 L1 (Zhu-Balam)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 02 02.83	a	C	19.0	GA	60.0	Y	6	a240	0.3	1			NAK01
1998 02 04.84	a	C	18.7	GA	60.0	Y	6	a240	0.35	1			NAK01
1998 04 03.76		C	19.2	GA	60.0	Y	6	a240	0.3	1			NAK01

Comet C/1997 N1 (Tabur)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 09 09.84		S	10.1:	HS	20	R	14	90	1.4	1			SHA02
1997 09 22.82		S	11.8:	HS	30	R	18	100	1.3	1			SHA02

Comet C/1997 O1 (Tilbrook)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 07 26.4		B	10.3	VN	20	L			1.3				TIL
1998 02 04.02		C	17.6	AO	60	P	6	a 50	< 0.01	d0/			PRA02
1998 02 04.83		C	17.3	GA	60.0	Y	6	a240	0.65	1/			NAK01
1998 02 18.16		C	17.5	AO	60	P	6	a 60	< 0.01	d0/			PRA02
1998 03 23.09		C	17.8	AO	60	P	6	a 90	< 0.01	d0/			PRA02

Comet C/1997 T1 (Utsunomiya)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 10 06.11		S	11.0:	HS	33.3	L	4	58	1.8	5	0.03	130	KR002
1997 10 06.81	x	S	10.5	TJ	35	M	10	90	1.7	s3			DRA02
1997 10 06.82	x	S	10.3	TJ	10.0	B		25	1.7	s1			DRA02
1997 10 06.83	x	M	11.1	TJ	35	M	10	90	0.8	s5	0.1	134	DRA02
1997 10 07.13		S	10.2	HS	33.3	L	4	58	1.7	5	0.01	125	KR002
1997 10 07.83		S	9.8	AC	6.0	B		20	& 3	3			RES
1997 10 09.83		S	9.9	AC	6.0	B		20	& 3	2			RES
1997 10 09.87	x	M	11.0	TJ	35	M	10	90	2.1	s4			DRA02
1997 10 09.89	x	S	9.6:	TJ	10.0	B		25	& 4	s1			DRA02
1997 10 10.83		S	9.7	AC	6.0	B		20	2.5	2			RES
1997 10 11.88		S	10.0	AC	6.0	B		20	2.0	3			RES
1997 10 12.19		S	12.2	AA	101.6	R	19	386	0.4	3	0.02		KR002
1997 10 13.84		S	9.5:	AC	6.0	B		20	& 3	2			RES

Comet C/1997 T1 (Utsunomiya) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 10 14.13		S	10.4	HS	33.3	L	4	58	1.1	5			KRO02
1997 10 19.06		S	10.2	HS	33.3	L	4	58	3	4	0.05		KRO02
1997 10 19.83		S	9.7	AC	6.0	B		20	& 3	2			RES
1997 10 20.86		S	9.9	AC	6.0	B		20	2.5	4			RES
1997 10 21.05		S	11.3	AC	44.5	L	4	80	0.9	4	0.10	60	MOR03
1997 10 21.07		S	11.1	AC	15	R	5	62	2.0	3			MOR03
1997 10 21.82		S	9.8	AC	6.0	B		20	2.0	3			RES
1997 10 22.09		S	10.3	HS	33.3	L	4	58	1.9	4			KRO02
1997 10 22.87		S	9.9	AC	6.0	B		20	2.0	3			RES
1997 10 24.81	x	M	11.0	TJ	35	M	10	90	3	s4			DRA02
1997 10 24.82		S	9.8	AC	6.0	B		20	3.0	3/			RES
1997 10 25.84		S	9.6	AC	6.0	B		20	3.0	2/			RES
1997 10 26.88		S	9.5	AC	6.0	B		20	2.5	2/			RES
1997 10 28.05		S	10.1	HS	33.3	L	4	58	2.1	4	0.05	65	KRO02
1997 10 28.87		S	9.6	AC	6.0	B		20	2.5	3			RES
1997 11 01.80	x	M	10.3	TJ	35	M	10	90	2	s4			DRA02
1997 11 02.07		S	10.1	HS	33.3	L	4	58	2.4	3			KRO02
1997 11 03.83		S	9.8	AC	6.0	B		20	2.5	3			RES
1997 11 04.12		S	10.2	AC	15	R	5	42	3.5	2			MOR03
1997 11 04.63	a	M	10.0	SE	25	L	4	64	3	4			SHU
1997 11 07.83		S	9.7	AC	6.0	B		20	2.0	3			RES
1997 11 19.70		S	10.3	AC	6.3	R	13	52	3	4			KOS
1997 11 24.98		S	10.5	AC	15	R	5	42	2.5	4			MOR03
1997 11 29.98		S	9.5	AC	15	R	5	42	3.5	3			MOR03
1997 12 15.97	w	S	10.8	AC	15	R	5	62	1.7				MOR03
1997 12 16.97	w	S	10.5	AC	44.5	L	4	80	2.1	3			MOR03
1997 12 17.96	w	S	10.4	AC	44.5	L	4	80	1.6	3			MOR03
1998 04 02.67		S	12.4	GA	25.4	L	4	114					SEA
1998 04 03.80		C	13.8	GA	60.0	Y	6	a120	1.4			305	NAK01
1998 04 22.55		S[	12.5	HS	20	L	7	158					MAT08
1998 04 23.09		O[	12.0	HS	35	L	5	158	! 1.5				HOR02
1998 04 26.06		S	13.2	HS	38.5	L	5	116	1.5	2			SAR02
1998 04 26.07		S	13.0	HS	35	L	5	158	1.5	1/			HOR02
1998 04 26.47		S	13.4	HS	25.6	L	5	84	0.8	5			BIV
1998 05 03.72	a	C	13.3	GA	60.0	Y	6	a120	1.6		> 5.1m	40	NAK01
1998 05 15.92		S	14.4	HS	44.0	L	5	156	0.3	3			HAS02
1998 05 19.63	a	C	14.1:	GA	60.0	Y	6	a120	1.2				NAK01
1998 05 21.61		C	13.8	GA	60.0	Y	6	a120	1.6		4.0m	59	NAK01
1998 05 23.90		S	14.5	HS	44.5	L	4	230	0.8	2			SAR02
1998 06 17.53	a	C	16.2	GA	60.0	Y	6	a120	0.65				NAK01

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DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 26.61		C	12.1	GA	60.0	Y	6	a 60	1.9		> 5.5m	202	NAK01
1998 04 26.97		S	10.6	TI	35	L	5	92	3	1			HOR02
1998 04 26.99	x	S	10.2	TT	10.0	B		20	6	2			MEY
1998 04 27.83		M	10.4	TT	35	L	5	92	2.8	3			HOR02
1998 04 27.85		M	10.7	TI	35	L	5	92	3	3			PLS
1998 04 27.89	!	V	12.3	YF	36.0	T	7	a120	+ 1.3	7	& 5 m	190	MIK
1998 04 28.04		S	10.4	TT	23.0	L	5	68		3/			DES01
1998 04 28.08		S	11.7	VB	30	R	18	100	1.1	s3			SHA02
1998 04 28.20		J	10.4	SC	25.4	T	5	a 60	3.03	s3	3.2m	191	ROQ
1998 04 28.58		S	10.7	TJ	25.6	L	5	42	4	2			BIV
1998 04 28.91		S	11.9	VB	30	R	18	100	1.5	s3			SHA02
1998 04 28.92		B	10.9	HS	40.6	T	10	73	5	2			CHE03
1998 04 28.92		S	10.4	HI	6.0	B		20	4	2/			RES
1998 04 28.98		S	10.7	NP	21	L	6	100	2	1			MAR02
1998 04 29.59		S	10.9	TJ	25.6	L	5	42	3.5	3			BIV
1998 04 29.86		B	10.8	HS	40.6	T	10	56	5	3			CHE03
1998 04 29.86	s	S	11.9	NP	25	L	4	64	1	3			SHU
1998 04 29.89		S	10.3	HI	25.0	L	6	61	5.0	2			RES
1998 04 30.01		S	11.8	NP	25	L	4	64	1	2			NEK
1998 04 30.01	s	S	11.9	NP	25	L	4	64	1	2			SHU
1998 04 30.15		S	10.6	AC	25.3	L	6	58	& 3	4			PER01

Comet C/1998 H1 (Stonehouse) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 30.82		S	10.4	TT	10.0	B		25	2.1	3			HAS02
1998 04 30.92		S	10.2	HI	25.0	L	6	61	5	3			RES
1998 04 30.99	x	S	10.7	TT	25.4	L	5	65	3.5	s3/			MEY
1998 05 01.01		S	10.7	TT	13	L	8	69	3	3			HOR02
1998 05 01.06		S	10.6	TT	23.0	L	5	68		3			DES01
1998 05 01.27		S	10.5	AC	20.0	T	10	102	5	2			SPR
1998 05 01.90		S	10.4	HI	6.0	B		20	6	2			RES
1998 05 02.02	x	S	11.0	TT	25.4	L	5	65	2.5	2			MEY
1998 05 02.03		M	10.8	TT	13	L	8	69	3.3	2/			HOR02
1998 05 02.04		S	10.7	TT	23.0	L	5	68		2			DES01
1998 05 02.16		J	10.7	SC	25.4	T	5	a 60	2.51	s5	3.4m	185	ROQ
1998 05 02.51		S	10.9	TJ	25.6	L	5	42	5	2			BIV
1998 05 02.94		C	11.6	A0	60	P	6	a 40	< 0.9	D5	& 2 m	185	PRA02
1998 05 03.03		S	10.5	HI	6.0	B		20	4	2			RES
1998 05 03.29		S	10.7	AC	20.0	T	10	102	3	2/			SPR
1998 05 03.69		C	12.3	GA	60.0	Y	6	a 60	2.0				NAK01
1998 05 03.89		S	12.1	VB	30	R	18	100	1.2	3			SHA02
1998 05 04.06	x	S	10.7	TJ	25.4	J	6	58	3.2	2			BOU
1998 05 04.07		S	10.7	AA	30.0	T	10	54	& 3	1/			COM
1998 05 04.21		S	10.7	AC	20.0	T	10	125	3	2/			SPR
1998 05 04.72		S	10.8	VN	41	L	4	90	2	2			PEA
1998 05 04.87		S	11.2	AC	15.2	L	5	42	3.0	2			MOE
1998 05 04.90		S	11.9	VB	30	R	18	100	1.9	3			SHA02
1998 05 05.21		S	10.6	AC	20.0	T	10	102	5	2			SPR
1998 05 06.04		S	10.7	TT	23.0	L	5	68		2			DES01
1998 05 06.07		M	11.1	TT	35	L	5	92	2.8	2			HOR02
1998 05 06.09	!	V	12.5	YF	36.0	T	7	a120	+ 1.9	5	& 5 m	175	MIK
1998 05 06.35		S	12.0	AC	44.5	L	4	80	1.2	1			MOR03
1998 05 13.21		S	10.9	AC	20.0	T	10	102	3	2/			SPR
1998 05 14.87		O	11.0:	TI	20	L	4	57	2	3			KYS
1998 05 14.88		S	11.4	HS	20.3	T	10	93	1.0	3			HAS02
1998 05 14.91		S	12.8	VB	30	R	18	170	0.9	2			SHA02
1998 05 14.91	x	S	11.7	TT	25.4	J	6	72	2	1			BOU
1998 05 14.92		S	11.2	AC	30.5	T	10	117	& 3	1			COM
1998 05 15.26		S	11.6	TJ	25.6	L	5	42	4	3			BIV
1998 05 15.86		M	11.6	TT	35	L	5	92	2.4	2			HOR02
1998 05 15.90		S	11.6	HS	44.0	L	5	63	1.9	3			HAS02
1998 05 15.90		S	11.7	TI	20	L	4	34	2.5	1			KYS
1998 05 15.93	x	S	11.2	TT	25.4	J	6	58	3.5	1			BOU
1998 05 15.94		S	12.1	VB	30	R	18	100	1.6	1			SHA02
1998 05 16.15		J	11.8	SC	25.4	T	5	a 60	3.03	s5	3.3m	150	ROQ
1998 05 16.30		S	11.4	TJ	25.6	L	5	42	4	2			BIV
1998 05 16.87		S	11.5	TT	13	L	8	69	3.2	2			HOR02
1998 05 16.94		S	12.2	VB	30	R	18	100	1.6	2			SHA02
1998 05 16.98	x	S	11.3	TT	25.4	J	6	58	3.5	1			BOU
1998 05 17.31		S	11.2	TJ	25.6	L	5	42	3.5	2			BIV
1998 05 17.85		S	11.1	AC	25.0	L	6	61	2.5	2			RES
1998 05 17.95		S	11.4	AC	25.4	L	5	65	2.2	1/			MEY
1998 05 17.97	x	S	11.5	TT	25.4	J	6	72	3.0	1			BOU
1998 05 18.00		S	11.4	AC	30.5	T	10	117	& 3	0/			COM
1998 05 18.28		S	11.6	HS	25.6	L	5	42	3	2			BIV
1998 05 18.85		S	11.3	AC	25.0	L	6	61	2.0	3/			RES
1998 05 19.03		S	12.5	HS	20	T	10	75	1.4	2			SHA02
1998 05 19.11		S	11.3	TI	41.0	L	5	70	& 2.5	1			BOR
1998 05 19.32		S	11.7	HS	25.6	L	5	42	2.5	2			BIV
1998 05 19.61		C	13.6:	GA	60.0	Y	6	a120	1.6		> 4.8m	153	NAK01
1998 05 20.31		S	11.8	HS	25.6	L	5	42	3	1			BIV
1998 05 21.95		S	12.0	HS	30	R	18	170	1.5	2			SHA02
1998 05 22.94		S	11.5	HS	44.5	L	4	82	3.5	1			SAR02
1998 05 23.12		S	11.5	TI	41.0	L	5	70	& 2.0	1			BOR
1998 05 23.40		S	11.9	HS	25.6	L	5	84	2.5	2			BIV
1998 05 23.96		S	12.0	HS	44.5	L	4	82	2.8	1			SAR02
1998 05 26.31		S	12.0	HS	25.6	L	5	42	3	1			BIV
1998 05 26.58		C	14.0	GA	60.0	Y	6	a120	1.4		4.0m	142	NAK01
1998 05 26.87		S	12.4	HS	35	L	5	92	1.5	1/			HOR02

Comet C/1998 H1 (Stonehouse) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 27.15		J	12.4	SC	25.4	T	5	a 60	1.65	s5	2.7m	135	ROQ
1998 05 28.98		S	12.1	AC	25.4	J	6	72	2.5	0/			BOU
1998 05 29.96		S	[13.4	HS	30	R	18	100					SHA02
1998 05 30.89		S	12.2	HS	44.0	L	5	63	2.3	2			HAS02
1998 06 08.16		J	13.0	SC	25.4	T	5	a 60	1.73	s3/	1.4m	137	ROQ
1998 06 14.28		S	13.1	HS	25.6	L	5	84	1.2	2			BIV
1998 06 17.38		S	13.6	HS	25.6	L	5	84	1.5	1			BIV
1998 06 17.54		C	15.6	GA	60.0	Y	6	a120	0.8		1.8m	117	NAK01
1998 06 20.22		J	13.4	SC	25.4	T	5	a 60	0.55	s3/			ROQ
1998 06 21.94		S	13.3	HS	35	L	5	207	1.5	2			HOR02
1998 06 25.88		V	16.4	HV	152	L	8	a300	0.16				COZ
1998 06 25.91		S	13.6	HS	35	L	5	207	1.3	2			HOR02
1998 06 26.87		V	16.3	HV	152	L	8	a300	0.16				COZ
1998 06 28.89		S	13.9	HS	35	L	5	207	1.3	2			HOR02
1998 06 29.89		S	13.8	HS	35	L	5	207	1.3	1/			HOR02
1998 07 02.18		J	14.5	SC	25.4	T	5	a 60	1.63	d1/	0.7m	112	ROQ
1998 07 19.88		S	14.2:	HS	35	L	5	237	1.2	1/			HOR02
1998 07 20.93		S	13.9	HS	35	L	5	207	1.1	2			HOR02
1998 07 21.89		S	14.0	HS	35	L	5	207	1.2	1/			HOR02
1998 07 24.90		S	13.9:	HS	35	L	5	207	1.3	2			HOR02

Comet C/1998 J1 (SOHO)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 09.81		B	[0.5	HV	6.3	B		9	! 2				KAM01
1998 05 11.23		S	0.5:	HV	25.6	L	5	84	0.5	8/	0.1	70	BIV
1998 05 13.24		S	1.5:	HV	25.6	L	5	42	0.5	8/			BIV
1998 05 16.25		S	3.5	HV	25.6	L	5	42	1	7/	0.1	110	BIV
1998 05 16.36		B	2.4	YF	5.0	B		7	& 5	S6/	3	100	FAR01
1998 05 16.37					15.0	L	5	52	10	D5/	&5	105	FAR01
1998 05 16.89		B	3.5	A	5.0	B		7	15	5/	0.5		AMO01
1998 05 17.25		S	3.9	HV	25.6	L	5	42	1.5	7	0.2	100	BIV
1998 05 17.35		B	2.8	YF	5.0	B		7	& 8	S6/	5	110	FAR01
1998 05 17.87		S	3.6	AA	8.0	B		11		7/			DES01
1998 05 17.88		B	3.5	A	5.0	B		7	12	5	0.5		AMO01
1998 05 18.25		S	4.0	HV	25.6	L	5	42	1.5	7	0.2	115	BIV
1998 05 18.33			3.5:		10.0	B		25					SEA
1998 05 18.68		M	2.4	AA	0.0	E		1		9	1.0	120	BEG01
1998 05 18.69		B	2.8	AA	5.0	B		10	4.0	8	4.5	122	BEG01
1998 05 18.69		S	4.0	S	5.0	B		10		9	0.75	112	C0002
1998 05 18.70		S	4.0	S	11.2	L	8	50		8	0.50	112	C0002
1998 05 18.86		S	3.7	AA	8.0	B		11	& 3.0	7/			DES01
1998 05 18.90		B	3.6	A	5.0	B		7	5	7	0.5		AMO01
1998 05 19.24		S	4.2	HV	25.6	L	5	42	1.7	7	0.2	130	BIV
1998 05 19.28		S	4.3	TT	5.0	B		7					JON
1998 05 19.35	w	S	3.2	AA	0.0	E		1					SEA
1998 05 19.68		M	3.7	AA	5.0	B		10					BEG01
1998 05 19.68		M	3.8	AA	0.0	E		1					BEG01
1998 05 19.68		S	3.8	S	5.0	B		10		8	2.2	118	C0002
1998 05 19.69		S	4.2	AA	15.0	L	7	50					WIN02
1998 05 19.71		S	3.2	S	4.0	B		8			0.5		HOL03
1998 05 19.88		S	4.1	AA	5.0	B		7	10	6			SOU01
1998 05 19.90		B	3.8	A	5.0	B		7	4	7	1.2		AMO01
1998 05 20.25		S	4.7:	HV	25.6	L	5	42	1.8	6	0.15	140	BIV
1998 05 20.34		I	3.6	AA	0.0	E		1			1	135	SEA01
1998 05 20.35		B	3.5	AA	0.0	E		1					SEA
1998 05 20.35		B	4.3	AA	5.0	B		10	1	9	10	135	SEA01
1998 05 20.69		M	3.3	AA	5.0	B		10					BEG01
1998 05 20.71		S	4.2	AA	5.0	B		7			1.0	130	TUR
1998 05 20.71		S	4.6	S	12.5	R	6				0.5		HOL03
1998 05 20.73		S	5.2	S	12.7	L		45	2.5		0.33		SL002
1998 05 20.91		B	4.0	A	5.0	R	12	50	1.5	5	0.4		AMO01
1998 05 21.35		B	4.2	AA	5.0	B		10	1	9	7	125	SEA01
1998 05 21.35		I	3.8	AA	0.0	E		1			2	125	SEA01
1998 05 21.68		M	4.0	AA	0.0	E		1					BEG01

Comet C/1998 J1 (SOHO) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 21.69		M	4.2	AA	5.0	B		10					BEG01
1998 05 21.70		M	4.3	AA	6.0	R	13	40					BEG01
1998 05 21.71		S	4.6	AA	5.0	B		7			1.0	125	TUR
1998 05 21.72		S	4.5	S	12.5	R	6						HOL03
1998 05 22.24		S	5.5:	HV	25.6	L	5	42	2.5	5/			BIV
1998 05 22.33		I	4.2	AA	0.0	E		1					SEA01
1998 05 22.35		B	4.2	AA	5.0	B		10	1	9	6	130	SEA01
1998 05 22.36		S	4.0	AA	5.0	B		10					SEA
1998 05 22.37		I	4.5	Y	0.0	E		1		8/			MCN
1998 05 22.68		M	4.4	AA	0.0	E		1					BEG01
1998 05 22.69		M	4.8	AA	5.0	B		10					BEG01
1998 05 22.69		S	4.6	AA	3.5	B		7					PRI04
1998 05 22.70		M	4.9	AA	6.0	R	13	40					BEG01
1998 05 22.88		S	4.2	AA	8.0	B		11	5.0	6/			SOU01
1998 05 22.90		S	4.6	AA	5.0	B		20		7/			DES01
1998 05 22.91		B	4.7	A	5.0	R	12	50	1.0	4	0.25		AMO01
1998 05 23.33		I	3.9	AA	0.0	E		1					SEA01
1998 05 23.34		B	4.2	AA	5.0	B		10		8/	6.4	120	SEA01
1998 05 23.36		B	4.6	AA	10.0	B		25			5	130	SEA
1998 05 23.68		M	4.7	AA	0.0	E		1					BEG01
1998 05 23.68		S	4.5	S	11.2	L	8	50		7	0.5	120	C0002
1998 05 23.68		S	4.7	S	5.0	B		10		8			C0002
1998 05 23.69		M	4.7	AA	5.0	B		10					BEG01
1998 05 23.87		S	4.5	AA	8.0	B		11	5.0	7/			SOU01
1998 05 23.91		B	5.0	A	5.0	R	12	50	1.0	4	0.1		AMO01
1998 05 24.28		S	5.0	TT	4.5	R	6	13	5	6	1.0	131	JON
1998 05 24.33		B	4.2	AA	5.0	B		10	2	9			SEA01
1998 05 24.68		S	4.5	S	11.2	L	8	50	1.5	7	0.5	125	C0002
1998 05 24.70		M	4.6	AA	5.0	B		10					BEG01
1998 05 24.70		S	4.5	AA	5.0	B		7			1.3	135	TUR
1998 05 25.34		I	4.4	AA	0.0	E		1			1.5	90	SEA01
1998 05 25.35		B	4.6	AA	5.0	B		10	4	9	5.8	90	SEA01
1998 05 25.69		M	4.6	AA	5.0	B		10					BEG01
1998 05 25.69		S	4.6	S	5.0	B		10		7			C0002
1998 05 25.69		S	4.7	S	11.2	L	8	50		7			C0002
1998 05 25.70		M	4.9	AA	6.0	R	13	40					BEG01
1998 05 25.71		S	5.0:	YF	5.0	B		10					EVA01
1998 05 25.72		S	5.4	AA	5.0	B		7			1.0	140	TUR
1998 05 25.88		S	5.3	AA	8.0	B		11	3.0	7			SOU01
1998 05 26.34		I	4.8	AA	0.0	E		1					SEA01
1998 05 26.35		B	4.6	AA	5.0	B		10	3.5	8/	7.8	130	SEA01
1998 05 26.36		B	4.8	AA	10.0	B		25	3	6	&2	135	SEA
1998 05 26.37		I	5.1	Y	0.0	E		1		9			MCN
1998 05 26.69		M	4.9	AA	5.0	B		10					BEG01
1998 05 27.33		B	5.1	AA	10.0	B		25					SEA
1998 05 27.34		B	5.0	AA	5.0	B		10	3.0	8/	4.7	125	SEA01
1998 05 27.34		I	5.0	AA	0.0	E		1			1.0		SEA01
1998 05 27.68		S	4.6	S	5.0	B		10		7			C0002
1998 05 28.33		B	5.2	AA	10.0	B		25	4	6	&2.5	125	SEA
1998 05 28.35		B	5.5	AA	5.0	B		10	3	8	5.8	130	SEA01
1998 05 28.35		I	5.0	AA	0.0	E		1					SEA01
1998 05 28.71		M	5.3	AA	5.0	B		10					BEG01
1998 05 28.72		M	5.6	AA	6.0	R	13	40					BEG01
1998 05 29.29		S	5.4	TT	4.5	R	6	13	5	6			JON
1998 05 29.33		B	5.3	AA	10.0	B		25	4	5	1.3	135	SEA
1998 05 29.33		B	5.6	AA	5.0	B		10	2	8	0.75		SEA01
1998 05 29.34		I	5.0	AA	0.0	E		1					SEA
1998 05 29.70		M	5.3	AA	5.0	B		10					BEG01
1998 05 29.70		S	6.2	AA	5.0	B		7					TUR
1998 05 30.33		B	5.8	AA	5.0	B		10	3.5	8	0.5		SEA01
1998 05 30.70		M	5.3	AA	5.0	B		10					BEG01
1998 05 30.70		S	5.3	S	5.0	B		10		7			C0002
1998 05 30.71		M	5.4	AA	15.0	L	7	50					BEG01
1998 05 30.89		S	5.5	AA	8.0	B		11	5	7/			DES01
1998 05 30.91		B	4.5	AA	5.0	B		7		3			FRE01

Comet C/1998 J1 (SOHO) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 31.28		S	5.6	TT	4.5	R	6	13	6	7			JON
1998 05 31.68		M	4.8	AA	0.0	E		1					BEG01
1998 05 31.68		S	5.3	S	5.0	B		10		7			C0002
1998 05 31.69		S	5.4	S	11.2	L	8	50	2.4	6			C0002
1998 05 31.70		M	5.0	AA	5.0	B		10					BEG01
1998 05 31.89		S	5.6	AA	8.0	B		11	5	7/			DES01
1998 05 31.91		B	4.3	AA	5.0	B		7		3			FRE01
1998 06 01.29		S	4.2	TT	4.5	R	6	13	8				JON
1998 06 01.69		M	4.0	AA	0.0	E		1					BEG01
1998 06 01.69		S	3.7:	YF	5.0	B		10			0.5	110	EVA01
1998 06 01.70		M	4.0	AA	5.0	B		10					BEG01
1998 06 01.71		M	4.0	AA	6.0	R	13	40					BEG01
1998 06 01.88		S	4.3	SC	5.0	B		7	&10	5			VIT02
1998 06 01.90		B	3.5	A	5.0	R	12	50	3.5	4	0.3		AMO01
1998 06 01.91		B	3.8	AA	3.0	B		8	3	5			FRE01
1998 06 02.68		S	5.2	S	11.2	L	8	50		5	0.5	135	C0002
1998 06 02.69		M	4.7	AA	5.0	B		10					BEG01
1998 06 02.69		S	5.2	S	5.0	B		10		7			C0002
1998 06 02.70		M	5.1	AA	6.0	R	13	40					BEG01
1998 06 02.72		S	4.4	YF	5.0	B		10					EVA01
1998 06 02.88		S	4.9	SC	5.0	B		7	& 7	5			VIT02
1998 06 02.91		B	5.5	A	5.0	R	12	50	2.0	4			AMO01
1998 06 02.93		B	4.2	AA	5.0	B		7		4			FRE01
1998 06 03.29		S	5.4	TT	4.5	R	6	13	7				JON
1998 06 03.36		B	4.4	AA	5.0	B		10	4	8	3.5	140	SEA01
1998 06 03.68		S	5.4	S	5.0	B		10		7			C0002
1998 06 03.69		S	5.3	S	11.2	L	8	50	3.0	5			C0002
1998 06 03.75		S	4.8	YF	5.0	B		10					EVA01
1998 06 03.91		B	5.7	A	5.0	R	12	50	1.7	4			AMO01
1998 06 03.92		B	4.6	AA	3.0	B		8		5			FRE01
1998 06 04.29		S	5.5	TT	4.5	R	6	13	4	6			JON
1998 06 04.33		B	4.6	AA	5.0	B		10	6	8	0.8		SEA01
1998 06 04.34		B	5.5	AA	5.0	B		10		6			SEA
1998 06 04.89		S	4.7	AA	8.0	B		11	5.0	4			SOU01
1998 06 04.91		B	6.0	A	5.0	R	12	50	1.5	3			AMO01
1998 06 04.93		B	5.0	AA	3.0	B		8		7			FRE01
1998 06 05.27		S	5.6	HD	5.0	B		10		5			RAE
1998 06 05.29		S	5.6	TT	4.5	R	6	13	3	6			JON
1998 06 05.34		B	4.8	AA	8.0	B		15	3	8			SEA01
1998 06 05.69		S	5.6	S	5.0	B		10		6			C0002
1998 06 05.89		S	5.5	AA	8.0	B		11	& 6	4/			DES01
1998 06 05.91		B	6.0	A	5.0	R	12	50	1.0	3			AMO01
1998 06 05.93		B	5.3	AA	3.0	B		8		7			FRE01
1998 06 06.33		B	5.6	AA	10.0	B		25		5			SEA
1998 06 06.35		B	4.7	AA	8.0	B		15	5	8			SEA01
1998 06 06.68		S	5.9	S	5.0	B		10		6			C0002
1998 06 06.69		S	5.8	S	11.2	L	8	50	3.2	5			C0002
1998 06 06.89		S	5.8	SC	5.0	B		7	& 6	5			VIT02
1998 06 06.90		S	5.8	AA	8.0	B		11	1.0	4			SOU01
1998 06 07.33		B	4.8	AA	5.0	B		10	6	8			SEA01
1998 06 07.88		S	5.8	AA	8.0	B		11		4			DES01
1998 06 07.90		S	6.0	SC	5.0	B		12	& 6	5			VIT02
1998 06 07.90		S	6.2	AA	8.0	B		11	1.0	3			SOU01
1998 06 08.33		B	5.1	AA	5.0	B		10	4	8			SEA01
1998 06 08.69		S	6.0	S	5.0	B		10		3			C0002
1998 06 08.69		S	6.0	S	11.2	L	8	50		5			C0002
1998 06 08.89		S	6.2	AA	8.0	B		11					SOU01
1998 06 08.90		S	6.1	SC	5.0	B		12	& 5	4			VIT02
1998 06 09.33		B	5.3	AA	5.0	B		10	3	8			SEA01
1998 06 09.34		B	6.3	AA	10.0	B		25	3	5			SEA
1998 06 09.69		S	6.1	S	11.2	L	8	50		5			C0002
1998 06 09.89		S	6.4	AA	8.0	B		11					SOU01
1998 06 10.33		B	5.3	AA	5.0	B		10	3	8			SEA01
1998 06 10.70		S	6.0	S	11.2	L	8	50		5			C0002
1998 06 10.89		S	6.5	AA	8.0	B		11					SOU01

Comet C/1998 J1 (SOHO) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 06 11.29		S	6.7	S	5.0	B		10	2	4			RAE
1998 06 11.34		B	6.0	AA	5.0	B		10	3.5	8	1.1	145	SEA01
1998 06 11.68		S	6.3	S	11.2	L	8	50	3.2	5			C0002
1998 06 11.89		S	6.5	AA	8.0	B		11	5	4			SOU01
1998 06 12.32		B	5.8	AA	5.0	B		10	7	7	1.0	135	SEA01
1998 06 12.34		M	6.6	AA	10.0	B		25	7	5	0.3	150	SEA
1998 06 12.94		S	6.8	AA	8.0	B		11					SOU01
1998 06 13.33		M	6.5	AA	5.0	B		10	6	7/			SEA01
1998 06 13.68		S	6.5	S	11.2	L	8	50	3.0	5			C0002
1998 06 14.35		M	7.2	AA	5.0	B		10	7	7/			SEA01
1998 06 14.68		S	6.6	S	11.2	L	8	50	2.8	5			C0002
1998 06 14.89		S	6.7	SC	20.3	T	10	77	& 4	4			VIT02
1998 06 15.42		M	6.6	TI	5.0	B		7	4	4			MAT08
1998 06 15.70		S	6.8	S	11.2	L	8	50	3.0	5			C0002
1998 06 15.70		S	6.9	S	5.0	B		10		6			C0002
1998 06 16.87		S	6.9	AA	8.0	B		11	& 3	3/			DES01
1998 06 16.91		S	6.9	AA	8.0	B		11	5	3			SOU01
1998 06 17.38		M	7.7	AA	5.0	B		10	6	7/			SEA01
1998 06 17.47		M	6.8	TI	5.0	B		7	4	4			MAT08
1998 06 17.89		S	7.1	SC	20.3	T	10	77	& 4	4			VIT02
1998 06 17.92		S	7.1	AA	8.0	B		11					SOU01
1998 06 18.32		S	7.0	S	5.0	B		10	4	4			RAE
1998 06 19.31		S	7.1	S	5.0	B		10	4	4			RAE
1998 06 19.33		M	7.5	AA	5.0	B		10	5	7/			SEA01
1998 06 19.35		M	6.8	AA	10.0	B		25					SEA
1998 06 19.92		S	7.2	AA	8.0	B		11					SOU01
1998 06 20.28		S	7.3	S	5.0	B		10	5	3			RAE
1998 06 20.86		S	7.2	TT	8.0	B		11	3	3			DES01
1998 06 21.87		S	7.3	TT	8.0	B		11	4	3			DES01
1998 06 22.36		S	7.8	AA	8.0	B		15	3.5	6			SEA01
1998 06 22.43		M	7.5	TI	20	L	7	45	4	4			MAT08
1998 06 22.89		S	7.4	SC	20.3	T	10	77	& 4	4			VIT02
1998 06 23.31		S	7.5	S	5.0	B		10	4	3			RAE
1998 06 23.35		M	7.8	AA	8.0	B		15	4.5	7			SEA01
1998 06 23.91		S	7.5	SC	20.3	T	10	77	& 3	4			VIT02
1998 06 23.91		S	7.6	AA	8.0	B		11	3	4			SOU01
1998 06 24.33		M	7.0	AA	8.0	B		15	3	3			SEA01
1998 06 25.34		M	6.8	AA	5.0	B		10	6.5	6			SEA01
1998 06 26.33		M	6.9	AA	5.0	B		10	5	4			SEA01
1998 06 26.92		S	7.8	AA	8.0	B		11	3	4			SOU01
1998 06 26.92		S	7.8	SC	20.3	T	10	77	& 3	3			VIT02
1998 06 27.28		S	7.2	S	5.0	B		10	4	5			RAE
1998 06 27.32		S	7.2	AA	8.0	B		15	3.5	2			SEA01
1998 06 28.28		S	7.6	S	5.0	B		10	3	4			RAE
1998 07 03.30		S	8.0	S	5.0	B		10	3	3			RAE
1998 07 22.39		S	9.3	AA	8.0	B		15					SEA
1998 07 23.42		S	9.4	AA	8.0	B		15					SEA

Comet C/1998 K1 (Mueller)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 19.53		C	16.0:	GA	60.0	Y	6	a240	0.55				NAK01
1998 05 21.57		C	16.1	GA	60.0	Y	6	a240	0.65				NAK01
1998 05 25.15		J	15.1	SC	25.4	T	5	a 60	0.43	s3	?		ROQ
1998 05 26.89		S	14.4	HS	35	L	5	237	0.6	3			HOR02
1998 05 27.52		C	16.2	GA	60.0	Y	6	a240	0.55				NAK01
1998 06 15.16		J	15.8	SC	25.4	T	5	a 60	0.63	s1/			ROQ
1998 06 17.49		C	16.1	GA	60.0	Y	6	a240	0.5				NAK01

Comet C/1998 K2 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 26.46		B	12.7	HS	25.6	L	5	84	0.7	6			BIV
1998 05 27.64	a	C	12.7	GA	60.0	Y	6	a120	1.4		> 4.8m	338	NAK01
1998 05 30.45		B	12.6	HS	25.6	L	5	84	1.0	6			BIV

Comet C/1998 K2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 31.47		B	12.5	HS	25.6	L	5	84	1.0	6			BIV
1998 05 31.67	a	C	12.3:	GA	60.0	Y	6	a120	1.6		> 4.9m	340	NAK01
1998 06 01.48		S	12.6	HS	25.6	L	5	84	1.0	6			BIV
1998 06 02.64		S	12.6	HS	20	L	7	158	1.5	4			MAT08
1998 06 04.56		S	12.6	HS	25.6	L	5	84	0.8	6			BIV
1998 06 14.34		B	12.7	HS	25.6	L	5	84	1.0	6			BIV
1998 06 15.44		S	12.7	HS	20	L	7	158	1.5	3			MAT08
1998 06 16.55	x	C	12.4	HV	60.0	Y	6	a120	1.4		> 5.5m	3	NAK01
1998 06 17.39		B	12.5	HS	25.6	L	5	84	1.0	6			BIV
1998 06 17.54		S	12.7	HS	20	L	7	158	1.5	3			MAT08
1998 06 17.62	x	C	12.4	HV	60.0	Y	6	a120	1.3		> 4.7m	7	NAK01
1998 06 19.30		S	12.4	HS	25.6	L	5	84	1.0	5			BIV
1998 06 20.35		S	12.2	HS	25.6	L	5	84	1.0	4			BIV
1998 06 21.43		S	12.1	HS	25.6	L	5	84	1.0	3			BIV
1998 06 22.45		S	12.8	HS	20	L	7	158	1	3			MAT08
1998 06 25.33		S	12.3	HS	25.6	L	5	84	0.9	4			BIV
1998 06 27.44		S	12.3	HS	25.6	L	5	84	1.0	3			BIV
1998 06 28.38		S	12.6	HS	25.6	L	5	84	0.9	4			BIV
1998 07 01.54		S	12.1	GA	25.4	L	4	114					SEA
1998 07 12.30		S	12.5	HS	25.6	L	5	169	0.7	3			BIV
1998 07 21.54		S	12.9	GA	25.4	L	4	71					SEA
1998 07 25.29		S	12.7	HS	25.6	L	5	169	0.6	2			BIV
1998 07 26.28		S	13.0	HS	25.6	L	5	169	0.7	2			BIV
1998 07 28.98		V	13.0	HV	91	L	14	a600	0.83		1.7m	88	COZ

Comet C/1998 K3 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 26.90	!	V	17.4	YF	36.0	T	7	a300	+ 0.5	5			MIK
1998 05 27.62		C	17.9	GA	60.0	Y	6	a240	0.3		0.5m	121	NAK01
1998 05 31.68		C	17.9:	GA	60.0	Y	6	a240	0.3		0.7m	113	NAK01
1998 06 02.16		C	18.3	FA	91.4	L	5		0.15		28.8s	117	SCO01
1998 06 02.16		c	20.4	FA	91.4	L	5						SCO01
1998 06 16.53		C	18.1	GA	60.0	Y	6	a240	0.3		0.5m	108	NAK01

Comet C/1998 K5 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 31.72		C	15.3:	GA	60.0	Y	6	a120		9			NAK01
1998 06 01.00		S	14.9	HS	35	L	5	259	0.2	6			HOR02
1998 06 03.74		C	15.1:	GA	60.0	Y	6	a120		9	0.3m	240	NAK01
1998 06 17.68		C	13.0	GA	60.0	Y	6	a 60	0.4	8/	0.8m	234	NAK01
1998 06 17.96		S	13.0	AC	25.0	L	6	121	0.3	7			RES
1998 06 19.41		B	12.8	HS	25.6	L	5	169	0.1	8/			BIV
1998 06 19.98		S	12.9	VB	30	R	20	170	0.1	8			SHA02
1998 06 20.44		B	12.7	HS	25.6	L	5	169	0.1	8/			BIV
1998 06 20.62		I	12.5	HS	31.7	L	6	152		9			MIY01
1998 06 20.63		I	12.4	HS	31.7	L	6	152		9			YOS04
1998 06 20.91		B	12.4	HS	35	L	5	237	0.1	8/			HOR02
1998 06 20.98		S	12.9	VB	30	R	20	170	& 0.1	9			SHA02
1998 06 21.47		B	12.6	HS	25.6	L	5	169	0.05	9			BIV
1998 06 21.49		B	12.8	HS	25.6	L	5	169	0.05	9			BIV
1998 06 21.89		B	12.1	HS	35	L	5	207	0.1	8/			HOR02
1998 06 21.94		I	12.8	AC	25.4	L	5	104	< 0.1	9			MEY
1998 06 21.97		S	12.8	AC	25.0	L	6	121	0.3	6/			RES
1998 06 22.97		I	12.8:	AC	25.4	J	6	150		9			BOU
1998 06 24.95		S	12.7	AC	25.0	L	6	121	0.1	8			RES
1998 06 25.46		B	12.7	HS	25.6	L	5	169	0.05	9			BIV
1998 06 25.49		B	12.9	HS	25.6	L	5	169	0.05	9			BIV
1998 06 25.89		B	12.7	HS	35	L	5	92	0.15	8			HOR02
1998 06 25.96		S	13.1	VB	30	R	20	170	0.1	8			SHA02
1998 06 25.97		S	12.9	HS	44.5	L	4	230	< 0.1	9			SAR02
1998 06 25.99		I	12.5	GA	25.4	J	6	100		8/			BOU
1998 06 27.58		B	12.7	HS	25.6	L	5	169	0.05	9			BIV
1998 06 27.59		B	12.6	HS	25.6	L	5	507	0.08	8/	0.3m	260	BIV

Comet C/1998 K5 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 06 28.01		S	14.4:	NP	32	L	5	125	0.5	1			MAR02
1998 06 28.52		B	12.6	HS	25.6	L	5	169	0.05	9	0.2m	250	BIV
1998 06 28.91		B	12.1	HS	35	L	5	92	0.2	8			HOR02
1998 06 28.96		S	12.9	VB	30	R	20	170	& 0.1	9			SHA02
1998 06 29.74		I	12.0	HS	40.0	L	6	133		8/			NAG08
1998 06 29.88		B	12.2	HS	35	L	5	92	0.2	8			HOR02
1998 07 02.89		B	12.1	HS	35	L	5	207	0.2	8			HOR02
1998 07 03.57		B	12.4	HS	25.6	L	5	169	0.05	9			BIV
1998 07 03.74		C	12.4	GA	60.0	Y	6	a 60	0.45	8	1.5m	271	NAK01
1998 07 03.89		B	12.5	HS	35	L	5	207	0.15	8/			HOR02
1998 07 16.99		I	12.6	GA	25.4	J	6	115		9			BOU
1998 07 17.98		I	12.7	GA	25.4	J	6	72		9			BOU
1998 07 19.00		I	12.6	GA	25.4	J	6	88		9			BOU
1998 07 19.93		B	11.7	TI	35	L	5	207	0.3	8			HOR02
1998 07 20.95		B	12.1	TI	35	L	5	207	0.3	7/			HOR02
1998 07 21.05		I	12.2	HS	20	L	4	57	0.2				KYS
1998 07 21.96		B	12.2	TI	35	L	5	92	0.3	8			HOR02
1998 07 22.00		B	12.6	GA	25.4	J	6	88		9			BOU
1998 07 23.01		B	12.5	HS	40.0	L	5	200	0.4	8/			BOU
1998 07 24.04	!	V	12.5	YF	36.0	T	7	a120	+ 0.6	8	& 2 m	275	MIK
1998 07 24.97		B	12.4	TI	35	L	5	92	0.2	8			HOR02
1998 07 25.00		B	12.6	AC	25.4	J	6	88		8/			BOU
1998 07 25.54		B	12.8	HS	25.6	L	5	169	0.1	9	0.3m	275	BIV
1998 07 25.99	a	I	12.9	GA	25.4	J	6	100		9			BOU
1998 07 26.02		S	12.4	AC	25.0	L	6	61	< 0.1	8/			RES
1998 07 26.52		B	12.7	HS	25.6	L	5	169	0.08	9	0.3m	270	BIV
1998 07 27.03		S	12.6	AC	25.0	L	6	121	< 0.1	8/			RES
1998 07 27.59		B	12.6	HS	25.6	L	5	169	0.1	8/	0.3m	270	BIV
1998 07 29.02		S	12.9	AC	25.0	L	6	121	< 0.1	8/			RES

Comet C/1998 M1 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 06 17.58	a	C	14.9	GA	60.0	Y	6	a120	0.75			150	NAK01

Comet C/1998 M2 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 06 21.01		S	13.8	HS	35	L	5	207	0.4	2			HOR02
1998 06 21.91		S	14.0	HS	35	L	5	207	0.4	2			HOR02
1998 06 21.91	!	V	14.4	YF	36.0	T	7	a120	+ 0.6	8			MIK
1998 06 21.96		S	13.6:	AC	25.0	L	6	121	0.2	2			RES
1998 06 25.93		S	14.3	HS	35	L	5	207	0.6	2/			HOR02
1998 06 28.94		S	14.6	HS	35	L	5	207	0.5	2/			HOR02
1998 07 02.62		C	14.0	GA	60.0	Y	6	a120	0.95		1.7m	201	NAK01
1998 07 03.64		C	13.9	GA	60.0	Y	6	a120	1.0		1.5m	203	NAK01
1998 07 19.90		S	13.9	HS	44.0	L	5	156	0.3	4			HAS02
1998 07 19.90		S	14.0	HS	35	L	5	207	0.7	2			HOR02
1998 07 20.91		S	14.1	HS	35	L	5	207	0.7	2			HOR02
1998 07 21.91		S	14.0	HS	35	L	5	207	1.0	2			HOR02
1998 07 22.95		S	13.8	HS	40.0	L	5	133	0.8	2/			BOU
1998 07 23.60		C	14.3:	GA	60.0	Y	6	a120	1.0		1.2m	188	NAK01
1998 07 24.89		S	14.0	HS	35	L	5	207	1.0	2			HOR02
1998 07 29.88	!	V	15.0	YF	36.0	T	7	a120	+ 0.6	6			MIK

Comet C/1998 M3 (Larsen)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 02.57		C	17.6	GA	60.0	Y	6	a240	0.3				NAK01
1998 07 23.57		C	17.8:	GA	60.0	Y	6	a240	0.35				NAK01

Comet C/1998 M4 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 06 28.97		O	[14.5	HS	35	L	5	207	! 0.4				HOR02

Comet C/1998 M4 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 02.69		C	15.0	GA	60.0	Y	6	a120	0.75				NAK01
1998 07 03.69		C	15.2	GA	60.0	Y	6	a120	0.6				NAK01

Comet C/1998 M5 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 01.96		S	12.5	AC	25.0	L	6	121	0.4	3			RES
1998 07 02.75		C	13.6	GA	60.0	Y	6	a120	1.2		1.5m	210	NAK01
1998 07 02.91		S	12.8	HS	35	L	5	207	1.1	2			HOR02
1998 07 02.96		S	12.6	AC	25.0	L	6	121	0.4	2			RES
1998 07 03.53		B	13.0	HS	25.6	L	5	84	0.8	6			BIV
1998 07 06.71		C	13.6	GA	60.0	Y	6	a120	1.0		1.2m	208	NAK01
1998 07 13.05		C	13.5	HS	20.3	T	10	a300	& 0.7	D3/	& 1 m	215	JAM01
1998 07 18.99		S	12.5	AC	25.4	J	6	100	1.0	2/			BOU
1998 07 19.89		M	11.8	HS	35	L	5	92	2.1	3			HOR02
1998 07 19.96		S	12.3	HS	44.0	L	5	156	0.3	4			HAS02
1998 07 20.89		M	11.6	TI	35	L	5	92	1.9	2/			HOR02
1998 07 21.93		M	11.6	TI	35	L	5	92	1.9	3/			HOR02
1998 07 21.99		S	12.3	GA	25.4	J	6	88	1.0	3			BOU
1998 07 22.99		M	12.2	HS	40.0	L	5	77	0.7	5			BOU
1998 07 24.00	!	V	13.2	YF	36.0	T	7	a120	+ 1.0	7	& 3 m	190	MIK
1998 07 24.88		M	11.5	TT	35	L	5	92	2.2	3			HOR02
1998 07 24.99		S	12.2	GA	25.4	J	6	88	1.1	5			BOU
1998 07 25.48		S	12.2	HS	25.6	L	5	84	1.0	6			BIV
1998 07 25.90		S	11.5	AC	25.0	L	6	61	1.2	2/			RES
1998 07 25.97		S	12.2	GA	25.4	J	6	88	0.9	5			BOU
1998 07 26.39		S	12.0	HS	25.6	L	5	42	1.0	5			BIV
1998 07 26.90		S	11.7	AC	25.0	L	6	61	1.3	2			RES
1998 07 26.95	!	V	13.3	YF	36.0	T	7	a120	+ 1.0	7	& 3 m	195	MIK
1998 07 26.97	s	S	11.5	SE	25	L	4	64	0.9	3			SHU
1998 07 27.53		S	12.1	HS	25.6	L	5	84	0.8	4			BIV
1998 07 28.94		S	11.5	AC	25.0	L	6	61	1.2	3			RES
1998 07 30.97		S	11.4	AC	25.0	L	6	61	1.2	3/			RES

Comet C/1998 M6 (Montani)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 03.73	a	C	18.6	GA	60.0	Y	6	a240	0.25				NAK01
1998 07 06.73	a	C	18.5	GA	60.0	Y	6	a240	0.25				NAK01
1998 07 23.70		C	18.8:	GA	60.0	Y	6	a240	0.2				NAK01

Comet 4P/Faye

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 24.40		C	20.5	FA	91.4	L	5			9	9 s	249	SC001
1998 05 28.41		c	21.4	FA	91.4	L	5						SC001
1998 05 28.43		C	20.1	FA	91.4	L	5				6.6s	256	SC001
1998 05 30.44		R	19.1	AO	360	C	8	a900			14 s	250	VEI

Comet 9P/Tempel 1

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1983 09 26.53		S	12.6	AC	41	L	4	86	1.5	0			CLA

Comet 19P/Borrelly

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 11 08.01		E	9.2	AA	13.3	R	5	31	6	2/	0.02	290	SC004
1994 11 09.03		E	9.3	AA	13.3	R	5	31	2.1	3			SC004
1994 12 05.00		E	8.7	AA	13.3	R	5	31	2.7	5			SC004

Comet 21P/Giacobini-Zinner

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 03.78		C	19.3	GA	60.0	Y	6	a240	0.25				NAK01

Comet 21P/Giacobini-Zinner [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 16.02			C 17.0	HS	60	P	6	a 90	& 0.1	d4	>10 s	230	PRA02
1998 05 21.73			C 16.7	GA	60.0	Y	6	a240	0.45		0.7m	238	NAK01
1998 05 23.00			S[14.0	HS	44.5	L	4	230	! 1				SAR02
1998 05 23.96			S 15.0:	HS	44.5	L	4	230	0.6	3			SAR02
1998 05 31.73			C 16.5:	GA	60.0	Y	6	a240	0.5			230	NAK01
1998 06 16.62			C 15.3	HV	60.0	Y	6	a120	0.65				NAK01
1998 06 25.99			S 14.3	HS	44.5	L	4	230	0.8	3/			SAR02
1998 06 28.95			S 14.1	HS	35	L	5	207	0.9	1/			HOR02
1998 06 29.97			S 14.2	HS	35	L	5	207	0.9	2			HOR02
1998 07 02.56			C 15.0	GA	60.0	Y	6	a120	0.65			155	NAK01
1998 07 19.90			S 14.3	HS	44.0	L	5	156	0.4	4			HAS02
1998 07 19.94			S 14.0	HS	35	L	5	207	0.9	1/			HOR02
1998 07 20.93			S 13.9	HS	35	L	5	207	1.0	2			HOR02
1998 07 21.90			S 14.0	HS	35	L	5	207	1.1	2			HOR02
1998 07 22.96			S 13.8	HS	40.0	L	5	133	1.2	1/			BOU
1998 07 23.59			C 14.4:	GA	60.0	Y	6	a120	1.05		1.3m	139	NAK01
1998 07 23.97	!	V	14.6	YF	36.0	T	7	a180	+ 0.8	7			MIK
1998 07 24.92			S 13.9	HS	35	L	5	207	1.2	2			HOR02
1998 07 25.43			S 14.0	HS	25.6	L	5	169	0.5	5			BIV
1998 07 25.89			S 13.6	AC	25.0	L	6	121	0.7	3/			RES
1998 07 25.95			S 13.6	GA	25.4	J	6	115	1.0	2			BOU
1998 07 26.32			S 14.0	HS	25.6	L	5	169	0.5	6			BIV
1998 07 26.89			S 13.6	AC	25.0	L	6	121	0.7	3/			RES
1998 07 28.95			S 13.3	AC	25.0	L	6	121	0.7	3			RES
1998 07 30.97			S 13.2	AC	25.0	L	6	121	0.9	2/			RES

Comet 29P/Schwassmann-Wachmann 1

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1982 06 21.58			[12.0	A	15.2	L	5	72					PEA
1982 06 26.55			[11.8	A	15.2	L	5	72					PEA
1982 12 14.80			[12.0	A	15.2	L	5	72					PEA
1982 12 15.79			[12.0	A	15.2	L	5	72					PEA
1982 12 19.78			[12.0	A	15.2	L	5	72					PEA
1982 12 21.79			[12.0	A	15.2	L	5	72					PEA
1983 01 09.80			[12.0	A	15.2	L	5	72					PEA
1983 01 12.79			[12.2	A	15.2	L	5	72					PEA
1983 04 11.75			[12.0	A	15.2	L	5	72					PEA
1983 04 12.72			[12.0	A	15.2	L	5	72					PEA
1983 04 13.74			[12.0	A	15.2	L	5	72					PEA
1983 04 14.72			[12.0	A	15.2	L	5	72					PEA
1983 04 15.73			[12.2	A	15.2	L	5	72					PEA
1983 04 16.74			[12.2	A	15.2	L	5	72					PEA
1983 04 17.72			[12.2	A	15.2	L	5	72					PEA
1983 05 04.77			[12.8	VN	20	L	5	142					PEA
1983 05 06.77			S 12.1	VN	20	L	5	95	1.4	1			PEA
1983 05 07.84			S 12.0	VN	20	L	5	50	2	0/			PEA
1983 05 09.81			S 11.9	VN	20	L	5	50	2.2	1			PEA
1984 01 11.82			[12.0	A	15.2	L	5	72					PEA
1984 01 13.82			[12.0	A	15.2	L	5	72					PEA
1984 06 25.50			[12.0	A	15.2	L	5	72					PEA
1984 06 26.50			[12.2	A	15.2	L	5	72					PEA
1984 06 27.51			[12.2	A	15.2	L	5	72					PEA
1984 06 28.50			[12.2	A	15.2	L	5	72					PEA
1984 06 29.52			[12.2	A	15.2	L	5	72					PEA
1984 07 22.50			[12.0	A	15.2	L	5	72					PEA
1984 07 23.51			[12.0	A	15.2	L	5	72					PEA
1984 07 27.50			[12.0	A	15.2	L	5	72					PEA
1998 01 24.17			C 13.2	A0	60	P	6	a 90	& 3	D8/			PRA02
1998 02 04.15			C 13.0	A0	60	P	6	a120	> 1	D6			PRA02
1998 02 06.14			C 13.5	A0	60	P	6	a 60	& 1.3	d5			PRA02
1998 02 07.16			C 13.0	A0	60	P	6	a120	< 1.3	d4			PRA02
1998 02 18.09			C 14.0	A0	60	P	6	a120	< 2	d3/			PRA02
1998 02 21.09			C 13.8	A0	60	P	6	a120	< 2.5	d7			PRA02
1998 02 23.11			C 14.1	A0	60	P	6	a120	& 3	d8			PRA02

Comet 29P/Schwassmann-Wachmann 1 [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 03 21.04		C	13.1	AO	60	P	6	a120	& 1	D5			PRA02
1998 03 22.39		B	12.9	HS	43	L	5	216	1.1	5			BIV
1998 03 23.05		S	12.4	HS	35	L	5	158	1.1	1/			HOR02
1998 03 26.29		C	12.5	MT	45	C	8		2	d2/			JOH04
1998 03 30.64		C	12.8:	GA	60.0	Y	6	a120	2.1	s3			NAK01
1998 03 30.64		c	16.4:	GA	60.0	Y	6	a120					NAK01
1998 04 02.71	a	C	12.6	GA	60.0	Y	6	a120	2.7	s3			NAK01
1998 04 02.71	a	c	16.5	GA	60.0	Y	6	a120					NAK01
1998 04 19.33		C	13.5	MT	45	C	8		1	d1/			JOH04
1998 04 19.64		C	12.3	GA	60.0	Y	6	a120	2.8	s2/			NAK01
1998 04 19.64		c	16.3	GA	60.0	Y	6	a120					NAK01
1998 04 22.54		S[	12.5	HS	20	L	7	158					MAT08
1998 04 22.88		I[	12.5	HS	8	R	11	67					OKS
1998 04 25.93		I[	14.1:	HS	30	R	18	170					SHA02
1998 04 25.93		S[	13.5:	HS	30	R	18	170					SHA02
1998 04 26.04		S[	13 :	HS	38.5	L	5	116	! 1				SAR02
1998 04 26.35		S	13.3	HS	25.6	L	5	84	1.5	1			BIV
1998 04 28.62	a	C	13.0:	GA	60.0	Y	6	a120	2.1	s1/			NAK01
1998 04 28.62	a	c	16.6:	GA	60.0	Y	6	a120					NAK01
1998 04 28.93		S[	13.2	HS	30	R	18	170					SHA02
1998 05 15.87		C	16.2	HS	60	P	6	a120	> 1	d7			PRA02
1998 05 15.88		S[	14.0	HS	44.0	L	5	156					HAS02
1998 05 15.90		O[	12.6	HS	35	L	5	207	! 1				HOR02
1998 05 15.97		I[	14.0	HS	30	R	18	170					SHA02
1998 05 16.92		S	13.0:	HS	30	R	18	170	0.5	3			SHA02
1998 05 19.57	a	C	13.9:	GA	60.0	Y	6	a120	2.0	s0			NAK01
1998 05 19.57	a	c	17.1:	GA	60.0	Y	6	a120					NAK01
1998 05 21.58		C	14.0	GA	60.0	Y	6	a120	1.8	s0			NAK01
1998 05 21.58		c	17.2	GA	60.0	Y	6	a120					NAK01
1998 05 22.93		S[	13.0	HS	44.5	L	4	230	! 1				SAR02
1998 05 23.89		S	13.8	HS	44.5	L	4	116	1.6	1/			SAR02
1998 05 26.58	a	C	14.5	GA	60.0	Y	6	a120	1.6	s0			NAK01
1998 05 26.58	a	c	17.2	GA	60.0	Y	6	a120					NAK01
1998 05 29.95		S	12.7:	HS	30	R	18	170	0.4	3			SHA02
1998 06 17.51	a	C	14.8	GA	60.0	Y	6	a120	+ 0.25	8/			NAK01
1998 06 17.56		S[	13.0	HS	20	L	7	158					MAT08
1998 07 22.99		V	15.5	HV	91	L	14	a300	0.18			110	COZ

Comet 43P/Wolf-Harrington

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 10 10.37		S	13.5	AC	44.5	L	4	167	0.8	3			MOR03
1997 10 12.08		S	12.2:	AC	25.0	L	6	61	1.0	4			RES
1997 10 30.42		S	13.0	AC	44.5	L	4	167	1.0	1			MOR03
1997 11 10.37		S	13.6	AC	44.5	L	4	167	0.6	3			MOR03
1997 12 02.45		S	13.2	AC	44.5	L	4	167	0.8	4			MOR03
1997 12 03.43		S	13.0	AC	44.5	L	4	167	0.7	2			MOR03
1998 01 06.17		S	13.3:	VB	20	T	10	135	0.6	3			SHA02
1998 01 26.04		C	13.3	AO	60	P	6	a 60	< 1	D6	& 2.3m	316	PRA02
1998 02 17.97		C	13.4	AO	60	P	6	a 60	> 1	d6	& 2.5m	324	PRA02
1998 02 21.65	a	C	13.3	GA	60.0	Y	6	a120	1.6			335	NAK01
1998 03 22.88		C	14.7	AO	60	P	6	a 90	& 1	d6/			PRA02
1998 03 25.22		C	13.9	MT	45	C	8		1	d1/			JOH04
1998 04 19.15		J	14.0	SC	25.4	T	5	a 60	0.69	s3/			ROQ
1998 04 19.52		C	14.7	GA	60.0	Y	6	a120	1.2				NAK01
1998 05 02.14		J	14.3	SC	25.4	T	5	a 60	0.03	s3			ROQ
1998 05 22.48	a	C	14.9:	GA	60.0	Y	6	a240	1.3				NAK01
1998 05 26.16		C	17.2	FA	91.4	L	5		0.35		23.4s	120	SCO01
1998 05 26.16		c	21.3	FA	91.4	L	5						SCO01

Comet 45P/Honda-Mrkos-Pajdušáková

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1995 12 25.73		S	6.9	SC	10.8	L	4	27	8	6	0.15	280	GET
1995 12 28.73		S	6.1	SC	10.8	L	4	27	4.0	6			GET

Comet 45P/Honda-Mrkos-Pajdušáková [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1995 12 29.73		N	7.9	CM	10.8	L	4	27	3.5	6	0.07	292	GET
1996 02 18.09		S	8.8	NP	8.0	B	5	20	16	1			MIL02

Comet 46P/Wirtanen

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 02 27.77		S	10.2	AC	25.0	L	6	50	3	1			RES
1997 03 03.76		S	9.6	AC	25.0	L	6	50	2	3/			RES
1997 03 04.77		S	9.6	AC	25.0	L	6	50	2	2			RES
1997 03 05.78		S	9.5	AC	25.0	L	6	50	2	3			RES
1997 03 10.07		S	9.8	HS	33.3	L	4	58	1.9	3			KR002
1997 03 11.07		S	10.0	HS	33.3	L	4	58	2.1	2			KR002

Comet 52P/Harrington-Abell

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 22.01		S	10.9	TT	35	L	5	92	2.8	2			HOR02
1998 07 22.03		C	12.3	HS	57	L	5		0.33		1.5m	260	TIC
1998 07 22.03		c	14.2	HS	57	L	5						TIC
1998 07 22.04	x	S	11.8	TJ	25.4	J	6	100	1.2	4			BOU
1998 07 22.07	!	V	12.9	YF	36.0	T	7	a120	+ 1.0	7	& 2 m	258	MIK
1998 07 24.07	!	V	12.6	YF	36.0	T	7	a180	+ 1.3	6	& 4 m	260	MIK
1998 07 25.02	x	S	11.4	TT	25.4	J	6	100	1.2	3			BOU
1998 07 25.57		S	12.5	HS	25.6	L	5	169	1.2	5	0.02	250	BIV
1998 07 26.02		S	11.2	AC	25.0	L	6	61	1	2/			RES
1998 07 26.55		S	11.8	HS	25.6	L	5	84	2.0	2	0.03	240	BIV
1998 07 27.02		S	11.6	AC	25.0	L	6	61	1.5	2			RES
1998 07 27.55		S	12.0	HS	25.6	L	5	84	1.5	2	0.02	230	BIV
1998 07 29.03		S	11.9	AC	25.0	L	6	121	1.5	2			RES

Comet 55P/Tempel-Tuttle

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 01.15		S	11.0:	AA	11	L	7	32	& 4	2/			SAD
1998 01 01.16		S	10.5:	AA	11	L	7	54	& 5	3			SAD
1998 01 01.35		S	11.0	TI	41.0	L	5	70	3.2	1			BOR
1998 01 02.05		S	11.0:	AA	11	L	7	32	& 4	3			SAD
1998 01 04.05		S	11.3	VB	30	R	18	100	2.5	1			SHA02
1998 01 05.20		S	10.2	VB	20	T	10	75	3.0	1			SHA02
1998 01 06.19		S	10.2	VB	20	T	10	75	2.5	2			SHA02
1998 01 06.23		S	9.4	VB	10	B		14	6.3	2			SHA02
1998 01 07.20		S	9.3	VB	10	B		14	9.4	2			SHA02
1998 01 07.21		S	9.0	VB	5.0	B		10	9	2			SHA02
1998 01 10.43		S	9.0	TI	8.0	B		20	8.4	2			BOR
1998 01 13.70	x	B	9.7	TI	35	M	10	90	8	s3			PLE01
1998 01 13.75		S[	8.5	S	8.0	B		10					SHA02
1998 01 13.82		S[	9.5	AC	20	R	14	70					SHA02
1998 01 14.73		B	9.4	S	10.0	B		25	12	s3/			PLE01
1998 01 14.75		S	8.6	AA	8.0	B		20	9	1			SHA02
1998 01 14.81		S	10.5:	HS	20	R	14	40	3.2	2			SHA02
1998 01 15.71		B	9.1	S	10.0	B		25	14	s3/			PLE01
1998 01 15.73		S	9.3:	S	8	R	7	35	5	3			KWI
1998 01 15.75		S	9.0	NP	5.0	B		10	12	1			SHA02
1998 01 16.69		S	8.9:	S	6.0	B		20	& 6	0/			KON07
1998 01 16.72		S	9.2:	S	8	R	7	35	5	3			KWI
1998 01 16.78		S	8.9	NP	5.0	B		10	18	1			SHA02
1998 01 16.81		S	8.9	NP	33	L	5	45	6.1	2			SHA02
1998 01 16.87		S	11.7	HS	22	L	7	107	2	2			TAY
1998 01 16.89		S	8.8	NP	8.0	B		10	12	1			SHA02
1998 01 17.69		B	8.9	S	6.6	B		20	12	3/			PLE01
1998 01 18.07	x	S	9.2	TJ	10.0	B		25	16	s2/			DRA02
1998 01 18.71		S	8.0	S	6.0	B		20	& 9	2			KON07
1998 01 18.72		B	9.1	S	6.0	B		20	19	d2			TRY
1998 01 18.72		S	8.9	S	8	R	7	35	8	3			KWI
1998 01 18.74		B	9.2	S	25	L	6	100	4	1			SWI

Comet 55P/Tempel-Tuttle [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 18.74	x	S	7.2:	TJ	6.0	B		20	17	s2			DRA02
1998 01 18.76		B	8.5	S	10.0	B		25	16	s4			PLE01
1998 01 18.76		S	8.6	S	11	L	7	32	13.5	4/			SAD
1998 01 18.76	!	B	9.5:	S	6.8	R	12	40	& 7	d2			CHR
1998 01 18.77		S	9.2	S	6.0	B		20	&12	3/			SAD
1998 01 18.78		S	7.9	S	6.0	B		20	&10	2			KON07
1998 01 18.83		E	8.6	AA	13.3	R	5	22	9	2/			SC004
1998 01 19.78		S	8.0	VB	5.0	B		10	14	2			SHA02
1998 01 19.80		S	9.5:	S	11	L	7	32	& 6	2			SAD
1998 01 19.85		S	8.0	VB	8.0	B		10	10	2			SHA02
1998 01 19.92		B	9.0	S	6.0	B		20	15	d2			TRY
1998 01 20.98		S	8.0	VB	5.0	B		10	14	2			SHA02
1998 01 20.98		S	8.2	VB	8.0	B		10	12	2			SHA02
1998 01 21.05		S	7.4	TI	5.0	B		10	14	1			BOR
1998 01 21.86		S	9.2	S	25	L	5	66	5	1			KWI
1998 01 22.76		S	8.8	TT	33	L	5	45	4.6	2			SHA02
1998 01 22.79		B	7.7	AA	11.0	L	7	32	11	2			BAL02
1998 01 22.79		E	9.3	AA	13.3	R	5	22	5.4	2			SC004
1998 01 22.80		O	8.9	S	11	L	7	26	4	s3			BUR04
1998 01 22.88		E	9.2	AA	13.3	R	5	22	4.9	2			SC004
1998 01 22.88		O	9.0	S	11	L	7	45	4	2/			BUR04
1998 01 22.88		S	9.0	S	11	L	7	32	& 7.5	d1			CHO01
1998 01 22.98		B	7.6	AC	10.0	B	4	20	12	1			NOW
1998 01 23.72		B	8.1	S	5.0	B		10	&15	4/			PLE01
1998 01 23.72	!	B	9.3:	S	6.8	R	12	40	& 7	d3			CHR
1998 01 23.74		S	8.2	S	8	R	7	35	8	3			KWI
1998 01 23.75		B	9.3:	S	6.0	B		20	12	d3			TRY
1998 01 23.76		E	9.5	AA	13.3	R	5	22	4.8	1/			SC004
1998 01 23.80		S	9.1	S	10.0	B		25	6	s2			DRA02
1998 01 23.81		S	9.1	S	25	L	5	66	4	1			KWI
1998 01 23.83		B	9.4:	S	25	L	6	100	4	d1			SWI
1998 01 23.87		B	7.8	AA	11.0	L	7	32	12	2			BAL02
1998 01 23.87		O	9.1	S	11	L	7	26	3	2			BUR04
1998 01 23.89		S	9.5	S	11	L	7	32	& 7.5	d1			CHO01
1998 01 23.90		S	8.2:	S	6.0	B		20	& 6	3/			KON07
1998 01 24.68		S	8.6	VF	5.0	B		7	& 6				FIL05
1998 01 24.70	!	B	9.2	S	6.8	R	12	40	& 6	d3			CHR
1998 01 24.78		S	8.0	VB	8.0	B		10	10	3			SHA02
1998 01 24.80		S	8.8	VB	20	R	14	70	4.4	2			SHA02
1998 01 24.82		O	9.0	S	11	L	7	45	3	2			BUR04
1998 01 24.88		S	9.5	S	11	L	7	32	& 7.5	d1			CHO01
1998 01 24.90		E	9.0	AA	13.3	R	5	22	4.9	1			SC004
1998 01 24.91		B	7.7	AA	11.0	L	7	32	17	2			BAL02
1998 01 24.94		S	7.9	S	6.0	B		20	& 7	2			KON07
1998 01 25.68	!	B	9.3:	S	6.8	R	12	40	& 5	d2			CHR
1998 01 25.73		B	8.5	S	5.0	B		10	18	4			PLE01
1998 01 25.73		B	9.0	S	6.0	B		20	10	d5			TRY
1998 01 25.80		S	7.8	S	6.0	B		20	& 9	2/			KON07
1998 01 25.81		S	9.2	S	25	L	5	66	4	2			KWI
1998 01 25.82		B	8.8	S	6.6	B		20	11	3			FIL04
1998 01 25.95		S	10.0:	S	11	L	7	32	& 7.5	d1			CHO01
1998 01 25.99					41.0	L	5	70	6.4	3/	?0.1	275	BOR
1998 01 25.99		S	7.5	TI	5.0	B		10	15	2			BOR
1998 01 26.11		S	8.0:	AA	20.0	T	10	50		2			SHA04
1998 01 26.74		C	12.2	AO	60	P	6	a 16	& 3	D5/			PRA02
1998 01 26.76	!	B	9.5:	S	35	C	16	210	& 4	d2			CHR
1998 01 26.82		S	8.2:	AC	30.5	L	5	45	&10	1/			GIL01
1998 01 26.83		E	9.2	AA	13.3	R	5	22	4.1	3			SC004
1998 01 26.95		E	9.1	AA	13.3	R	5	22	4.1	3			SC004
1998 01 26.99	&	B	7.8:	S	6.6	B		20	4	2			FIL04
1998 01 27.68	!	B	9.5:	S	35	C	16	210	& 4	d2			CHR
1998 01 27.72		E	9.5	S	6	R	6	51	1	3			ERO
1998 01 27.74		B	8.4	S	10.0	B		25	&12	4			PLE01
1998 01 27.74		S	8.4	S	8	R	7	35	8	2/			KWI
1998 01 27.75		S	8.4	S	10.0	B		25	10	2/			FIL04

Comet 55P/Tempel-Tuttle [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 27.75		S	9.2	S	15	L	5	75	3.2	d2			CHO01
1998 01 27.78		S	7.7	S	6.0	B		20	&10	3/			KON07
1998 01 27.80		S	8.3	S	10.0	B		25	10	s3			DRA02
1998 01 27.81		E	8.8	AA	13.3	R	5	22	6.4	3			SCO04
1998 01 28.67		S	7.7	AA	11	L	7	32	10	3			IVA03
1998 01 28.76		E	9.7	S	6	R	6	51	1	3			ERO
1998 01 29.71		B	8.6	S	10.0	B		25	15	3/			PLE01
1998 01 29.72	!	B	9.5	AA	35	C	16	210	& 4	d2			CHR
1998 01 29.73		S	7.9	S	6.0	B		20	& 6	3			KON07
1998 01 29.74		S	8.4	S	8	R	7	35	9	2/			KWI
1998 01 29.76		S	8.4	TT	20	R	14	40	6.4	2			SHA02
1998 01 30.00		S	8.3	TI	8.0	B		20	7	3/			BOR
1998 01 30.00		S	8.6	TI	41.0	L	5	70	4.9	4			BOR
1998 01 30.06		B	7.5	AC	10.0	B	4	20	10	1			NOW
1998 01 30.67		S	8.0	AA	11	L	7	32	8	3			IVA03
1998 01 30.73		E	9.7	S	6	R	6	51	1	3			ERO
1998 01 31.11		S	8.9	S	20	T	10	100	4.5	1			PRY
1998 01 31.68		S	8.4	AA	11	L	7	32	7	2			IVA03
1998 01 31.72		E	9.9:	S	6	R	6	51	1	3			ERO
1998 01 31.73		B	8.8	S	15	M	10	38	15	s3			PLE01
1998 01 31.73		S	8.0:	S	6.0	B		20	& 6				KON07
1998 01 31.80		B	8.8	S	6.6	B		20	13	3			FIL04
1998 01 31.80		S	8.5	AA	11	L	7	32	6	2/			BAR06
1998 02 01.14		S	8.8	S	20	T	10	63	4.5	1			PRY
1998 02 01.67		S	8.5	AA	11	L	7	32	7	2			IVA03
1998 02 01.69		E	9.8:	S	6	R	6	51	1	3			ERO
1998 02 01.72		S	8.3	AA	11	L	7	32	6	2			BAR06
1998 02 01.76		B	9.0	S	15	M	10	38	14	s3			PLE01
1998 02 01.77		B	9.1	S	6.6	B		20	9	2/			FIL04
1998 02 01.81		S	9.1	TJ	6.0	B		20	5	s3/			DRA02
1998 02 01.88		E	8.8	AA	13.3	R	5	22	5.5	2			SCO04
1998 02 01.88		S	8.4:	S	6.0	B		20	& 5	2			KON07
1998 02 02.02		S	9.0	AC	15	R	5	42	5	2			MOR03
1998 02 02.70		E	9.6	S	6	R	6	51	1	3			ERO
1998 02 02.73		S	8.5:	AA	11	L	7	32	5	2			BAR06
1998 02 03.67		S	8.5	AA	11	L	7	32	7	2			IVA03
1998 02 03.75		C	11.6	AO	60	P	6	a 16	& 3	D5/			PRA02
1998 02 04.82		S	9.0	TJ	6.0	B		20	7	s3			DRA02
1998 02 05.67		S	8.5	AA	11	L	7	32	7	2			IVA03
1998 02 05.83		S	8.7:	AA	11	L	7	32	5	3			BAR06
1998 02 07.84		S	9.4	S	10	B		25	& 9	2/			PLE01
1998 02 13.76		S	9.0	AA	11	L	7	50	4	3			BAR06
1998 02 14.02		S	8.3	TI	8.0	B		20	6	4			BOR
1998 02 15.00		S	9.5	AC	15	R	5	42	4	3			MOR03
1998 02 15.02		S	8.4	TI	8.0	B		20	5.0	4/			BOR
1998 02 15.70		E	10.1:	S	6	R	6	51	1	3			ERO
1998 02 15.84	x&	S	9.8	TJ	5.0	B		7	& 8	2			PLE01
1998 02 16.04		B	9.0	AC	10.0	B	4	20	5	3			NOW
1998 02 17.76		S	8.9	AA	11	L	7	50	4	4			BAR06
1998 02 19.05		S	8.0:	AA	20.0	T	10	50		2			SHA04
1998 02 19.84	x&	S	10.1	TJ	6.6	B		20	& 8	2/			PLE01
1998 02 21.73		S	9.9	AA	11	L	7	50	3.7	4			BAR06
1998 02 21.85	x&	S	10.3	TJ	6.6	B		20	& 7	2			PLE01
1998 02 22.02		S	8.5	TI	8.0	B		20	4.0	5			BOR
1998 02 22.02		S	8.9	TI	41.0	L	5	70	3.1	5			BOR
1998 02 22.74		E	9.8	AA	13.3	R	5	40	4.3	3			SCO04
1998 02 23.77		E	9.4	AA	13.3	R	5	40	3.9	4			SCO04
1998 02 26.06		S	9.3	AC	15	R	5	42	4	3			MOR03
1998 02 27.03		S	8.9	TI	8.0	B		20	2.5				BOR
1998 02 27.03		S	9.2	TI	41.0	L	5	70	2.0	5			BOR
1998 02 28.01		S	9.4	TI	41.0	L	5	70	2.6	5			BOR
1998 03 02.04		S	9.9	AC	15	R	5	42	3				MOR03
1998 03 05.77		M	10.8	TI	35	L	5	92	2.4	4			PLS

Comet 62P/Tsuchinshan 1

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 03 01.74		C	14.6	AO	60	P	6	a 40	< 1	d6/			PRA02
1998 03 15.10		C	15.4	MT	45	C	8		1	d1/			JOH04
1998 03 22.81		S	13.4	HS	35	L	5	237	1.0	2			HOR02
1998 03 22.82		C	14.8	AO	60	P	6	a 40	> 1	d6/			PRA02
1998 03 25.08		C	13.5	MT	45	C	8		1	d1/			JOH04
1998 03 25.80		S	13.2	AC	25.0	L	6	121	0.9	2			RES
1998 03 25.87		S	13.6	HS	35	L	5	237	0.7	2			HOR02
1998 03 28.80		S	13.1	AC	25.0	L	6	121	0.7	2			RES
1998 03 29.80		S	13.3	AC	25.0	L	6	121	0.7	2			RES
1998 03 29.81		S	13.1	HS	35	L	5	158	1.4	2			HOR02
1998 04 16.82		S	12.2	AC	25.0	L	6	121	1.1	2			RES
1998 04 19.47		C	13.7	GA	60.0	Y	6	a120	1.4				NAK01
1998 04 20.83		S	12.8:	HS	35	L	5	158	1.1	2			HOR02
1998 04 22.82		I[	12.3	HS	8	R	11	84					OKS
1998 04 23.82		S	12.4	HS	35	L	5	158	1.3	1/			HOR02
1998 04 25.81		S[	13 :	HS	38.5	L	5	116	! 1				SAR02
1998 05 15.84		C	14.6	HS	60	P	6	a120	< 1	d5			PRA02
1998 05 15.86		O	12.4:	TI	20	L	4	57	1.5	3			KYS
1998 05 15.90		S	12.9	HS	44.0	L	5	156	0.6	3			HAS02
1998 05 19.47	a	C	13.5:	GA	60.0	Y	6	a120	1.7				NAK01
1998 05 23.85		S[	12.5	HS	44.5	L	4	230	! 1				SAR02

Comet 68P/Klemola

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1987 07 25.78		S	13.9:	A	31	L	4	51	0.5	0			CLA
1998 07 03.78	a	C	16.1	GA	60.0	Y	6	a120	0.45		1.6m	247	NAK01
1998 07 21.04		O[	13.0	HS	35	L	5	207	! 1.4				HOR02

Comet 69P/Taylor

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 24.12		C	13.1	AO	60	P	6	a 60	& 1	D7			PRA02
1998 02 01.14		S	13.3	VB	30	R	18	170	0.6	2			SHA02
1998 02 05.11		C	13.1	AO	60	P	6	a 60	< 1	D7			PRA02
1998 02 18.04		C	12.3	AO	60	P	6	a 60	> 1.3	D6	& 2.5m	150	PRA02
1998 02 22.05		S	11.8	AC	41.0	L	5	70	1.5	6			BOR
1998 02 27.05		S	11.8	AC	41.0	L	5	70	1.4	5			BOR
1998 02 28.03		S	11.7	AC	41.0	L	5	70	2.3	5			BOR
1998 03 01.90		S	12.0	HS	20.3	T	10	93	0.6	4			HAS02
1998 03 20.94		S	11.4	TI	13	L	8	69	2.4	2/			HOR02
1998 03 21.80		M	11.9	TI	35	L	5	92	1.5	2/			HOR02
1998 03 22.52		C	13.5	GA	60.0	Y	6	a120	1.4		1.9m	128	NAK01
1998 03 22.83		S	11.9	TI	35	L	5	92	1.6	2			HOR02
1998 03 23.00		C	13.2	AO	60	P	6	a 60	< 1	D5/	& 2 m	140	PRA02
1998 03 25.81		S	12.0	AC	25.0	L	6	61	1.5	2			RES
1998 03 25.84		S	12.1	TI	35	L	5	92	2.1	2			HOR02
1998 03 26.15		C	12.5	MT	45	C	8		2	d2/			JOH04
1998 03 26.84		S	12.0	TI	35	L	5	92	2.1	2			HOR02
1998 03 29.83		S	12.2	AC	25.0	L	6	61	1.2	2/			RES
1998 03 30.82		S	12.3	TI	35	L	5	92	2.1	2			HOR02
1998 04 14.84	!	V	13.5	YF	36.0	T	7	a120	+ 2.0	6			MIK
1998 04 15.94		S	13.5	VB	30	R	18	170	0.8	1			SHA02
1998 04 17.97		S	13.7:	VB	30	R	18	170	0.8	2			SHA02
1998 04 19.54		C	14.5	GA	60.0	Y	6	a120	1.0		1.4m	125	NAK01
1998 04 20.85		S	13.4	HS	35	L	5	158	1.3	2			HOR02
1998 04 22.85		S	13.2	HS	35	L	5	158	1.5	2/			HOR02
1998 04 22.86		I[	12.5	HS	8	R	11	67					OKS
1998 04 23.86		S	13.3	HS	35	L	5	158	1.2	2			HOR02
1998 04 25.30		S	13.5:	HS	25.6	L	5	169	1	2			BIV
1998 04 25.90		S	13.3:	VB	30	R	18	170	0.8	2			SHA02
1998 04 25.90		S	13.5	HS	38.5	L	5	116	1.5	2			SAR02
1998 04 26.29		S	13.5	HS	25.6	L	5	84	1	2			BIV
1998 04 28.88		S	13.3:	VB	30	R	18	170	0.7	2			SHA02
1998 04 28.90		S	13.1	HS	40.6	T	10	102	1.7	1			CHE03

Comet 69P/Taylor [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 29.93		S	13.5:	HS	40.6	T	10	102	& 1	1			CHE03
1998 04 30.89		S	13.2	AC	25.0	L	6	121	1.0	3/			RES
1998 05 15.86		S	13.9	HS	44.0	L	5	156	0.3	3			HAS02
1998 05 15.88		S	13.5	HS	35	L	5	158	1.1	1/			HOR02
1998 05 17.86		S	13.3	AC	25.0	L	6	61	0.9	3			RES
1998 05 18.86		S	13.4	AC	25.0	L	6	61	1.0	3			RES
1998 05 19.50		C	14.6:	GA	60.0	Y	6	a120	1.2			130	NAK01
1998 05 22.91		S	14.0	HS	44.5	L	4	230	1.5	2/			SAR02
1998 05 23.87		S	13.7	HS	44.5	L	4	230	1.5	3			SAR02
1998 05 26.90		S	13.7	HS	35	L	5	237	1.1	2/			HOR02
1998 05 27.89		S	13.7	HS	35	L	5	158	1.4	2/			HOR02
1998 06 17.48		C	15.4	GA	60.0	Y	6	a120	0.8				NAK01

Comet 73P/Schwassmann-Wachmann 3

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1995 10 13.01		N	7.6	SC	33.3	L	4	58					KR002
1995 10 13.01	*	S	6.6	SC	8.0	B		20	4	7	0.13	89	KR002
1995 10 13.01	*	S	6.6	SC	33.3	L	4	58	1.1	7			KR002
1995 10 15.02		N	8.4	S	33.3	L	4	58					KR002
1995 10 15.02	*	S	6.1	SC	8.0	B		20			0.15	97	KR002
1995 10 16.02	*	S	6.0	SC	8.0	B		20			0.15	98	KR002
1995 10 17.01	*	S	6.0	SC	8.0	B		20			0.15		KR002
1995 10 19.01		N	9.1	S	33.3	L	4	58					KR002
1995 11 26.74		S	7.1	SC	10.8	L	4	15	11	1			GET
1995 12 09.75		S	7.9	SC	10.8	L	4	15	9	4			GET

Comet 74P/Smirnova-Chernykh

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 23.73		C	17.6	A0	60	P	6	a120	< 0.1	d1/			PRA02
1998 02 04.76		C	18.1	A0	60	P	6	a120	< 0.1	d1			PRA02

Comet 78P/Gehrels 2

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 08 12.35		S	13.6	AC	44.5	L	4	167	0.3	4			MOR03
1997 08 29.36		S	12.7	AC	44.5	L	4	167	0.8				MOR03
1997 09 01.35		S	12.5	AC	44.5	L	4	167	0.8	2			MOR03
1997 09 27.39		S	13.0	AC	44.5	L	4	167	0.7	3			MOR03
1997 10 10.36		S	12.9	AC	44.5	L	4	167	0.7	3			MOR03
1997 10 12.06		S	12.6	AC	25.0	L	6	61	1.2	2			RES
1997 12 02.42		S	13.9	AC	44.5	L	4	167	0.4	5			MOR03
1997 12 03.21		S	14.0	AC	44.5	L	4	167	0.4	5			MOR03
1997 12 18.05		S	13.5	AC	44.5	L	4	167	0.6	4			MOR03
1997 12 21.16		S	13.4	AC	44.5	L	4	167	0.6	4			MOR03
1998 01 01.18		S	13.6	AC	44.5	L	4	167	0.5	3			MOR03
1998 01 02.91		S	13.0	VB	30	R	18	170	0.8	3			SHA02
1998 01 04.02		S	12.9	VB	30	R	18	100	0.8	3			SHA02
1998 01 06.20		S	13.1:	VB	20	T	10	135	0.5	2			SHA02
1998 01 15.83		S	12.9	VB	30	R	18	170	0.5	3			SHA02
1998 01 16.88		S	13.6	VB	30	R	18	170	0.5	3			SHA02
1998 01 19.84		S	13.6	VB	30	R	18	170	0.6	1			SHA02
1998 01 20.99		S	13.6	VB	30	R	18	170	0.7	2			SHA02
1998 01 25.98		C	13.2	A0	60	P	6	a 60	& 1.5	D7			PRA02
1998 02 03.92		C	13.0	A0	60	P	6	a160	> 1.5	D7	&20 s	42	PRA02
1998 02 19.97		C	14.0	A0	60	P	6	a 60	& 0.5	d7			PRA02
1998 03 19.81		S	13.2	HS	35	L	5	207	1.0	1/			HOR02
1998 03 21.88		C	14.3	A0	60	P	6	a 90	< 0.3	d5			PRA02
1998 03 22.85		S	13.5	HS	35	L	5	237	0.7	1/			HOR02
1998 03 23.91		S	13.3	HS	35	L	5	207	0.8	2			HOR02
1998 03 25.80		S	13.3	AC	25.0	L	6	121	0.8	2			RES
1998 03 25.89		S	13.4	HS	35	L	5	237	0.7	1/			HOR02
1998 03 26.14		C	14.2	MT	45	C	8		1	d1/			JOH04
1998 03 28.81		S	13.3	AC	25.0	L	6	121	0.8	3/			RES

Comet 78P/Gehrels 2 [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 03 29.80		S	13.4	AC	25.0	L	6	121	0.7	2/			RES
1998 04 13.49		S	[13.0	VN	41	L	4	200					PEA
1998 04 17.88		C	14.8	AO	60	P	6	a 60	& 0.3	d5			PRA02
1998 04 19.49		C	15.3	GA	60.0	Y	6	a120	0.7				NAK01
1998 04 22.84		I	[12.1	HS	8	R	11	67					OKS
1998 04 24.16		J	15.1	SC	25.4	T	5	a 60	0.87	s3			ROQ

Comet 81P/Wild 2

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 01 28.84		S	10.1:	S	15	L	9	80	2	2			SMI08
1997 01 29.06		S	10.5	GA	25.4	L	4	46	3	s1			DID
1997 01 29.97		S	10.5	GA	25.4	L	4	46	3	1			DID
1997 02 07.22		S	10.1	GA	25.4	L	4	46	3	2			DID
1997 02 09.8		S	10.1	GA	25.4	L	4	46	3	2			DID
1997 02 27.81		S	9.8	AC	25.0	L	6	50	4	1			RES
1997 03 03.77		S	9.7	AC	25.0	L	6	50	3	2			RES
1997 03 04.79		S	9.9	AC	25.0	L	6	50	3	1			RES
1997 03 05.79		S	9.9	AC	25.0	L	6	50	4	1			RES
1997 03 07.79		S	9.7	AC	25.0	L	6	50	3	2/			RES
1997 03 10.78		S	9.4	AC	25.0	L	6	50	3	3			RES
1997 03 11.81		S	10.0:	S	15	L	9	80	3	1			SMI08
1997 05 08.73		S	10.0:	S	15	L	9	80	3	3			SMI08
1997 05 10.15		S	10.4	HS	33.3	L	4	58	2.1	2			KR002
1997 05 11.10		S	10.4	HS	33.3	L	4	58	1.9	2			KR002
1997 05 28.14		S	11.5	GA	25.4	L	4	46	2	0			DID
1997 06 05.10		S	11.7	GA	25.4	L	4	46	3	0			DID

Comet 85P/Boethin

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 11 09.60		S	10.8	VN	41	L	4	86	2.5	5			CLA
1985 11 16.55		S	10.5	VN	41	L	4	86	3	4			CLA

Comet 88P/Howell

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 03 21.09		C	15.6	AO	60	P	6	a120	> 0.2	d7	&30 s	298	PRA02
1998 03 30.65		C	16.3:	GA	60.0	Y	6	a240	0.6				NAK01
1998 04 02.72		C	16.3	GA	60.0	Y	6	a240	0.65		1.5m	294	NAK01
1998 04 05.29		C	14.5	MT	45	C	8		0.5	d3/			JOH04
1998 04 19.35		C	14.5	MT	45	C	8		1	d1/			JOH04
1998 04 19.65		C	15.1	GA	60.0	Y	6	a120	0.9				NAK01
1998 04 20.87		S	13.6	HS	35	L	5	158	1.3	2			HOR02
1998 04 22.87		I	[12.5	HS	8	R	11	67					OKS
1998 04 28.63		C	15.3:	GA	60.0	Y	6	a120	0.75				NAK01
1998 04 28.94		S	13.2:	HS	30	R	18	170	0.7	2			SHA02
1998 05 02.99		C	15.5	HS	60	P	6	a240	& 0.3	d7			PRA02
1998 05 15.87		S	12.8	HS	20	L	4	57	1.5	2			KYS
1998 05 15.89		S	13.5	HS	35	L	5	207	1.3	2			HOR02
1998 05 17.84		S	13.4	AC	25.0	L	6	61	0.7	3			RES
1998 05 18.85		S	13.4	AC	25.0	L	6	61	0.7	2			RES
1998 05 19.57		C	15.1:	GA	60.0	Y	6	a120	1.0				NAK01
1998 05 22.92		S	14.2	HS	44.5	L	4	230	0.6	3/			SAR02
1998 05 23.88		S	14.6	HS	44.5	L	4	230	0.8	4			SAR02
1998 05 26.91		S	13.2	HS	35	L	5	237	1.6	1/			HOR02
1998 05 27.87		S	13.2	HS	35	L	5	158	1.5	1/			HOR02
1998 06 17.52	a	C	15.0	GA	60.0	Y	6	a120	1.1		1.1m	112	NAK01
1998 06 17.55		S	[13.0	HS	20	L	7	158					MAT08
1998 06 25.90		S	12.4	HS	35	L	5	207	1.6	2			HOR02
1998 06 28.89		S	12.4:	HS	35	L	5	207	1.5	2			HOR02
1998 07 19.89		S	13.6	HS	44.0	L	5	156	0.4	4			HAS02
1998 07 21.42		S	12.6	GA	25.4	L	4	71					SEA
1998 07 25.31		S	12.3	HS	25.6	L	5	84	1.5	3			BIV
1998 07 26.31		S	12.1	HS	25.6	L	5	42	2.0	2			BIV

Comet 88P/Howell [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 29.01		V	13.7	HV	91	L	14	a600	1				COZ

Comet 91P/Russell 3

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 21.75		C	18.6	GA	60.0	Y	6	a240	0.25				NAK01
1998 05 24.41		c	21.7	FA	91.4	L	5		0.23		75	s 249	SC001
1998 05 24.47		C	19.5	FA	91.4	L	5						SC001

Comet 93P/Lovas 1

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 07 06.78	a	C	17.3	GA	60.0	Y	6	a240	0.3			240	NAK01

Comet 95P/Chiron

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 23.95		S	16.2:	HS	44.5	L	4	230	0.0	9			SAR02

Comet 103P/Hartley 2

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 02 27.79		S	12.5	AC	25.0	L	6	61	0.8	0/			RES
1997 08 05.92		S[	12.5	NP	33	L	5	100					SHA02
1997 08 23.89		I[	14.2	NP	33	L	5	100					SHA02
1997 08 25.90		S	13.3:	VB	30	R	18	170	0.4	2			SHA02
1997 08 27.91		S	13.8:	VB	30	R	18	170	0.5	3			SHA02
1997 09 25.83		S	12.3:	AC	25.0	L	6	61	1.0	1			RES
1997 09 27.03		S	13.0	AC	44.5	L	4	167	1.0	1			MOR03
1997 10 21.00		S	11.8	AC	44.5	L	4	80	1.5	0			MOR03
1997 11 19.69		S	10.2	AC	6.3	R	13	52	6	1			KOS
1997 11 24.98		S	9.5	AC	15	R	5	42	3.5	3			MOR03
1997 11 29.98		S	9.5	AC	15	R	5	42	3.5	3			MOR03
1997 12 03.80		S	8.3	S	15	L	9	80	5	3			SMI08
1997 12 07.69		S	9.3	AC	6.3	R	13	52	8	2			KOS
1997 12 14.76	a	B	8.8	S	10.0	B		25	&10	1/			PLE01
1997 12 15.97		S	8.9	AC	15	R	5	42	5	3			MOR03
1997 12 17.67		E	7.9	AA	13.3	R	5	22	3	3			SC004
1997 12 17.70		S	8.3	AC	5.0	B		7	8	2			KOS
1997 12 17.71	x	S	8.3	TJ	10.0	B		25	9	s5			DRA02
1997 12 17.74	x	S	9.5	TJ	35	M	10	60	4	s2			DRA02
1997 12 17.77	a	B	8.7	S	10.0	B		25	&12	1/			PLE01
1997 12 17.98		S	8.4	AC	15	R	5	42	4.5	3			MOR03
1997 12 18.72		S	8.5	AC	5.5	M		12	8	2			KOS
1997 12 18.77	a	B	8.6	S	10.0	B		25	&11	1/			PLE01
1997 12 21.98		S	9.0	AC	15	R	5	42	4	3			MOR03
1997 12 25.75		S	8.7	S	6.6	B		20	15	4/			FIL04
1997 12 26.78	&	B	8.4	S	10.0	B		25	12	2			PLE01
1997 12 27.68		B	8.4	S	25	L	6	100	& 3	1			SWI
1997 12 27.77	&	B	8.5	S	10.0	B		25	14	2			PLE01
1997 12 31.79		B	8.4	S	6.6	B		20	16	2			PLE01
1997 12 31.99		S	8.9	AC	15	R	5	42	4.5	3			MOR03
1998 01 01.67		B	8.6	S	25	L	6	100	3	2			SWI
1998 01 01.69		M	8.4	S	10.0	B		25	8	s3			DRA02
1998 01 01.70	!	B	8.2	S	6.8	R	12	40		D5			CHR
1998 01 01.71		S	8.4:	S	11	L	7	32	3.8	5			SAD
1998 01 01.71		S	8.4:	S	11	L	7	54	4.6	4			SAD
1998 01 01.72		S	8.6	S	6.0	B		20	& 6	4/			SAD
1998 01 01.72		S	8.7	S	5.0	B		7	& 5	4			SAD
1998 01 01.72		S	8.7	S	8	R	7	35	6	3/			KWI
1998 01 01.75		S	8.8	S	6.6	B		20	10	4/			FIL04
1998 01 01.77		M	7.9:	S	6.0	B		20	& 3	5/			KON07
1998 01 01.79		B	8.4	S	10.0	B		25	20	2			PLE01
1998 01 02.74		S	8.0	AA	20	R	14	40	4.0	4	0.15	235	SHA02
1998 01 02.75		S	8.7	S	8	R	7	35	6	3/			KWI

Comet 103P/Hartley 2 [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 02.75		S	8.8:	S	6.6	B		20	& 8	4			FIL04
1998 01 02.78		S	7.8	AA	8.0	B		20	5.0	3			SHA02
1998 01 05.68	!	B	8.2	S	35	C	16	210	& 7	D4			CHR
1998 01 07.79		B	8.3	S	10.0	B		25	18	2/			PLE01
1998 01 09.74		S	8.1	AA	20	R	14	40	4.7	3			SHA02
1998 01 11.72		S	8.5:	S	10.0	B		25	&16	3/			FIL04
1998 01 11.72		S	8.6:	S	6.0	B		20	&10	3/			SAD
1998 01 11.72		S	8.6:	S	11	L	7	32	8.0	5			SAD
1998 01 11.72		S	8.8:	S	5.0	B		7	&12	3			SAD
1998 01 11.73		S	8.4	S	10.0	B		25	8	s2/			DRA02
1998 01 12.72		S	8.5	S	15	L	5	23	3	7			OSS
1998 01 12.73		S	8.3:	S	6.0	B		20	&10	3			SAD
1998 01 12.73		S	8.4:	S	11	L	7	32	7.2	4/			SAD
1998 01 12.74		S	8.7:	S	5.0	B		7	&10	4/			SAD
1998 01 13.73		S	8.8	S	8	R	7	35	4	3			KWI
1998 01 13.75		S	8.9	S	6.6	B		20	8	3/			FIL04
1998 01 13.77		S	9.6	AA	30	R	18	95	1.4	2			SHA02
1998 01 13.79		B	8.5	S	10.0	B		25	15	3			PLE01
1998 01 14.68	!	B	8.9	S	35	C	16	210	& 5	d3			CHR
1998 01 14.69		M	8.7:	S	6.0	B		20	& 4				KON07
1998 01 14.71		B	8.9:	S	6.0	B		20	16	d4			TRY
1998 01 14.73		S	8.6	S	15	L	5	23	2	7			OSS
1998 01 14.78		S	9.6	AA	30	R	18	100	2.5	3			SHA02
1998 01 15.72		S	8.8	S	8	R	7	35	6	3/			KWI
1998 01 15.80		B	8.6	S	10.0	B		25	12	3			PLE01
1998 01 15.80		S	9.6	AA	30	R	18	100	2.5	4		225	SHA02
1998 01 16.68	!	B	8.8	S	6.8	R	12	40	& 5	d3			CHR
1998 01 16.71		M	8.6	S	6.0	B		20	& 5	5			KON07
1998 01 16.71		S	8.9	S	8	R	7	35	6	3/			KWI
1998 01 16.80		B	8.7	S	6.6	B		20	11	2/			PLE01
1998 01 16.80		S	9.1	AA	33	L	5	45	3.0	4			SHA02
1998 01 17.74		S	8.2	S	10.0	B		25	10	2			FIL04
1998 01 17.78		S	8.7	S	25	L	5	66	5	1			KID01
1998 01 18.67	!	B	8.8	S	6.8	R	12	40	& 5	d3			CHR
1998 01 18.69		B	8.8	S	25	L	6	100	4	2			SWI
1998 01 18.71		B	7.5:	S	6.0	B		20	8	s2			DRA02
1998 01 18.71		B	8.7	S	6.0	B		20	10	d6			TRY
1998 01 18.71		S	9.0	S	8	R	7	35	6	4			KWI
1998 01 18.73		M	8.4	S	6.0	B		20	& 6	5			KON07
1998 01 18.73		S	9.0:	S	11	L	7	54	& 6	4/			SAD
1998 01 18.73		S	9.2:	S	11	L	7	32	5.5	5/			SAD
1998 01 18.74		S	8.8	S	6.0	B		20	&10	5			SAD
1998 01 18.74		S	8.9	S	5.0	B		7	& 6	3/			SAD
1998 01 18.75		E	8.9	AA	13.3	R	5	22	5.1	3			SC004
1998 01 18.81		B	8.7	S	10.0	B		25	&10	2/			PLE01
1998 01 19.82		S	9.6	AA	30	R	18	100	1.9	4	0.05	220	SHA02
1998 01 20.80		B	8.8	S	5.0	B		10	&14	2/			PLE01
1998 01 22.77		S	9.5	TT	33	L	5	60	2.2	3			SHA02
1998 01 22.84		E	9.2:	AA	13.3	R	5	22	& 3.5	3			SC004
1998 01 23.68	!	B	8.9	S	6.8	R	12	40	& 5	d3			CHR
1998 01 23.69		M	8.7:	S	6.0	B		20	& 5	2/			KON07
1998 01 23.72		B	9.0	S	6.0	B		20	10	d6			TRY
1998 01 23.73		S	9.4:	S	8	R	7	35	5	4			KWI
1998 01 23.75		E	8.3	AA	13.3	R	5	22	4.1	3			SC004
1998 01 23.78		S	8.6	S	10.0	B		25	9	s3			DRA02
1998 01 23.79		S	8.8	S	25	L	5	66	3	1			KID01
1998 01 23.80		B	8.8	S	5.0	B		10	&13	2/			PLE01
1998 01 23.84		S	8.5	S	11	L	7	32	& 8	d1			CH001
1998 01 24.72	!	B	8.9	S	6.8	R	12	40	& 5	d2			CHR
1998 01 24.82		S	10.4	TT	30	R	18	100	2.5	3			SHA02
1998 01 25.71		B	9.3:	S	6.0	B		20	5	d4			TRY
1998 01 25.72	!	B	9.1	S	6.8	R	12	40	& 5	d2			CHR
1998 01 25.81		B	9.0	S	5.0	B		10	&14	2/			PLE01
1998 01 25.82		S	8.6	S	25	L	5	66	3	1			KID01
1998 01 26.78		E	9.3	AA	13.3	R	5	22	4.7	d3			SC004

Comet 103P/Hartley 2 [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 27.71		B	8.9	S	6.0	B		20	10	D5			TRY
1998 01 27.71		M	8.7	S	6.0	B		20	& 4	3/			KON07
1998 01 27.72	!	B	9.4:	S	35	C	16	210	& 5	d2			CHR
1998 01 27.73		S	9.4:	S	8	R	7	35	6	3			KWI
1998 01 27.78		E	8.9	AA	13.3	R	5	22	6.7	2			SC004
1998 01 28.69		S	9.0	AA	11	L	7	80	2.4	4			IVA03
1998 01 29.71		M	9.0:	S	6.0	B		20	& 5	4/			KON07
1998 01 29.72		S	8.5	S	6.6	B		20	10	1/			FIL04
1998 01 29.73		S	9.5:	S	8	R	7	35	6	3			KWI
1998 01 29.74	!	B	9.5:	S	35	C	16	210	& 4	d2			CHR
1998 01 29.77		O	9.1:	S	11	L	7	26	3	1/			BUR04
1998 01 29.79		S	8.8	TT	20	R	14	40	3.0	2			SHA02
1998 01 29.81		B	9.0	S	15	M	10	38	14	2/			PLE01
1998 01 29.98		S	9.2	TI	41.0	L	5	70	3.5	4			BOR
1998 01 31.12		S	9.1	S	20	T	10	100	3.3	3			PRY
1998 01 31.78		B	9.1	S	6.6	B		20	12	2			FIL04
1998 01 31.80		S	8.7	AA	11	L	7	50	4	2			BAR06
1998 01 31.82		B	9.1	S	15	M	10	38	14	2/			PLE01
1998 01 31.85	&	O	9.8:	S	11	L	7	26	3	1			BUR04
1998 02 01.13		S	9.1	S	20	T	10	63	3.2	3			PRY
1998 02 01.68		S	9.0	AA	11	L	7	80	2.5	4			IVA03
1998 02 01.71		S	8.9	AA	11	L	7	50	4	2			BAR06
1998 02 01.72		B	9.2:	S	6.0	B		20	7	d4			TRY
1998 02 01.78		O	9.6:	S	11	L	7	32	& 3	2			BUR04
1998 02 01.79		B	8.8	S	6.6	B		20	11	1/			FIL04
1998 02 07.78		C	11.5	A0	60	P	6	a 80	& 3.5	D6			PRA02
1998 02 07.82	x	B	9.5	TJ	10.0	B		25	10	2			PLE01
1998 02 13.70		S	9.2	AA	11	L	7	80	1.5	4			IVA03
1998 02 13.77		S	10.0:	AA	11	L	7	50	3	2			BAR06
1998 02 15.01		S	10.0	AC	15	R	5	42	4	2			MOR03
1998 02 15.03		S	9.7	TI	41.0	L	5	70	3.7	3			BOR
1998 02 15.70		S	9.5	AA	11	L	7	80	1.5	4			IVA03
1998 02 15.83	x	S	9.9	TJ	6.6	B		20	& 8	1/			PLE01
1998 02 17.70		S	9.8	AA	11	L	7	80	1.5	4			IVA03
1998 02 17.72	w	M	9.9	PA	25	L	4	64	3	3			SHU
1998 02 17.77	w	M	9.9	PA	25	L	4	64	3	3			SHU
1998 02 17.78		S	10.2	AA	11	L	7	50	3	2/			BAR06
1998 02 17.82	w	M	9.9	PA	25	L	4	64	3	3			SHU
1998 02 18.81		M	9.9:	S	15	L	9	80	3	3			SMI08
1998 02 19.84	x	S	10.0	TJ	6.6	B		20	& 6	1/			PLE01
1998 02 20.82		C	11.4	A0	60	P	6	a 96	& 2.5	D6			PRA02
1998 02 21.74		S	9.9	AA	11	L	7	50	3	3			BAR06
1998 02 21.83	x	S	10.2	TJ	6.6	B		20	& 6	1			PLE01
1998 02 22.04		S	10.0	TI	41.0	L	5	70	3.6	2/			BOR
1998 02 22.70		S	10.0	AA	11	L	7	80	1.3	4			IVA03
1998 02 22.76		E	9.8	AA	13.3	R	5	40	4.3	3			SC004
1998 02 23.78		E	10.6:	AA	13.3	R	5	40	7.2	1			SC004
1998 02 23.79		M	10.2:	S	15	L	9	50	3	1			SMI08
1998 02 26.71		S	10.3	AA	11	L	7	80	1.2	3			IVA03
1998 02 26.84	x	[	10.5	TJ	10.0	B		25					PLE01
1998 02 27.02		S	10.4	AC	15	R	5	42	3	1			MOR03
1998 02 27.04		S	10.0	TI	41.0	L	5	70	3.9	1			BOR
1998 02 28.02		S	10.2	TI	41.0	L	5	70	3.7	1			BOR
1998 03 16.04		S	11.6	AC	44.5	L	4	80	2.2	0			MOR03
1998 03 17.03		S	12.0	AC	44.5	L	4	80	1.7	0			MOR03
1998 03 20.79		S	11.3	TI	20	L	5	48	2.4	2/			PLS
1998 03 21.79		S	10.6	TT	35	L	5	92	3.7	1/			HOR02
1998 03 22.47		C	12.8	GA	60.0	Y	6	a120	2.0				NAK01
1998 03 22.82		S	10.8	TT	35	L	5	92	2.6	1/			HOR02
1998 03 25.79		S	11.4	AC	25.0	L	6	61	2.0	2/			RES
1998 03 25.82		S	11.6	TI	35	L	5	92	2.2	2			HOR02
1998 03 26.12		C	12.2	MT	45	C	8		2	d2/			JOH04
1998 03 26.78		E	[12.0:	AA	13.3	R	5	40	! 2				SC004
1998 03 26.78		S	[12.2	VF	20	L	5	70	! 2				BAR06
1998 03 28.80		S	11.7	AC	25.0	L	6	61	2.4	2			RES

Comet 103P/Hartley 2 [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 03 29.80		S	11.7	AC	25.0	L	6	61	1.9	1			RES
1998 04 13.48		S	12.5:	VN	41	L	4	200	1.3	2			PEA
1998 04 14.83	!	V	15.5	YF	36.0	T	7	a120	+ 0.5	4			MIK
1998 04 16.81		S	12.3	AC	25.0	L	6	61	1.5	2			RES
1998 04 17.84		C	14.8	AO	60	P	6	a160	& 0.5	d4			PRA02
1998 04 19.48		C	14.2	GA	60.0	Y	6	a120	1.05				NAK01
1998 04 22.83		I[	12.3	HS	8	R	11	67					OKS
1998 04 25.80		S[	13 :	HS	38.5	L	5	116	! 1				SAR02
1998 04 26.27		S	13.9:	HS	25.6	L	5	169	0.6	1			BIV
1998 05 19.48	a	C	15.3:	GA	60.0	Y	6	a120	1.1				NAK01

Comet 104P/Kowal 2

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 02.78		S	13.7:	VB	30	R	18	170	0.5	3			SHA02
1998 01 14.76		S[	13.2	VB	30	R	18	170					SHA02
1998 01 15.79		S	13.7	VB	30	R	18	170	0.6	2			SHA02
1998 01 16.82		S	13.0:	VB	33	L	5	100	1.0	3			SHA02
1998 01 19.83		S	13.5	VB	30	R	18	170	0.9	2			SHA02
1998 01 26.77		S	13.2	HS	30	R	18	170	0.6	2			SHA02
1998 02 20.76		C	13.7	AO	60	P	6	a120	< 2	d7			PRA02
1998 02 27.76		C	14.0	AO	60	P	6	a 75	> 1	d6/	& 1 m	55	PRA02
1998 03 18.44	a	C	15.0	GA	60.0	Y	6	a120	1.0				NAK01
1998 03 19.79		S	13.1	HS	35	L	5	92	1.6	2			PLS
1998 03 22.11		C	14.3	MT	45	C	8		1	d1/			JOH04
1998 03 22.78		C	14.6	AO	60	P	6	a120	> 0.7	d5	&40 s	75	PRA02
1998 03 25.79		S	13.0:	AC	25.0	L	6	121	0.7	3			RES
1998 03 26.11		C	14.3	MT	45	C	8		1	d1/			JOH04
1998 03 29.79		S	13.0	HS	35	L	5	237	1.3	2			HOR02
1998 03 29.80		S	13.2	HS	35	L	5	237	0.6	1/			PLS

Comet 110P/Hartley 3

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 30.46		q	22.7	AO	360	C	8	a600		9			VEI

Comet 114P/Wiseman-Skiff

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 02 27.80		S	12.6:	AC	25.0	L	6	50	1	3			RES

Comet 118P/Shoemaker-Levy 4

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 26.18		C	20.1	FA	91.4	L	5						SCO01

Comet 119P/Parker-Hartley

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 02 05.06		C	17.5	AO	60	P	6	a120	< 0.1	d1	& 0.5m	305	PRA02
1998 02 23.07		C	17.3	AO	60	P	6	a120	< 0.1	d2	& 0.5m	298	PRA02

Comet 122P/de Vico

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1995 10 11.42	*	S	5.5	SC	0.0	E		1	5	6			KR002
1995 10 24.44	*	S	6.2	SC	8.0	B		20	8	6	0.43	0	KR002
1995 10 25.15		S	6.9	AA	6.3	R	13	52	6	7	0.6	30	KOS
1995 10 27.15		S	7.2	AA	6.3	R	13	52	6	6	0.8	30	KOS
1995 11 01.78		S	7.7	CM	10.8	L	4	27	4.0	6	0.11	41	GET
1995 11 04.22		S	8.0	HI	10.8	L	4	15	5.0	6	0.14	357	GET
1995 11 05.22		S	7.7	CM	10.8	L	4	15	5.5	6	0.07	240	GET
1995 11 07.70		S	9.8	AC	6.3	R	13	52	3	2			KOS
1995 11 08.70		S	10.0	AC	6.3	R	13	52	3	2			KOS
1995 11 15.82		S	7.9	SC	10.8	L	4	27	5.5	5			GET

Comet 122P/de Vico [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1995 11 17.75					10.8	L	4	27	5.0	5	0.11	272	GET
1995 11 18.76		S	8.7	CM	10.8	L	4	15	11	5			GET
1995 11 19.75		S	8.6	CM	10.8	L	4	27	3.0	5	0.06	305	GET
1995 11 21.71		S	8.8	AC	6.3	R	13	52	5	4			KOS
1995 11 25.69		S	9.0	AC	6.3	R	13	52	5	2			KOS
1995 11 26.69		S	9.0	AC	6.3	R	13	52	5	2			KOS
1995 11 27.72		S	9.2	AC	6.3	R	13	52	5	2			KOS

Comet 128P/Shoemaker-Holt 1

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 03 02.49		C	16.5	GA	60.0	Y	6	a240	0.55			65	NAK01
1998 03 18.46		C	16.5	GA	60.0	Y	6	a240	0.65				NAK01
1998 03 26.09		C	15.2	MT	45	C	8		1	d1/			JOH04
1998 04 19.46		C	17.2	GA	60.0	Y	6	a240	0.35				NAK01

Comet 128P/Shoemaker-Holt 1

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 23.92		C	15.7	AO	60	P	6	a 60	> 0.16	d7			PRA02
1998 02 20.91		C	15.7	AO	60	P	6	a 90	> 0.16	d7			PRA02
1998 03 10.83		C	15.9	AO	60	P	6	a 60	< 0.16	D7/			PRA02

Comet 129P/Shoemaker-Levy 3

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 26.01		C	16.3	AO	60	P	6	a 90	< 0.25	d7/			PRA02
1998 02 03.96		C	16.2	AO	60	P	6	a 60	& 0.25	d7/			PRA02
1998 02 21.57		C	16.3	GA	60.0	Y	6	a240	0.6				NAK01
1998 02 22.99		C	16.5	AO	60	P	6	a 60	< 0.16	d8			PRA02
1998 03 02.54		C	16.3	GA	60.0	Y	6	a240	0.6				NAK01
1998 03 22.49		C	16.8:	GA	60.0	Y	6	a240	0.3				NAK01
1998 04 19.51		C	17.0	GA	60.0	Y	6	a240	0.45				NAK01
1998 05 22.49	a	C	17.2:	GA	60.0	Y	6	a240	0.35				NAK01

Comet 132P/Helin-Roman-Alu 2

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 02 20.83		C	16.7	AO	60	P	6	a 60	< 0.1	d2			PRA02
1998 03 02.46		C	17.9	GA	60.0	Y	6	a240	0.4				NAK01

Comet 134P/Kowal-Vávrová

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 19.54		C	18.4	GA	60.0	Y	6	a240	0.25				NAK01
1998 05 19.52		C	18.0:	GA	60.0	Y	6	a240	0.35				NAK01

Comet P/1994 P1 (Machholz 2) [component A]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1994 09 17.09		E	8.7	AA	13.3	R	5	31	4.5				SC004

Comet P/1996 A1 (Jedicke)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 31.34		R	19.2	AO	360	C	8	a600			30 s	288	VEI

Comet P/1997 G1 (Montani)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 05 24.17		c	22.2	FA	91.4	L	5		0.23		&10.8s	41	SC001
1998 05 24.21		C	19.9	FA	91.4	L	5						SC001

Comet P/1997 V1 (Larsen)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 23.76		C	17.0	A0	60	P	6	a 80	< 0.16	d7			PRA02

Comet P/1998 G1 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 04 15.88		C	17.0	A0	60	P	6	a 90		d9			PRA02
1998 04 17.92		C	17.6	A0	60	P	6	a 60		d9			PRA02
1998 04 19.55		C	18.3	GA	60.0	Y	6	a240		9	0.4m	108	NAK01
1998 05 19.49		C	18.7:	GA	60.0	Y	6	a240		9			NAK01

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CORRIGENDA

- In the January 1998 *ICQ*, page 5, "Comments on Brian Skiff's Letter", line 16, *for* (x-axes) *read* (y-axes)
- In the April 1998 *ICQ*, page 101, "Book Reviews", line 4, *for* Classic *read* Classics
- In the April 1998 *ICQ*, page 104, list of designations, *for* C/1997 L1 (Xinglong) *read* C/1997 L1 (Zhu-Balam). This comet was renamed last January as a result of a controversy surrounding the naming of P/1997 T3 (see *IAUC* 6811).

Φ Φ Φ

1999 Comet Handbook

The *ICQ*'s *1999 Comet Handbook* is being issued in August 1998, and it is being mailed together with this regular July issue of the *ICQ* to the great majority of subscribers who elect to receive the *Comet Handbook* as part of their subscription.

The 1999 edition of the *ICQ Comet Handbook* is the thirteenth edition of this annual book of orbits and ephemerides, compiled by Syuichi Nakano and Daniel W. E. Green. The 1999 edition contains orbits for 81 comets — generally for those short-period comets predicted to be brighter than mag 22 and those long-period comets predicted to be brighter than mag ~ 20 at some time in 1999. As is the practice each year (described in the July 1996 issue — *ICQ* **18**, 103), the comet-magnitude parameters have been updated based on observations over the past year, and in most cases, the most up-to-date orbital elements available at press time were utilized for the ephemerides. Users need to be aware that the *IAU Circulars* and *Minor Planet Circulars* (and/or the corresponding World Wide Web pages) should be consulted for new comet discoveries and for those comets included in the 1999 *Handbook* that were discovered within a couple of months of publication for updates.

The *1999 Comet Handbook* is available for $15.00; *ICQ* subscribers may purchase one copy only for the special price of $8.00 postpaid.

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IWCA II

Readers are reminded of the second International Workshop on Cometary Astronomy, to be held at the University in Cambridge, England, during 1999 August 14-16, just after the total solar eclipse on August 11 whose path will cross central Europe. Preliminary information was supplied in the July 1997 issue of the *ICQ*, page 156. In addition to providing information in the printed *ICQ*, we have created a World Wide Web page for up-to-date information on this meeting, at `http://cfa-www.harvard.edu/cfa/ps/icq/IWCA2.html`.

If you plan to attend the meeting, please send e-mail to `icq@cfa.harvard.edu`, or write to the *ICQ* Editor. We hope to have additional information in forthcoming issues of the *ICQ* and on the *ICQ* web site (above).

Φ Φ Φ

Special Color-Sensitivity Survey

The American Association of Variable Star Observers has announced a special experiment for experienced visual astronomical observers to undertake, involving the magnitude estimation of a couple dozen stars in the field of the variable star SS Cygni. The idea is to identify differences in the spectral response of the eyes of experienced observers, and the AAVSO (and the *ICQ*!) warmly welcomes the participation of experienced visual comet observers. Details and copies of the relevant SS Cyg charts are available on the web at `http://www.aavso.org/vmag.html` or via postal mail ("V Magnitude" Experiment; c/o AAVSO; 25 Birch St.; Cambridge, MA 02138-1205; U.S.A.). All results are due by 1998 September 22, so observers need to work quickly to observe and report results.

DESIGNATIONS OF RECENT COMETS

Listed below, for handy reference, are the last 35 comets to have been given designations in the new system. The name, preceded by a star (★) if the comet was a new discovery (compared to a recovery from predictions of a previously-known short-period comet). Also given are such values as the orbital period (in years) for periodic comets, date of perihelion, T (month/date/year), and the perihelion distance (q, in AU). Four-digit numbers in the last column indicate the *IAU Circular* (4-digit number) containing the discovery/recovery or permanent-number announcement.

Not included below are numerous recently-discovered comets observed only with the ESA/NASA Solar and Heliospheric Observatory (SOHO) spacecraft — and seen only close to the sun with the SOHO instruments — that are presumed to be Kreutz sungrazers that are no longer in existence (*IAUC* 6781, 6811, 6813, 6825, 6837, 6862, 6879): C/1997 H3, C/1997 P3, C/1997 S2, C/1997 U1, C/1997 W1, C/1997 W2, C/1997 X1, C/1998 A1, C/1998 E1, C/1998 F1, C/1998 G2 (see list in October 1997 *ICQ*, p. 286, for earlier SOHO comets); eleven recently-announced SOHO comets received only 'X/' designations (*IAUC* 6952, 6984), pending an improvement in measurement techniques that proved quite poor for C/1998 J1 (the first SOHO-discovered comet to be viewed from the ground) for orbit determination. [This list updates that in the April 1998 issue, p. 104.]

	New-Style Designation	*P*	*T*	*q*	*IAUC*
★	C/1997 A1 (NEAT)		6/19/97	3.16	6532
★	P/1997 B1 (Kobayashi)	25.2	3/2/97	2.05	6553
★	C/1997 BA_6 (Spacewatch)		11/26/99	3.4	6561
★	P/1997 C1 (Gehrels)	17.4	1/29/96	3.6	6549
★	C/1997 D1 (Mueller)		10/11/97	2.25	6562
	55P/1997 E1 (Tempel-Tuttle)	33.2	2/27/98	0.98	6579
★	P/1997 G1 (Montani)	21.8	4/26/97	4.2	6622
★	C/1997 G2 (Montani)		4/16/98	3.1	6626
	130P/1997 H1 (McNaught-Hughes)	6.7	2/23/98	2.1	6640
★	C/1997 J1 (Mueller)		5/3/97	2.3	6642
★	C/1997 J2 (Meunier-Dupouy)		3/10/98	3.0	6648
★	C/1997 H2 (SOHO)		5/2/97	0.14	6650
★	C/1997 L1 (Xinglong)		11/22/96	4.9	6677
★	C/1997 L2 (SOHO)		6/10/97	0.04	6684
★	C/1997 N1 (Tabur)		8/15/97	0.40	6692
	131P/1997 M2 (Mueller 2)	7.0	11/22/97	2.4	6695
	132P/1997 N2 (Helin-Roman-Alu 2)	8.2	11/10/97	1.9	6704
★	C/1997 O1 (Tilbrook)		7/13/97	1.37	6705
★	C/1997 P2 (Spacewatch)		8/31/97	4.3	6717
★	C/1997 T1 (Utsunomiya)		12/10/97	1.36	6751
★	P/1997 T3 (Lagerkvist-Carsenty)	17.3	3/10/98	4.2	6754
★	P/1997 V1 (Larsen)	11.0	9/15/97	3.3	6767
	134P/1997 X2 (Kowal-Vávrová)	15.6	11/18/98	2.6	6784
	135P/1998 B1 (Shoemaker-Levy 8)	7.5	12/10/99	2.7	6821
★	P/1998 G1 (LINEAR)	42.0	11/16/98	2.13	6863
★	C/1998 H1 (Stonehouse)		4/14/98	1.49	6883
★	C/1998 J1 (SOHO)		5/8/98	0.15	6894
★	C/1998 K1 (Mueller)		9/1/98	3.4	6908
★	C/1998 K2 (LINEAR)		9/1/98	2.32	6915
★	C/1998 K3 (LINEAR)		3/7/98	3.5	6916
	136P/1998 K4 (Mueller 3)	8.7	3/20/99	3.0	6919
★	C/1998 K5 (LINEAR)		7/17/98	0.96	6923
	137P/1998 K6 (Shoemaker-Levy 2)	9.4	2/6/00	1.87	6928
★	C/1998 M1 (LINEAR)		10/29/98	3.1	6940
★	C/1998 M2 (LINEAR)		8/13/98	2.7	6949
★	C/1998 M3 (Larsen)		7/19/98	5.8	6951
★	C/1998 M4 (LINEAR)		12/2/97	2.5	6953
★	C/1998 M5 (LINEAR)		1/24/99	1.75	6959
★	C/1998 M6 (Montani)		10/15/98	6.0	6960
	138P/1998 O1 (Shoemaker-Levy 7)	6.9	8/15/98	1.70	6979