INTERNATIONAL COMET QUARTERLY

Whole Number 119 JULY 2001 Vol. 23, No. 3

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SMITHSONIAN ASTROPHYSICAL OBSERVATORY
60 Garden Street · Cambridge, MA 02138 · U.S.A.

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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/icq/icq.html). In early 1997, the *ICQ* published a 225-page *Guide to Observing Comets*; this edition is now out of print, but a revised edition is under preparation.

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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This issue is No. 119 of the publication originally called *The Comet* (founded March 1973) and is Vol. 23, No. 3, of the *ICQ*. *[ISSN 0736-6922]*

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CORRIGENDA

• In the January 2001 issue (*ICQ* 117), p. 28, new observer CRE02, *for* Claudio Cremaschi, Italy *read* Claudio Cremaschini, Pompiano (Brescia), Italy

• In the January 2001 issue (*ICQ* 117), p. 4, final paragraph, second line, *for* during a break in at *read* during a break at

Correlation Between Visual Magnitudes and the Outgassing Rate of CO in Comets Beyond 3 AU*

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Abstract. Since its first detection at radio wavelengths in comet 29P/Schwassmann-Wachmann in 1993, the outgassing of CO has been observed as the likely mechanism to sustain activity in comets beyond 3 AU from the sun. A sensitive search for CO in five comets showing sustained activity beyond that distance has been conducted. The comparison between the outgassing rates of CO (Q_{CO}) and the heliocentric magnitudes ($H_\Delta = m_1 - 5 \log \Delta$) of these comets shows a strong linear correlation for the two long-period comets well detected in CO, namely C/1995 O1 (Hale-Bopp) and C/1997 J2 (Meunier-Dupouy). The inferred correlation formula, $\log(Q_{CO}) = 30.0 - 0.29\ H_\Delta$, is not followed by 29P, which is very different and/or belongs to another distinct group of dust-poor comets that may have a larger outgassing rate of CO for a given magnitude H_Δ. The slope of the formula, "−0.29", is likely to be less comet-dependent and might be used to infer activity indexes (n) for distant comets. Given the current performances of the submillimeter-wavelength radio telescopes, CO could be detected in distant comets (heliocentric distance r = 3 to 30 AU) brighter than m_1 = 13 to 14, provided that it is responsible for their observed activity.

1. Introduction

One of the key problems in cometary astronomy is to connect the readily available total visual magnitudes (m_1) to physical quantities, for any given comet of interest. Indeed, for the purpose of planning professional observations, one would be interested in having the most recent quantitative information on each comet concerning its activity or mass-loss rate (dust- and gas- production rates). Previous work (*e.g.*, Jorda *et al.* 1992) has established relationships between the outgassing rate of water and the heliocentric magnitude ($H_\Delta = m_1 - 5 \log \Delta$, corrected for the comet-earth distance, Δ). My study now aims to extend this kind of correlation to heliocentric distances (r) beyond r = 3 AU. Farther than 3 AU from the sun, cometary activity is still frequently observed, but cold temperatures do not allow water sublimation to be efficient enough to sustain such activity. Since 1994, submillimeter observations have enabled us to measure the production rate of CO in several distant comets, which will be compared to the visual magnitudes measured at the same time.

2. CO in comets

The thorough chemical investigation of comets in recent decades (Bockelée-Morvan *et al.* 2000; Crovisier *et al.* 2000) has given us a better idea of the chemical content of the cometary ices.

Water is the main constituent, but other more volatile species like CO, CO_2, CH_3OH, CH_4, H_2CO, and H_2S have abundances relative to water that can reach or exceed 1%. Among them, CO (and to a lesser extent CO_2; Crovisier *et al.* 1999a, 1999b) can be considered as a major species with an abundance up to 25%. Being much more volatile than water, CO is likely the main gaseous species to escape from cometary nuclei far from the sun. Recent observations have, however, shown significant differences between comets, with CO/H_2O ratios in the coma close to the sun ranging from $< 2\%$ to $> 20\%$.

The long-term investigation of the activity of comet C/1995 O1 (Hale-Bopp), which is rather rich in CO ($\sim$ 20% relative to water, near perihelion), has shown that the sublimation rate of CO is overtaking that of water beyond r = 3-4 AU (Biver *et al.* 1997, 1999a; Figure 1 of this paper). This was expected, as the sublimation of pure water ice is expected to be significant only when $r < 3$ AU, while CO could still sublimate in the coldest part of the inner solar system (up to r = 50 AU) — although the mechanism for releasing CO, likely partially trapped in water ice, is not fully understood.

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* Written as a detailed version of a paper presented at the IWCA II, Cambridge, England, 2001 Aug. 14-16.

[1] Astronomie Radio Planétaire, Extragalactique, cométaire, Galactique, Et Stellaire

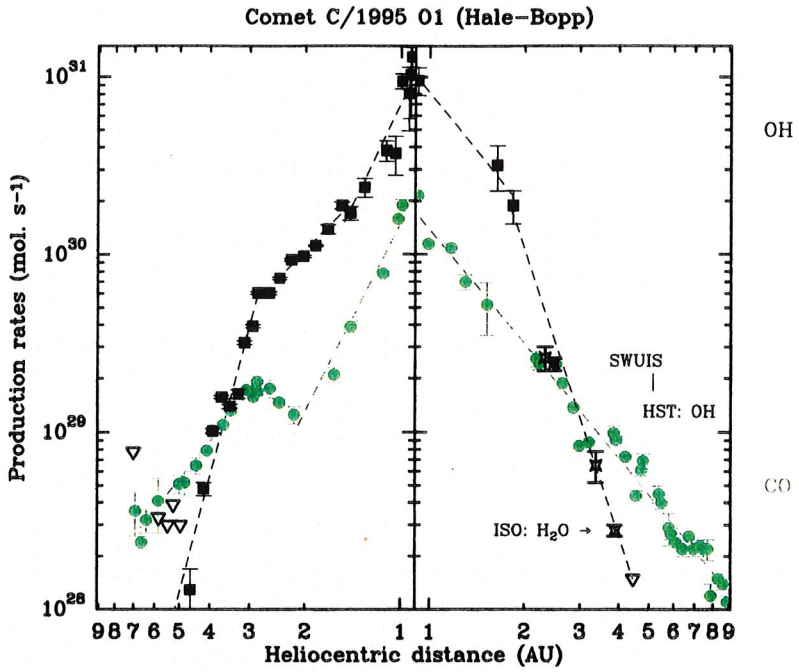

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Figure 1 (above). Evolution of the OH and CO production rates in comet C/1995 O1 (Hale-Bopp) versus time and heliocentric distance (left: pre-perihelion; right: post-perihelion). Circles represent CO, and squares represent OH, production rates from observations at Nançay (Biver et al. 1999a, 1999c). Crosses represent post-perihelion observations from space, as follows: Southwest Ultraviolet Imaging System (OH at 2.3 AU; Stern et al. 1999); Hubble Space Telescope (OH at 2.5 and 3.4 AU; Weaver et al. 1999); Infrared Space Observatory (H_2O at 3.9 and 4.6 AU; Crovisier et al. 1999b). Triangles are upper limits for OH or water-production rates (the water-production rates differs from those of OH by only 10%).

Figure 3 (below). Plot of the CO-production rates (or upper limits: downward-pointing triangles) versus heliocentric magnitudes for five comets observed at $r > 2.8$ AU.

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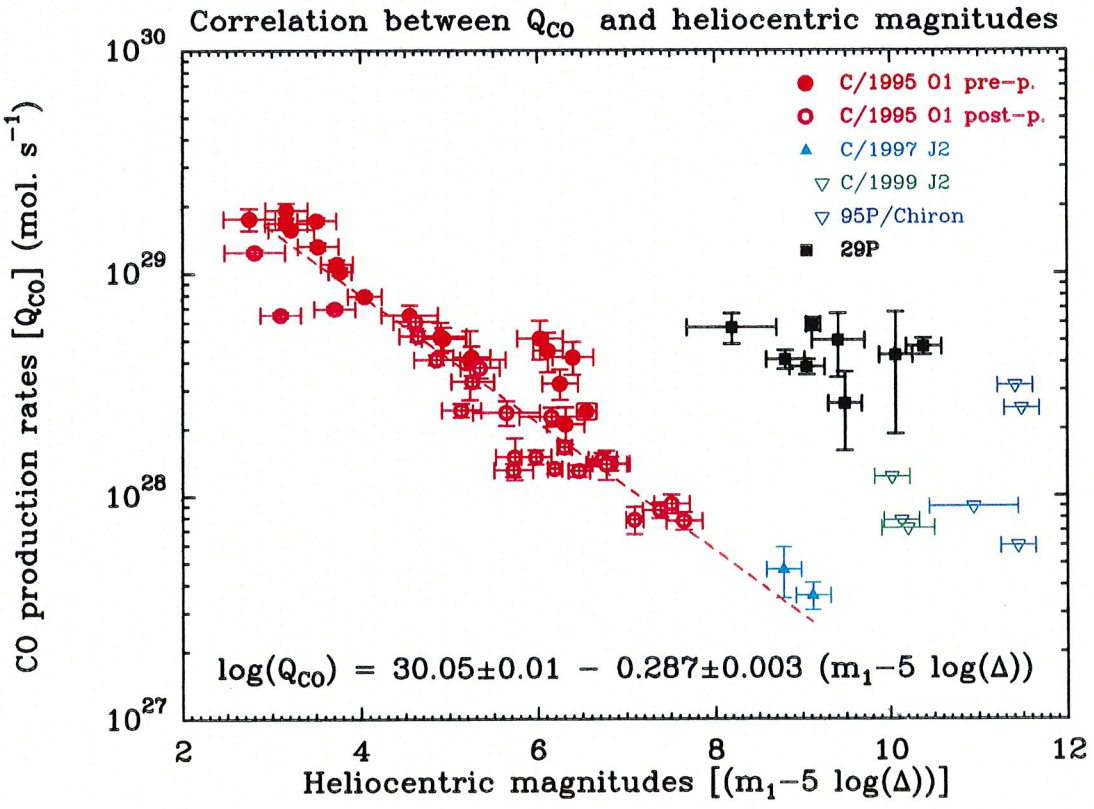


3. Production rates of water and CO

3.1. Spectroscopic observations

Most stable molecules like H_2O or CO are observable in the infrared to millimeter range (1μm to 3mm wavelength). A poly-atomic molecule can be in several discrete energy states following quantum theory. It stores energy in rotation and vibration of its atoms bindings and these energy levels are characterized by one or several integer quantum numbers. The energy step between two vibrational energy levels is about two orders of magnitude larger than between two rotational energy levels, and corresponds to the energy of infrared photons versus sub-millimeter to millimeter photons for rotational energy steps. What we observe are the photons emitted by molecules losing energy when they go down one step (in most cases) in energy level. The lowest energy level (of vibration or rotation) is called the ground level and corresponds to the minimum quantum number(s) (0 in many cases). Otherwise we talk about excited states and a molecule can be both in vibrational and rotational excited state. This makes the infrared spectrum usually more complex due to the large number of transitions possible, while sub-millimeter spectra only show transitions between rotational energy levels in the ground vibrational state. Also the simpler the molecule structure is (like CO), the simplest its energy diagram is (fewer quantum numbers needed to describe it).

Also to be in a given excited state, the molecule first needs to gain energy: either via the absorption of a photon (e.g. emitted by the Sun) or through collisions with other molecules: in a local equilibrium case the gas temperature will then characterize the distribution of the molecules on the various energy states.

There are several direct and indirect ways of measuring the water-production rate. Until recently, it has nearly been impossible to observe water vibrational (infrared) or rotational (submillimeter) transitions from the ground, because the earth's atmosphere contains water vapor and is opaque at these frequencies.

The Infrared Space Observatory (ISO) has been able to observe several of these lines in a few comets during its 30-month lifetime (Crovisier *et al.* 1999a, 1999b). Also recently, some specific vibrational lines of water have been observed in some bright comets in the infrared from a high-altitude dry site like Mauna Kea, at frequencies where atmospheric absorption is small (Dello Russo *et al.* 1997).

Most molecules are broken apart into radicals and atoms by the solar ultraviolet photons in a few hours at 1 AU. Water molecules photo-dissociate into OH + H in 90% of the cases, as a first step. The final photodissociation result is O + 2H. OH-radical lines have been observed for more than two decades either in the near-ultraviolet (*e.g.*, from space by the International Ultraviolet Explorer and Hubble Space Telescope) or at the radio wavelength of 18 cm. At such radio wavelengths, the atmosphere is totally transparent, and OH is observed with radio telescopes such as that at Nançay in France (*e.g.*, Bockelée-Morvan *et al.* 1990). Hydrogen atoms have been recently observed in detail in the ultraviolet at 121.6 nm (Lyman-α line) by the Solar Wind ANisotropies (SWAN) experiment aboard the SOHO spacecraft (Bertaux *et al.* 1998; Combi *et al.* 2000). The conversion of the production rates inferred for these "daughter" species OH and H into the outgassing rate of water is $Q_{H_2O} = 1.1\ Q_{OH} = 0.5\ Q_H$.

Due to the presence of some CO in the earth's atmosphere, CO infrared lines can be observed from the ground only if the velocity of the comet relative to the earth is large enough. The telluric absorption lines are relatively narrow, and a "Doppler-shift" (displacement of the cometary lines, thanks to the Doppler effect) of a few tens of km/sec allows ground-based observations. In the millimeter to submillimeter range, the atmospheric transparency is generally better, although the shorter wavelengths require drier conditions, requiring high altitude (*e.g.*, Pico Veleta, Spain, at 2900 m, or Mauna Kea at 4100 m). In this wavelength range, we observe the transitions between rotational energy levels characterized by consecutive quantum number J, belonging to the ground vibrational state of the CO molecule. CO is also observed in the ultraviolet, but excitation processes are more complex and some of these CO lines are sensitive to the product of photo-dissociation of CO_2.

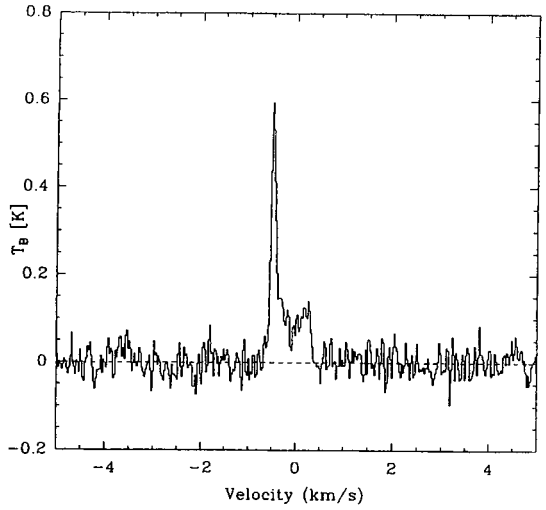
We will focus here on data from submillimeter observations of the CO transitions $J = 1 \rightarrow 0$ at 2.6 mm [later called CO(1-0)], $J = 2 \rightarrow 1$ at 1.3 mm [CO(2-1)], and $J = 3 \rightarrow 2$ at 0.87 mm [CO(3-2)]. Since the first detection of the CO(2-1) line in comet 29P at 6 AU from the sun in 1993 (Senay and Jewitt 1994), these lines have proven to be the best and easiest way to detect this molecule far from the sun. Indeed, cometary outer comae are usually very cold, especially at $r > 3$ AU (10-30 K) and submillimeter observations can sample "cold" gas. In contrast, other wavelengths (ultraviolet or infrared) require a significant amount of solar radiation (*i.e.*, being closer to the sun) to excite the observed transitions.

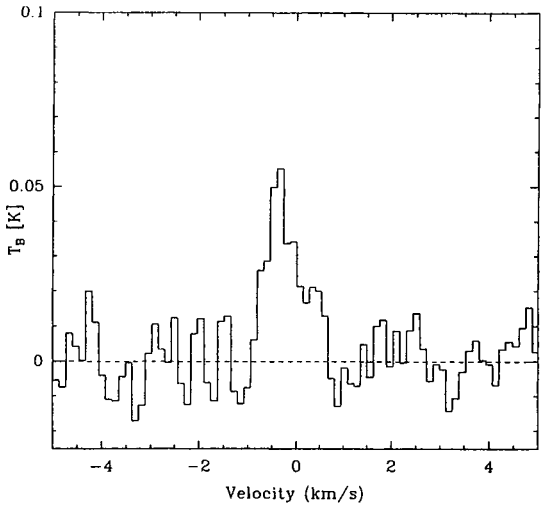
In addition, spectra at radio wavelengths are obtained with a very high spectral resolution, which are converted into Doppler velocities of the molecules relative to the cometary nucleus. They provide us with key information on gas dynamics: its expansion velocity and outgassing pattern. We often observe an asymmetry with a larger outgassing towards the sun, as can be deduced from most of the spectra like those in Figure 2. The simultaneous observation of several lines [*e.g.*, CO(1-0), CO(2-1), and CO(3-2)] — namely in comets C/1995 O1 and 29P (Biver *et al.* 1999a; Crovisier *et al.* 1995) — also yields essential information on the gas temperature.

3.2. Computation of outgassing rates

At radio wavelengths, a blackbody radiation spectrum follows the Rayleigh-Jeans approximation, which states that the energy radiated is proportional to its temperature. We use this approximation to express radio line intensities in degrees Kelvin (K). There are different "temperature" scales related to the exact beam pattern (equivalent to the diffraction pattern of an optical device) of the radio telescope. The "main-beam brightness temperature" scale is used here (Figure 2).

The conversion of the line-integrated intensity into the CO-outgassing rate, Q_{CO}, is done in several steps, summarized here:





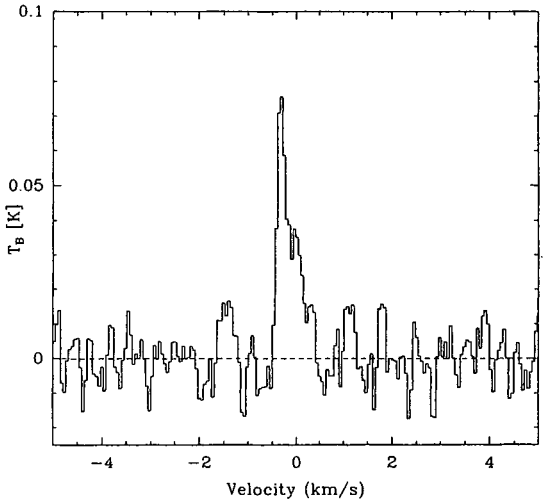


Figure 2. Sample of radio spectra of CO lines at submillimeter wavelengths: 29P/Schwassmann-Wachmann at 230.5 GHz, CO(2-1) line, with the Institut de RadioAstronomie Millimétrique 30-m telescope in Spain, July 1994-Sept. 1996 (Crovisier et al. 1995; Biver 1997), upper left; C/1997 J2 at 345.8 GHz, CO(3-2) line, with the 15-m James Clerk Maxwell Telescope in Hawaii on 1998 July 8.6, upper right; and C/1995 O1 at 230.5 GHz, CO(2-1) line, with the 15-m Swedish ESO Submillimetre Telescope in Chile, May-June 1999 (Biver et al. 1999c), right. The frequency (horizontal) scale is converted into Doppler velocities with respect to the nucleus. The intensity is expressed in main-beam brightness temperature (T_B). Spectra of 29P and C/1995 O1 are the result of the integration of several days of observations within the date interval given. The spectra show a clear asymmetry favoring larger outgassing rate towards the observer (and sun) — i.e., at negative velocities.

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(text continued from page 87)

- The use of the "Haser model" (Haser 1957), which describes the gas density, $n_{\rm CO}$, versus the distance, R, to the nucleus of the comet as:

$$n_{\rm CO}(R) = \frac{Q_{\rm CO}}{4\pi R^2 v_{\rm exp}} \exp\left(\frac{-R}{v_{exp}\tau_{\rm CO}}\right).$$

This formula assumes a stationary regime at a constant radial-expansion velocity, $v_{\rm exp}$, and CO expanding from the nucleus. The photodissociative lifetime of CO, $\tau_{\rm CO}$, is proportional to the square of the heliocentric distance (r^2) and is so long for this molecule ($>$ 3 months at r = 3 AU) that it can nearly be considered as infinite.

- The determination of the relative population, $p_J(R)$, of the different energy levels (J) of the molecules throughout the coma; *i.e.*, the fraction of the molecules that are on the given energy states J, which uses the information on the gas temperature (see section 3.1). The energy radiated in the J–J-1 transition is proportional to p_J in the first approximation.
- The volume integral — of the density multiplied by the population profile, weighted (multiplied) by the beam pattern of the radio-telescope, $\eta(\rho)$ — is computed.[2] This angular sensitivity[3] is typically of circular gaussian shape with a full-width-at-half-maximum (FWHM) sensitivity θ_B = 10″ to 1′. Typically

$$\eta(\rho) = \frac{1}{2\pi\sigma_B^2} \exp\left(\frac{-\rho^2}{2\sigma_B^2}\right), \quad \text{with } \sigma_B = \frac{\Delta \tan(\theta_B)}{2\sqrt{2\ln(2)}}.$$

[2]Note that the two-dimensional integral of $\eta(\rho)$ itself is equal to 1.0, so that this function 'beam pattern' can also be considered as a weighting function.

[3]$\rho = R\sin(\phi)$ being the projected radius on the sky, where ϕ (called "co-latitude" in spherical coordinates) is the angle subtending vectors **D** and **R**, with **D** on the z axis pointing towards the earth/observer and **R** being the vector comet → M, where M is a point at distance R from the comet's nucleus in the coma

And the volume integral to compute the line intensity is

$$\int\int\int n(R)p_J(R)\eta(\rho)dV = \int_{R=0}^{\infty}\int_{\theta=0}^{2\pi}\int_{\phi=0}^{\pi} n(R)p_J(R)\eta[R\sin(\phi)]R^2\cos(\phi)d\theta d\phi dR$$

In this first description we also assume spherical symmetry of the coma. Further details can be found in Crovisier (1987) and Biver *et al.* (1999b), and the main points to note are:

- The modeling is fairly simple, and inferred CO-production rates are not very sensitive to the various parameters (v_{exp} and gas temperature, which are estimated directly from observed lines), within acceptable ranges or uncertainties.
- The CO lines are optically thin, which implies that Q_{CO} is proportional to the integrated line intensity, and modeling the lines shapes usually produces good fits to the observations.
- On the other hand, radio observations are like single-pixel "blind" observations: for observations of the CO(2-1) line, the gaussian beams have FWHM values of only 10″ to 30″, depending on the radio telescope. There are no "finder-scope" optical tracking options, making such observations very sensitive to ephemeris and pointing uncertainties (at best, around 2″).

Besides the limit of the signal-to-noise ratio (S/N) of the observations themselves, I estimate that the uncertainty in the derivation of production rates of CO due to the modeling is below 15% — assuming that CO is a parent molecule (none is coming from an extended source in the coma; cf. DiSanti *et al.* 1999).

4. Correlation with visual magnitudes

Up to the year 2000, CO has been securely detected in three comets at $r > 3$ AU (29P, C/1995 O1, and C/1997 J2; Figure 2), and searched for in a few other comets. The lowest upper limit given for comet C/1999 J2 (Skiff) actually corresponds to a 3.5σ marginal signal, mostly coming from the June 1999 part of the integration, but not confirmed anywhere else or at any other opportunity. Comet C/1997 J2 was securely detected twice, in March and July 1998 at the James Clerk Maxwell Telescope (JCMT) on Mauna Kea at $r = 3.05$ and 3.27 AU, respectively. The observations of C/1995 O1 cover a 4-year-long monitoring, as presented at the "Asteroids, Comets, Meteors" meeting at Cornell University in July 1999 (Biver *et al.* 1999c; see also Biver *et al.* 1997 and 1999a). This monitoring is still going on, and data selected here cover the heliocentric ranges $r = 6.8$-2.8 AU inbound and 2.8-9.2 AU outbound. Comet 29P has also been observed on several occasions between 1994 and 1999, between $r = 6.1$ and 6.3 AU. C/1999 J2 was observed at 7.3-7.2 AU between June 1999 and July 2000, and 95P/Chiron was observed between $r = 8.9$ and 9.5 AU in 1998-1999. Other searches for CO in 95P were done earlier, closer to its perihelion, in June-November 1995 ($r = 8.5$ AU). Unfortunately, most of these observations were close to solar conjunction, and no visible observations were done at the same time. If the comet did not vary much, its interpolated magnitude was around $H_\Delta = 10.8$, but upper limits ($Q_{CO} < 10^{28}$ molecules/sec; Rauer *et al.* 1997) do not yield better constraints. A marginal detection in June 1995 ($Q_{CO} \approx 2 \times 10^{28}$ molecules/sec) claimed by Womack and Stern (1999) was not further confirmed, and lower limits, as those presented here, have been obtained since.

Figure 3 (page 86) shows the CO-production rates deduced from the observations *versus* heliocentric magnitudes. Error bars on the production rates are the result of uncertainties on the line intensities. When no line is detected, the 3σ upper limit is converted into a production rate and represented by a downward-pointing triangle. The visual magnitudes (m_1) were extracted from the *ICQ* archives (issue numbers 91-107). We mainly used those of the most experienced observers (Green 1998) — correcting for, or excluding, those with large systematical biases. We selected m_1 data available during an interval of ± 2 to 3 days around the time of each CO observation. They were then averaged and corrected for the comet-earth distance — *i.e.*, converted into heliocentric magnitudes $H_\Delta = m_1 - 5 \log \Delta$. Their standard deviation is plotted in Figure 3 as horizontal error bars. Some radio observations could not be used, as there were no magnitude estimates available for the same period, the comet being generally too close to the sun in the sky.

We then applied a linear regression, fitting the points corresponding to the data sets (H_Δ, $\log Q_{CO}$) to a straight line. In the fitting process, we assigned a relative weight to each such data set. We investigated three different possibilities and obtained the following results:

- Same weight for all points (or 1 for all):

$$\log Q_{CO} = (29.98 \pm 0.08) - (0.268 \pm 0.015)H_\Delta$$

- Weighting according to the uncertainty on the H_Δ magnitudes; the weights are the inverse squares of the errors:

$$\log Q_{CO} = (30.26 \pm 0.04) - (0.322 \pm 0.007)H_\Delta$$

- Weighting according to the uncertainty on the production rate Q_{CO}:

$$\log Q_{CO} = (30.05 \pm 0.01) - (0.287 \pm 0.003)H_\Delta$$

In these linear regressions, we have taken into account C/1995 O1 and C/1997 J2 data. C/1997 J2 data insignificantly change the fitting from C/1995 O1 data points alone [$\log(Q_{CO}) = (30.06 \pm 0.01) - (0.288 \pm 0.003)H_\Delta$ in the third case]. The two points of C/1997 J2 do not yield a tight constraint: they fall in the continuation of C/1995 O1 observations, within error-bars, suggesting that the formulae might be extrapolated to low production rate and fainter comets. In Figure 3, we give the third formula, for which the linear correlation coefficient is $\rho = 0.93$; it would be 1.0 for points perfectly aligned, and 0.0 if no line could be fitted at all. The 29P data points are clearly offset by either 3.5 magnitudes or a factor 10 in Q_{CO} and cannot be fitted within the previous set of data.

In order to investigate the correlation between CO-production rates and visual magnitudes, one could have followed other steps. Another option could have been to use all magnitudes for a given comet and describe them by a smoothed formula such as $m_1 = H + 5 \log \Delta + 2.5n \log r$, eventually determining several (H, n) parameter sets to describe the brightness evolution of a comet during various time intervals (*e.g.*, C/1995 O1 in July 1995-June 1996, July 1996-Nov. 1996, Dec. 1996-Mar. 1997, and Apr. 1997-1999; see also Kidger *et al.* 1999). This may globally reduce the uncertainty but, on the other hand, smooths out any brightness surge. It is essential to correct m_1 magnitudes for the geocentric distance, but then we could also use $m_1 - 5 \log (\Delta r) = H_\Delta - 5 \log r$, which should reflect the true activity of the comet: the factor 5 log (Δr) comes purely from the dependence of the brightness on the square of the distance. However, in this case, we find that the correlation factor ρ is worse for C/1995 O1 data alone ($\rho = 0.89$), and C/1997 J2 data points are even further away from the fitted line (including them yields $\rho = 0.85$, while we had $\rho = 0.93$ in the previous fit; cf. previous paragraph, above).

To take into account the outgassing of water molecules, one can make a weighted sum of the CO- and water-production rates, Q_{CO} and Q_{H_2O}. Their crude sum represents the total gas-production rate in number of molecules, but the following sums have more physical sense:

- $m_{CO}Q_{CO} + m_{H_2O}Q_{H_2O}$ (*cf.* Table 1), which is the mass-production rate (m_{CO} and m_{H_2O} are respectively the molecular masses of CO and H_2O); or
- $\sqrt{m_{CO}}Q_{CO} + \sqrt{m_{H_2O}}Q_{H_2O}$, which is proportional to the total momentum of the CO + H_2O molecules, if they are decoupled, to which dust particles are more likely to be sensitive.

This is generally relevant to observations of CO-rich comets at $r < 3$ AU, especially when we want to merge the two correlation formulae relating Q_{CO}, m_1 and Q_{H_2O}, m_1 into a single description of the magnitudes based on production rates. (The two formulae would stay valid in the CO or H_2O dominated regimes.) Several of these possibilities were investigated with pre-perihelion observations of comet C/1995 O1 by DiFolco (1997), but they did not provide any large improvement over the simple search for correlation between Q_{CO} and H_Δ that has been done in my work.

In summary, $\log Q_{CO} = (30.0 \pm 0.1) - (0.29 \pm 0.02)H_\Delta$. This formula is established on a fairly comprehensive data set for the two long-period comets that were detected: it covers two orders of magnitudes in production rate [Q_{CO} = (3-200) $\times 10^{27}$ molecules/sec)], a factor of 400 in brightness (H_Δ = 2.5-9), and a factor of 3 in heliocentric distances (r = 3-9 AU).

Previous work on this correlation was done by DiFolco (1997) and by Bockelée-Morvan and Rickmann (1999), yielding a relatively similar formula,

$$\log Q_{CO} = (30.00 \pm 0.04) - (0.256 \pm 0.009)H_\Delta,$$

which was only based on pre-perihelion data of comet C/1995 O1. Table 1 summarizes various correlation laws established between water- and/or CO-production rates and heliocentric magnitudes. We also give the correlation coefficient (ρ) when available, indicative of the quality of the fitting.

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Table 1. *Various correlation formulae between magnitudes and outgassing rates in comets.*

Fitted quantity "Q"	Correlation fit formula	ρ	Origin Cometary data	Reference
Q_{H_2O}	$\log(Q) = 32.4 - 0.4\ H_\Delta$		16 comets	Festou (1986)
Q_{H_2O}	$\log(Q) = 30.6 - 0.25\ H_\Delta$		1P/Halley	Sekanina (1989)
Q_{H_2O}	$\log(Q) = 30.74 - 0.24\ H_\Delta$	0.92	13 comets	Jorda et al. (1992)
Q_{H_2O}	$\log(Q) = 30.49 - 0.24\ H_\Delta$		HB $3 > r_h > 1$ AU	BM & R (1999)
$Q_{H_2O} + Q_{CO}$	$\log(Q) = 30.78 - 0.33\ H_\Delta$	0.98	HB $7 > r > 1$ AU	DiFolco (1997)
$\mu_{H_2O}Q_{H_2O} + \mu_{CO}Q_{CO}$	$\log(Q) = 30.44 - 0.33\ H_\Delta$	0.98	HB $7 > r > 1$ AU	DiFolco (1997)
Q_{CO}	$\log(Q) = 30.00 - 0.26\ H_\Delta$	0.96	HB $7 > r > 3$ AU	DiFolco (1997)
Q_{CO}	$\log(Q) = 30.0 - 0.29\ H_\Delta$	0.94	HB $r \gtrsim 3$ AU and MD	*this paper*
Q_{CO}	$\log(Q) \approx 30.2 - 0.2\ H_\Delta$	0.52	29P and C/1999 J2	*this paper*

Notes: $\mu_{H_2O} = \frac{m_{H_2O}}{m_{H_2O}+m_{CO}}$, $\mu_{CO} = \frac{m_{CO}}{m_{H_2O}+m_{CO}}$; ($m_{CO}$ and m_{H_2O} are respectively the molecular masses of CO and H_2O).
HB = C/1995 O1 (Hale-Bopp); MD = C/1997 J2 (Meunier-Dupouy).
BM & R (1999) = Bockelée-Morvan and Rickmann (1999).

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5. Discussion

One should notice in Figure 3 that, when taking all data together, there is no good correlation ($\rho = 0.61$). The data from C/1995 O1 and C/1997 J2, which are the only well-detected long-period comets, yield a nice linear correlation

between log Q_{CO} and H_Δ. Comet 29P is a peculiar object that could constitute another group of comets (to which comets like 95P or C/1999 J2 cannot yet be excluded). All comets above the dashed line on Figure 3 are either fainter visually or have a larger outgassing rate than expected from the correlation formula (*i.e.*, they have a much lower dust/gas ratio). Indeed, 29P is visually much fainter for a given CO-outgassing rate: the correlation formula based on C/1995 O1 and C/1997 J2 would put it at a visual magnitude between $m_1 = 8$ and 10 every time we observed it at radio wavelengths — which was never in fact the case. Data points are also relatively scattered for 29P reflecting a poor correlation between magnitudes (outbursts) and CO-production rates for this comet. Not many conclusions can be drawn from the observations of 95P and C/1999 J2, but one cannot exclude globally the correlation formula as providing a lower limit for the CO-production rate, given the brightness of the comet.

On the other hand, all investigations yield a similar slope in the correlation formula between log Q and H_Δ: -0.29 ± 0.03. This parameter is likely the more significant — not varying much from one comet to the other, in contrast to the other parameter of linear regression analysis (namely, the value of log Q for $H_\Delta = 0$ in the formulae), which may depend on the dust/gas ratio. The ultimate goal would be to find the scientific justification of this slope parameter. If the total brightness (or energy, E, radiated in the visible) was directly proportional to the total gaseous production rate ($E \propto 10^{-0.4 H_\Delta}$, by definition), the slope would be -0.4. But the light reflected and scattered by the dust coma significantly contributes to visual magnitudes. Several factors that must be taken into account (in the conversion of the production rate into total brightness of the dust coma) depend on the heliocentric distance: illumination ($\propto r^{-2}$), dust velocity and coupling with the gas (whose expansion velocity is $\propto r^{-0.5}$; Biver *et al.* 1999a), and radiation pressure. On the other hand, if we assume an increase in the outgassing rate of CO as r^{-2} (it was actually slightly steeper for C/1995 O1), one would find $H_\Delta \propto 6.9 \log r$, implying a rather low activity index $n = 2.8$ for comets active at $r > 3$ AU.

As a consequence of these correlation formulae, on the basis of assumed evolution of gaseous production rates with heliocentric distances, one could derive activity indices:

- $Q_{CO} \propto r^{-2}$ (which is proportional to the amount of energy received by the comet from the sun) implies $n = 2.8$, when CO is the dominant species.
- For water, at $r <$ 2-3 AU, $Q_{H_2O} \propto r^{-2}$ implies $n = 3.3$ (based on the "$-0.24 H_\Delta$" term in Table 1).
- But we have $Q_{H_2O} \propto r^{-6}$ at $r > 3$ AU in the case of C/1995 O1 (Figure 1). Similar behavior could explain higher values for n ($Q_{H_2O} \propto r^{-6}$ implies $n = 10$) for CO-depleted comets farther from the sun (*e.g.*, short-period comets).

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Table 2. *Using the correlation formula for observations of distant comets.*

Distance ($r \approx \Delta$)	Q_{CO} *inferred*		$<= m_1$ *observed*	Example
13 AU	0.3×10^{27} molec. s^{-1}	15 kg s^{-1}	18	C/1995 O1 in April 1993
9–13 AU	$0.8 - 1.5 \times 10^{27}$ molec. s^{-1}	35–70 kg s^{-1}	15–16	95P/Chiron
8.5 AU	0.1×10^{27} molec. s^{-1}	5 kg s^{-1}	18.5	C/1999 F1 (CATALINA)
7.9 AU	0.5×10^{27} molec. s^{-1}	25 kg s^{-1}	16	C/1999 S2 (McNaught-Watson)
4.2 AU	0.2×10^{27} molec. s^{-1}	10 kg s^{-1}	16	C/1999 S4 (LINEAR)
	Current 3-σ limit obtained in 5–6 days		$=> m_1$	
3 AU	1.2×10^{27} molec. s^{-1}	56 kg s^{-1}	12.8	
5 AU	2.0×10^{27} molec. s^{-1}	93 kg s^{-1}	13.1	
10 AU	4.5×10^{27} molec. s^{-1}	210 kg s^{-1}	13.4	
20 AU	9.0×10^{27} molec. s^{-1}	420 kg s^{-1}	13.8	
30 AU	14×10^{27} molec. s^{-1}	650 kg s^{-1}	14.0	

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Of key interest concerning a Q_{CO}-H_Δ correlation formula is the obtaining of estimates of gas-production rates (for data analysis and planning purposes) from the visual-magnitude data provided by amateur observations. But in this case, we also rely on the significance of the other parameter of the regression analysis [the value of (log Q) for $H_\Delta = 0$]. As it is more likely to vary from comet to comet (likely higher, as we see for 29P), it also means that comets might be more CO-productive for a given magnitude than anticipated. Table 2 gives the 3σ limit [*i.e.*, the value of the radio signal below which any line detection cannot be secured ($S/N = 3$)], converted into CO-production rates, that can currently be achieved with radio telescopes. From the correlation formula (or lower limit on Q_{CO} that it would yield for a given H_Δ), if we translate this Q_{CO} into visual total magnitudes (assuming $r \approx \Delta$), it means that, in most comets brighter than m_1 = 13-14 anywhere at $r > 3$ AU, a CO signal should be detectable — provided that their activity is governed by CO sublimation. In the near future, the Atacama Large Millimeter Array (ALMA) radio telescope should improve this detectability by nearly a factor 10, implying a gain of 3.5 magnitudes, thus putting many of the distant comets

discovered every year within reach. Table 2 summarizes examples of comets recently observed and active far from the sun, and the application of the correlation formula to the current radio telescopes' performances.

6. Acknowledgments

Most of the CO observations of comet C/1995 O1 are the result of a worldwide effort to undertake a long-term monitoring. I am grateful to all the people involved in this large collaboration: D. Bockelée-Morvan (who also supported the work done on this subject by E. DiFolco, on which this paper is partially based), J. Crovisier, E. Gérard, P. Colom (France); A. Winnberg, H. Rickman, M. Gunnarsson (Sweden); F. Rantakyrö (Chile); D. C. Lis, J. K. Davies (USA); and many others that I may forget (Biver *et al.* 1999a, 1999c). I would also like to express special thanks to D. Bockelée-Morvan, J. Crovisier, and D. W. E. Green for their fruitful discussions to improve the paper.

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CCD Photometry of Comet C/1995 O1 (Hale-Bopp): 1995 - 2000*

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Abstract. Some 360 nights of CCD V-band photometry of the inner region (34″) of comet C/1995 O1 (Hale-Bopp) were carried out over an interval of 4.47 years, beginning when the comet was at heliocentric distance r = 7.1 AU, continuing in to r = 1.02 AU, and ending finally at r = 10.3 AU. Before perihelion, the magnitude brightened fairly steadily, with power-law exponent n = 2.55, and — as has been shown elsewhere (Liller 1997) — a well-established 20-day (± 5 days) periodicity persisted for a few months in late 1995. Following perihelion, the character of the light curve changed dramatically. The rate of fading was characterized at first by n = 4.46, but after passing r = 2.5 AU, the comet's brightness decreased irregularly at a rate of n ≈ 2.5, with the fading interrupted by at least five spectacular outbursts. The projected velocities of the outward flow of material ranged from 62 to 217 m/sec. After perihelion, the brightness of the quiescent comet averaged ≈ 0.18 magnitude fainter than before perihelion.

Introduction.

Shortly after the discovery of comet C/1995 O1 (Hale-Bopp), the author, having at his full-time disposal a fast Schmidt camera equipped with a CCD, embarked on a systematic program of broadband V photometry. The camera, a Celestron 0.2-m $f/1.5$ system designed for photography, had been provided to the author by NASA as a part of NASA's International Halley Watch (see Niedner and Liller 1987 for a description of the program and sample photographs). It has since been on indefinite loan to the author with the proviso that it be used in part for comet research, and is now installed in the author's private observatory in Viña del Mar, Chile. The CCD is an SBIG ST-5 camera having a TC-225 chip with 10-micron pixels; it is mounted at the "Newtonian focus" of the Schmidt camera. At the focus, a pixel measures 6″.8 × 6″.8; the field dimensions are 36′ east-west by 27′ north-south. In the light path is a minus-IR filter (Corion NR-400), chosen after much experimentation to produce a high-throughput passband with an effective wavelength close to that of the standard V system. Its long wavelength cut-off is at ≈ 7200 Å. Measurements of standard stars showed that, at a typical air mass of around 1.3 in the relatively humid atmosphere of the coastal location, the deviations from true V magnitudes over a wide range of $B-V$ colors were never more than a few hundredths of a magnitude (see Liller 1997 for a sample calibration curve).

Observing Program.

Observations were made on most reasonably clear nights when the author was at home, beginning 1995 August 3. This translates into occasional absences of a few weeks at a time, and otherwise an average of three times a week in the southern summer months, and once or twice a week in the winter, with somewhat poorer coverage when the comet was

* Written as a detailed version of a paper presented at the IWCA II, Cambridge, England, 2001 Aug. 14-16.

in the pre-dawn sky owing to frequent morning fog. Before the availability of magnitudes from the Hipparcos and Tycho projects, magnitudes were determined by observing standard stars and well-photometered cluster stars located nearby, but since then, there have nearly always been several stars in the CCD frame with accurately known V magnitudes. So that the signal from stars as bright as 8th magnitude would not be saturated, individual exposure times were never longer than about 10 seconds, and from 8 to 25 frames were co-added so that the total number of photons recorded from the comet would be great enough to insure accuracies of a few hundredths of a magnitude.

Using the SBIG software, one can select analyzing squares measuring 20″, 34″, 48″, 61″, and 75″ on a side. Because of the relatively strong light pollution from the nearby population centers, and because the comet spent much of its time in and near crowded Milky Way fields (and the Large Magellanic Cloud), it was decided that the observations would, at least for this report, be reduced using the 34″ aperture rather than one of the larger apertures. The individual unpublished magnitudes are being published in this issue of the *International Comet Quarterly*[1]; a description and analysis of these observations follows.

Pre-perihelion behavior.

Following the procedure outlined by Morris and Hanner (1993), the broadband V magnitudes, V_{bb}, were converted to V_o magnitudes by removing the effect of the changing earth-comet distance with the expression $V_o = V_{bb} - 2.5 \log \Delta$. The comet's pre-perihelion light curve appears in Figure 1, together with a selection of visual-magnitude estimates taken from the *IAU Circulars*. A similar curve, but using $V_{bb} - 5 \log \Delta$ for the ordinate, has been published and discussed elsewhere (Liller 1997), but for the sake of convenience — and since a different reduction procedure is followed here — it is felt desirable to include the revised light curve in this report. Notably, it was found that during the first four months after discovery, when $\log r > 0.75$, a discrete Fourier-transform analysis showed that the comet brightness varied periodically with $P = 20 \pm 5$ days with a full amplitude of ≈ 0.20 magnitude. A similar periodicity had been reported by others (Sekanina 1995; Jorda *et al.* 1997). However, during later months, no periodicity could be detected in the photometric data.

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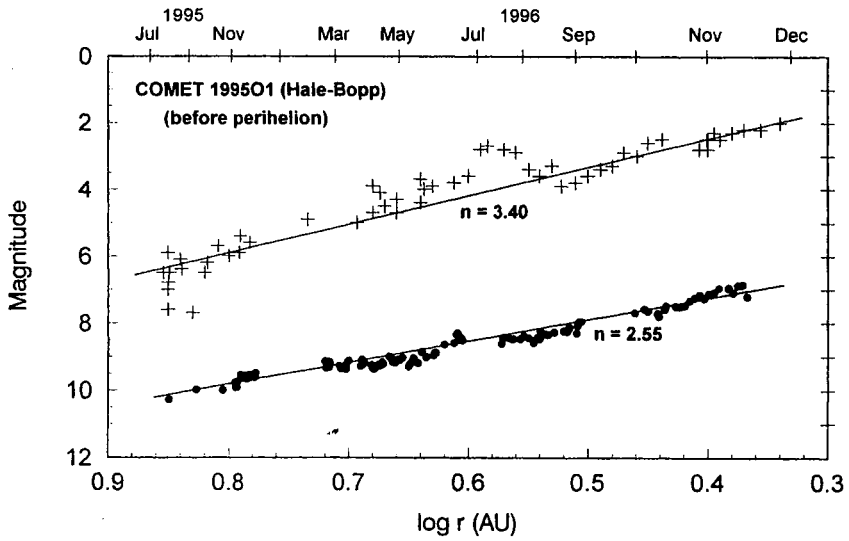

Figure 1. Heliocentric magnitudes, V_o, of the inner region of comet C/1995 O1 before perihelion passage (filled circles). The magnitudes were measured with a CCD using a 34″ square aperture with a broadband V filter. Representative heliocentric visual magnitudes taken from the IAU Circulars are plotted on the same scale (plus signs). A least-squares straight-line fit through the CCD observations is also shown; the location of the straight line through the visual observations was estimated by eye.

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[1]Editor's note: Those magnitudes made by Liller during 1995 Aug. 2-1996 Nov. 19 and published in his 1997 paper (pp. 1507-1508), which were given there to hundredths of a magnitude, have all been added directly into the *ICQ* archive without republication, though with magnitudes rounded to tenths (in the *ICQ*'s usual fashion of "rounding even"), because the estimated errors were stated in the paper to be generally ± 0.03 to 0.12 mag, and sometimes as much as ± 0.2 mag). The previously unpublished magnitudes by Liller (spanning 1997 Apr. 25-2000 Jan. 21), which appear in the tabulation of observations later in this same issue of the *ICQ*, were thus also rounded to tenths of a magnitude.

A least-squares fit to the CCD data points of Figure 1 shows that V_o brightened at the rate $n = 2.55$, and that the data points are never more than 0.5 magnitude from this straight line. However, it should be remembered that "numerous observers ... reported steady, strong jetting activity from both visual and CCD observations" in mid-1996 (cf. *IAUC* 6463), and outbursts were reported optically in September of that year (see, *e.g.*, Schulz *et al.* 2000). For reference, a straight line with $n = 3.40$ has been put through the visual estimates.

Post-perihelion behavior.

Following perihelion passage, the variation in the CCD brightness took on an entirely different nature, as the light curve in Figure 2 shows. Again, selected visual observations have been included. At least five outbursts are evident, and they will be discussed in the next section.

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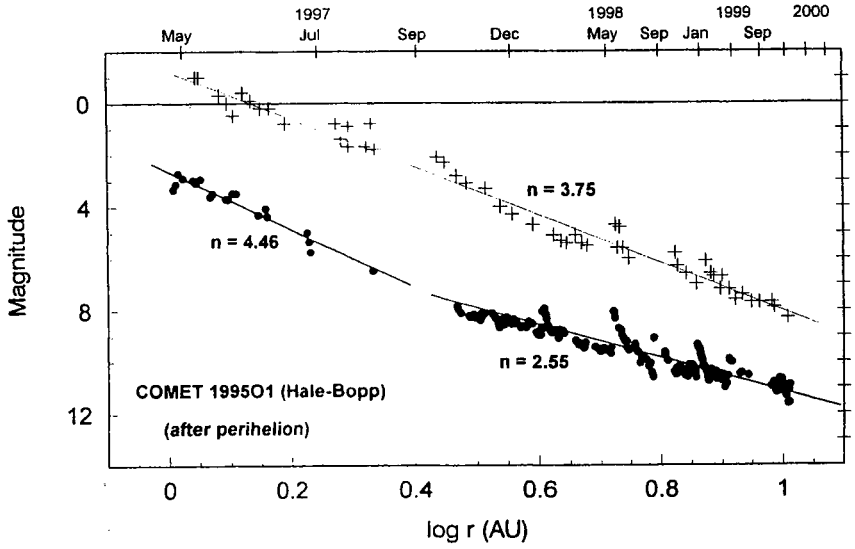

Figure 2. Heliocentric magnitudes of the inner region of comet C/1995 O1 after perihelion passage. The plotted quantities are the same as in Figure 1. However, the line extending from 0.4 < log r < 1.012 is the same least-squares straight line that appears in Figure 1 — indicating that the comet, when quiescent, was running approximately 0.18 magnitude fainter than before perihelion.

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During the first several months after perhelion, the magnitudes showed a clear change in rate of fading. A least-squares fit to the data in the range $0 < \log r < 0.4$ yields $n = 4.46$ — substantially steeper than the brightness behavior before perihelion. It should be noted, however, that the several pre-perihelion points at $\log r > 0.4$ do seem to show an upturn (see Figure 1), and with r now < 2.5 AU, the increasingly prominent appearance of emission bands would be expected to cause the comet to brighten more rapidly. But by $\log r > 0.45$, the brightness of the comet underlying the outbursts decreased at a slower rate; an eye-estimate of the slope yields $n \simeq 2.5$, effectively in agreement with the pre-perihelion slope.

To compare the pre- and post-perihelion behaviors at $r > 0.45$ AU, the least-squares fit to the pre-perihelion data is reproduced in Figure 2 as the straight line labelled $n = 2.55$. As can be seen, after perihelion, the quiescent comet was running ≈ 0.18 mag fainter than before perihelion.

The post-perihelion outbursts.

The characteristics of the five major post-perihelion outbursts are summarized in Table 1. Here `r` and `D` are the heliocentric and geocentric distances to the comet in AU, `dm` is the amplitude of the outburst in magnitudes (as measured through the 34″ × 34″ aperture), `dt` is the number of days since previous outburst, and `t1` is the number of days for the outburst to fade 1.0 magnitude. Owing to interruptions in the observing, the rate of decline of the third and fifth outbursts could not be determined precisely.

The fourth outburst was also noted by Garradd (1998), who reported "a remarkable 3-mag brightening of the nuclear region of this comet between his CCD observations on Dec. 11 and 21"; and by Pearce (1998), observing visually, who found on Dec. 18.78 that "at low power the nuclear condensation contributed 90-95 percent of the light" and "by Dec. 25.75 the condensation had enlarged and dispersed though the coma". Later, Pearce (1999), and Griffin and Bos (1999), reported an apparent outburst in mid-October 1999 when $\log r = 0.98$. No clear outburst was observed then in Viña del

TABLE 1. Major Post-Perihelion Outbursts.

#	Date (yyyy mm dd)	r (AU)	D (AU)	dm (mag)	dt (days)	t1 (days)
1	1998 01 11	4.03	3.88	0.8	-	19
2	1998 05 13	5.26	5.44	1.6	122	21
3	1998 08 17	6.15	6.30	1.4	96	< 39
4	1998 12 20	7.23	7.28	1.1	125	25
5	1999 04 14	8.16	8.21	0.7	115	< 76

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(text continued from page 95)

Mar; however, the coverage was sporadic during that time.

The largest and best observed outburst, number 2 (Table 1), occurred 97 hours after the previous observation, and Figure 3 shows its light curve in detail. Here the rapid increase in brightness is well emphasized, as is the slow exponential decay. It is possible that a small outburst occurred around log $r = 0.75$. In Figure 4 we see an enlargement of CCD frames, with the outburst image subtracted from the comet image taken 18.9 days later; the two images were centered on the pixel of highest counts. The inital outburst is the small sharp-edged black circle (diameter $\approx 42''$), with the much expanded outburst appearing as an irregular white cloud situated primarily to the north-northeast of the nucleus. (The direction to the sun is in the direction 33° west of north.) The images show that the brightness of the central $6''.8$ (26800 km) pixel increased by 2.6 magnitudes. The disturbance propagated outwards at a projected velocity of $\approx$ 62 m/sec. The noticeable asymmetry of the outburst, relative to the center of the coma, became apparent about a week after the outburst.

Analyses of outbursts numbers 1 and 4 yield projected propagation velocities of $\approx$ 171 and $\approx$ 217 m/sec, respectively. Because of the spotty coverage, no attempt was made to derive expansion velocities of the other two outbursts. Moreover, it may well be that there was an additional outburst several weeks after the occurrence of outburst number 3.

Uncertainties in these velocities arise primarily from the difficulty in determining precisely the location of the outermost edge of the expanding cloud. The estimated uncertainties in the values given above range from $\pm$ 20 m/sec for the first outburst to $\pm$ 40 m/sec for the fourth.

The expansion velocities derived here, 62 to 217 m/sec, are very similar to those reported for the pre-perihelion outbursts of September 1996, namely from 112 to 225 m/sec (see Larson *et al.* 2000; Schultz *et al.* 2000; Tao *et al.* 2000).

Conclusions.

More than 360 nights of broadband-V CCD observations were made of comet C/1995 O1 during the more-than four years that the comet was followed with a dedicated telescope from Viña del Mar. Comparison of the pre- and post-perihelion light curves (Figures 1 and 2) shows striking differences: before perihelion the rise in brightness was relatively steady, but after perihelion five major outbursts were observed.

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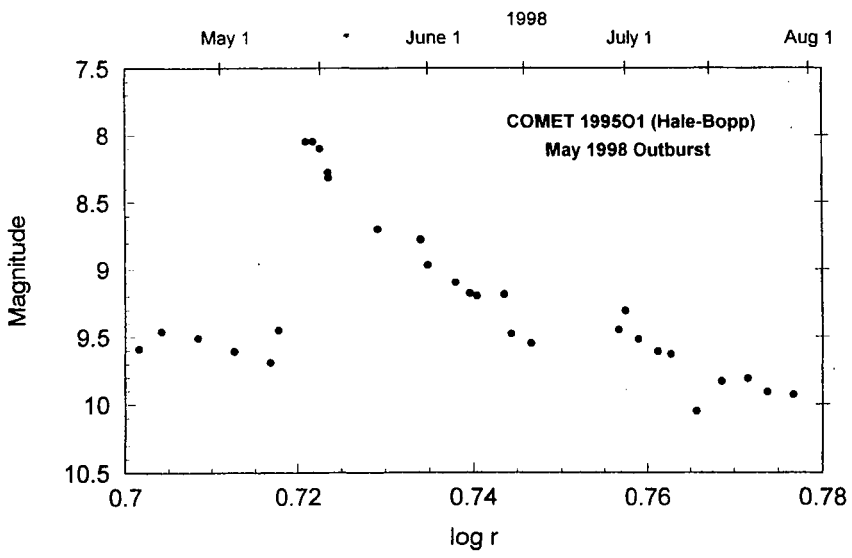

Figure 3. The light curve of the outburst of May 1998. The plotted quantities are the same as in Figure 1.

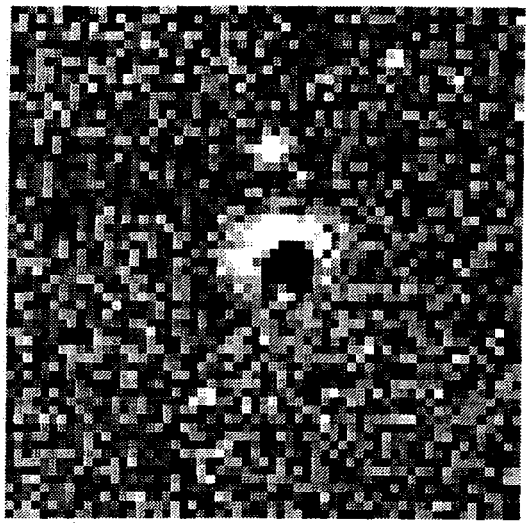

Figure 4. The CCD V-band image of comet C/1995 O1 taken during the outburst of 1998 May 13, subtracted from an image of the comet taken 18.9 days later. The outburst appears as the irregular black area near the center, with the white cloud of expanding material appearing mainly to the north and northeast. The frame measures 6'.5 square; pixels are 6".8 square. North is up; east to the left.

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(text continued from page 96)

The approximately equal spacing of the outbursts, the roughly equally strong flare-ups, and the similar expansion velocities strongly suggest that the outbursts were caused by recurrent activity in the nuclear region of the comet rather than the result of collisions with asteroidal objects. In many ways the behavior of comet C/1995 O1 resembles that of comet 29P/Schwassmann-Wachmann, where outbursts can be as large as five magnitudes with expansion speeds of 100 to 500 m/sec (see Hughes 1975). However, there is one important difference: for comet C/1995 O1, the outbursts occurred over a wide range of heliocentric distance, while the solar distance of comet 29P varies only from 5.76 to 6.48 AU. Although it is generally accepted that these outbursts result from the sudden release of dust, it would be interesting to have spectral information on or shortly after the above-listed dates of outburst.

Acknowledgements.

The author thanks Drs. Jack Brandt and Mal Niener of NASA for providing the telescope and the CCD equipment, Gonzalo Alcaino for both moral and financial support, and two anonymous referees for their always useful comments.

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Φ Φ Φ

Tabulation of Comet Observations

CORRIGENDA

• In the July 1994 issue, page 98, last line, observation by BAR06 for comet McNaught-Russell 1993v (= 1993 Y1), *for* 1994 04 31.90 *read* 1994 04 30.90

• In the April 1998 issue, page 60, the observer codes KAD and KAD01 were reversed; KAD refers to M. Kh. Kadyrov, and KAD01 refers to B. N. Kadomskyi.

• In the October 2000 issue (*ICQ* 116), pp. 142-143, the aperture of the SOHO observations (that is, those listed under "observers" CHE03 and BIE01) ***should read*** 1.0 R (for the 96-mm aperture of the C3 coronagraph). Also, all of the magnitudes were made not in the *V* passband, but with the C3 clear filter (which transmits light over 400-850 nm), though *V* magnitudes were used from comparson stars taken from the Hipparcos Input Catalogue (thus, all the reference codes ***should read*** HI, ***not*** HV). Furthermore, the **instrument code** has been revised from R to G, which is a new code representing a coronagraph (which has a relatively large occulting disk obstructing the sun and thus reducing the effective aperture to something < 96 mm, in this particular case).

• In the April 2001 issue, page 70, the observation by BAR06 for comet C/2001 A2 on 2001 04 14.86 is to be deleted.

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As inferred from the comment on page 27 of the January 2001 issue, the April 2001 issue contained descriptive information for tabulated data published in the January issue.

The tabulation below includes another set of data from observers in the former Soviet Union, as compiled by Alexandr Baransky (see his article on page 53 of the April 1998 issue, and the first batch of his tabulated work published in the same issue of the *ICQ*). Baransky notes that he continues to work on 20th-century data from observers in the former U.S.S.R. for eventual publication in the *ICQ*. His efforts are greatly appreciated. Due to additional editorial efforts needed for the descriptive information that accompanies the tabulated data of old former-U.S.S.R. data in this issue, that descriptive information will appear in the October issue.

New magnitude-method code. The letter G has been assigned to note a CCD magnitude with a Corion NR-400 'minus-infrared' filter, as used by William Liller, noting that it "gave a very nice broadband-*V* passband" (see his article on page 93 of this issue). Note also that former MM code K has been changed to a special-notes code.

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

Readers of the "Descriptive Information" section of comet observations in the *ICQ* will be aware of the numerous abbreviations used herein. For the reader's convenenience, here are some definitions of the most commonly used abbreviations: × = magnification; ⊥ = perpendicular to; w/ = with; w/o = without; w/in (or w/i) = within; m_1 and m_2 = total and nuclear magnitudes; W = west, westwards, or western; E = east, eastwards, or eastern; N = north, northwards, or northern; S = south, southwards, or southern (also, SW = southwest, NNE = north-northeast, etc.); p.a. = position angle (with 0° = north, 90° = east, etc.); MM = magnitude method (utilizing the 1-letter *ICQ* codes); ref. = source for comparison-star magnitudes (utilizing the 2-letter *ICQ* codes); hr = hour(s), min = minute(s), sec or s = second(s); alt. = altitude (referring to an object in the sky, and the distance in degrees above the observer's horizon; elevation is used in the *ICQ* to refer to an observers geographical location above sea level); cond. = (usually nuclear) condensation (or sometimes simply 'condensed'); obs. = observation(s) or observed. Other letter/number codes are used as for the tabulation (as instrument codes and observer codes), and of course symbols are used for degrees (°), arcmin (′), and arcsec (″). Note that binoculars are given in the descriptive text with their apertures in mm (*vs.* cm in the tabulated data). Descriptive information is ordered as are the tabulated data: by comet (long-period comets, then numbered short-period comets, then short-period comets with orbital periods < 30 yr); within each comet, the data are ordered chronologically by date. Information for a single observation time by a single observer are ended with the observer code (or observer's name) in square brackets, followed by a period; sentences or phrases of information for a comet on a single night by a single observer are broken up by semi-colons or dashes (rather than by periods, which are used to denote the end of a given 'date/observer' item.

◇ *Comet C/1995 O1 (Hale-Bopp)* ⟹ 1997 Apr. 25-2000 Jan. 21: these previously unpublished data supplement those made by Liller during 1995 Aug. 2-1996 Nov. 19 and published in his 1997 paper (see footnote 1 to the paper on this comet by Liller in this same issue of the *ICQ*, page 93); standard stars all within 22′ of the comet (selected w/o regard to color), but the comparison-star magnitudes were taken from Bill Gray's "Project Pluto" Guide 7.0 catalogue (the "default" magnitudes; in this case, usually stars brighter than 10th mag, which are Tycho-1 Johnson *V* magnitudes, according to Gray; fainter stars in Guide 7.0 tend to be HS magnitudes); as described above and on page 93, these are "broadband-*V*" magnitudes, the effective aperture being a 35″ × 35″ square (5 × 5 pixels) for each magnitude [LIL].

◇ *Comet C/1999 H3 (LINEAR)* ⟹ 2001 Feb. 20.80: this and all other obs. by this observer in this issue were made w/ SBIG ST-8 CCD camera w/ KAF1600 chip and no filter [TIC].

◇ *Comet C/1999 J2 (Skiff)* ⟹ 2001 May 22.24: central cond. of dia. < 2″ and mag 16.7; prominent diffuse tail showing an embedded, narrow core positioned along the initial third of the tail's W edge; comet's apparent motion was measured as ≈ 32″/hr in p.a. 265° [ROQ]. June 11.17: central cond. of dia. of > 2″ and mag 17.4; the generally symmetrical coma merged into a diffuse tail that gently curved E throughout its recorded length [ROQ]. July 16.14: central cond. of dia. < 3″ and mag 17.4; although irregularly bounded, the low-brightness coma was generally symmetrical; the tail was very faint and diffuse w/o apparent internal structure; the comet's apparent motion was measured as ≈ 20″/hr in p.a. 217° [ROQ].

◇ *Comet C/1999 S4 (LINEAR)* ⟹ 2000 July 22.91: bad weather (clouds); moderate light pollution [RIB].

◇ *Comet C/1999 T1 (McNaught-Hartley)* ⟹ 2001 Jan. 24.08: low alt. [SVE01]. Mar. 7.30: w/ 35-cm *f*/5 L (60×), coma dia. 3′, DC = 3 [MAI]. Apr. 4.74: w/ 8×80 B, m_1 = [7.5 (coma dia. = ! 3′); strong moonlight, low alt. [SVE01]. Apr. 13.00: w/ 25.4-cm L, dust tail > 16′ long was clearly visible; exposure times of comet images "generally 60-180 sec, depending on the tracking accuracy of instrument, sky conditions, and brightness and motion of the comet; the images have generally been flat-field-corrected"; SBIG ST-6 CCD (peaks in the red) [GRA04]. Apr. 24.99, May 3.86, 30.88, June 16.02, 21.02, 24.99, 26.00, 28.03, and 30.03: m_1 measured in square aperture of size 1′.60 × 1′.60 [HOR02]. Apr. 24.99: second tail 4′ long in p.a. 250° [HOR02]. Apr. 27.86 and May 13.94: near bright star [HOR02]. May 1.82, 3.86, and 30.88: moonlight [HOR02]. May 3.86: second tail 2′.2 long in p.a. 241° [HOR02]. May 10.48: GUIDE 6.0 software used for comparison-star mags [NAG08]. May 19.55: GUIDE 7.0 software used for comparison-star mags [YOS02]. May 28.55 and July 14.59: GUIDE 6.0 software used for comparison-star mags [TSU02]. June 16.02: broad tail > 12′ long spans p.a. 181°-258° [HOR02]. June 21.02: broad tail 14′ long spans p.a. 214°-252° [HOR02]. June 24.99: broad tail > 13′ long spans p.a. 210°-250° [HOR02]. June 26.00: broad tail 11′ long spans p.a. 192°-250° [HOR02]. June 28.03: broad tail > 6′ long spans p.a. 188°-250° [HOR02]. June 30.03: broad tail 12′ long spans p.a. 200°-254° [HOR02].

◇ *Comet C/1999 T2 (LINEAR)* ⟹ 2001 Apr. 12.97: faint, quite narrow tail; see camera remarks for C/1999 T1 (2001 Apr. 13.00) [GRA04]. Apr. 28.00: near bright star [HOR02]. Apr. 29.85, May 10.92, 11.96, 13.96, 20.95, 23.94, 24.94, 25.94, June 12.96, and 24.88: m_1 measured in square aperture of size 1′.60 × 1′.60 [HOR02]. May 1.84 and 30.92: moonlight [HOR02]. May 10.92: second faint tail 1′.2 long in p.a. 161° [HOR02]. May 11.96: second faint tail 1′.1 long in p.a. 170° [HOR02]. May 12.66, June 11.56, 26.54, and July 10.54: GUIDE 6.0 software used for comparison-star mags [TSU02]. May 13.96: second faint tail 1′.1 long in p.a. 164° [HOR02]. May 19.94: m_1 measured in square aperture of size 1′.40 × 1′.40 [HOR02]. May 20.95: second tail 1′.5 long in p.a. 175°; coma was apparently elongated from p.a. 57° to 175° [HOR02]. May 24.94: second broad tail 1′.8 long in p.a. 104°; very bright jet 0′.6 long in p.a. 270°, much fainter jet 0′.5 long in p.a. 200°; brightest point of the coma was asymmetrically placed; the shift of the brightest point from the geometric center of the coma was ≈ 5″ in p.a. ≈ 50° [HOR02]. May 25.94: second broad tail 1′.0 long in p.a. 115°; jet 0′.5 long in p.a. 248° [HOR02]. June 12.96: elongated coma in p.a. ≈ 180° [HOR02]. June 15.91: second tail 1′.2 long in p.a. 153° [HOR02]. June 25.93: second tail 1′.2 long in p.a. 115° [HOR02].

◇ *Comet C/1999 Y1 (LINEAR)* ⟹ 2001 Feb. 21.75: tail appeared quite narrow and somewhat curved, was also visible on two images taken shortly afterwards; low alt. and twilight (solar elongation 29°); see camera remarks for C/1999 T1 (2001 Apr. 13.00); precise astrometry provided [GRA04].

◇ *Comet C/2000 W1 (Utsunomiya-Jones)* ⟹ 2000 Dec. 28.61 and 2001 Jan. 4.35: observations with C3 coronagraph aboard SOHO; magnitude measured from a 3-pixel-by-3-pixel area, where each pixel is a square with each side measuring 56″; the uncertainty on the Jan. 4.35 magnitude is given as ± 0.5 mag; on Dec. 28.61, the very thin tail pointed approximately radially away from the sun [BIE01].

◇ *Comet C/2000 WM$_1$ (LINEAR)* ⟹ 2001 Mar. 21.89: eastward motion apparent during 1 hr; see camera remarks for C/1999 T1 (2001 Apr. 13.00) [GRA04].

◇ *Comet C/2000 Y2 (Skiff)* ⟹ 2001 June 11.50: GUIDE 7.0 software used for comparison-star mags [NAK01].

◇ *Comet C/2001 A2 (LINEAR)* ⟹ 2001 Apr. 12.83: "very low (alt. 4°), strong twilight (hence the faint m_1 and small coma dia.); I just managed to image the comet before it set behind the local horizon"; see camera remarks for C/1999 T1 (2001 Apr. 13.00) [GRA04]. Apr. 13.85: w/ 25.6-cm L (169×), central cond. of mag 13.4 [BIV]. Apr. 25.46: obs. through brief break in rain clouds; substantial increase in brightness over the last few days [PEA]. Apr. 27.93: w/ 20-cm L (160×), coma dia. 2′ [YUM]. Apr. 30.49: moonlight starting to affect sky brightness at comet's position [PEA].

May 1.46, 4.38, 6.40, 7.44, 9.44, June 3.38, 12.82, July 2.69, 3.69, 11.69, and 12.65: moonlight [MAT08]. May 1.49: "comet's brightness has again increased considerably over the past 24 hours; coma surface brightness appears much brighter tonight, despite the brighter sky due to moonlight" [PEA]. May 2.25, 3.25, 4.25, 5.25: moonlight [LIN04]. May 2.50: "moonlight is starting to seriously affect the sky background now; comet does not appear as bright as last night's obs." [PEA]. May 2.91 and 3.92: moonlight [DES01]. May 3.49: "central cond. has taken on a greater prominence (however, this may be pronounced from the moonlit sky background)" [PEA]. May 5.69: despite bright moonlight, comet is prominent, but tail is not detectable [BEG01]. May 6.40: w/ 20-cm L, tail > 30′ long in p.a. 120°; coma appears to have a slight extension towards p.a. 15°; "nucleus appears intact at 160×" [MAT08]. May 8.69 and 9.71: w/ 20-cm L, outer coma is faint and diffuse, inner coma is bright w/ evidence of stellar core; w/ 10×50 B, coma appears much sharper [COO02]. May 9-11: moonlight; comet has undergone another brightness increase of around 0.9 mag in < 48 hr [PEA].

May 9.71: "central cond. is elongated N-S, ⊥ the plasma tail (due to the split nucleus?)" [BEG01]. May 10.25, 12.25: low alt. [LIN04]. May 10.40: w/ 20-cm L, ion tail > 45′ long in p.a. 123° [MAT08]. May 10.71: comet distinctly brighter this evening, but little evidence of a tail, even though the naked-eye mag limit is ≈ 6.2 [BEG01]. May 11.36: "comet was faintly but easily seen w/ naked eye where stars of mag 5.9 and 5.7 were invisible (and one of 5.5 could only be seen w/ difficulty; stars of mag 4.7 and 5.0 appeared relatively faint, but were more readily seen than comet — though only marginally better for star of mag 5.0); w/ 25×100 B, comet was a very impressive object w/ straight and narrow ion tail of relatively high intensity (especially close to coma)" extending 0°.87 in p.a. ≈ 125° [SEA]. May 11.40: another significant 0.7-mag brightening in the past 24 hr [MAT08]. May 11.70: "comet continuing to brighten (possibly another outburst in progress?); very condensed star-like central cond. surrounded by a large, diffuse outer coma" [BEG01]. May 12.88: w/ 23-cm L (47×), central cond. very bright; 30′ ion tail [DES01]. May 13.38: hazy sky; "comet visible to naked eye (though only w/ certainty using averted vision), while a star of mag 4.7 at same alt. was visible w/ some difficulty (and one of mag 5.0 at greater alt. was barely visible)"; w/ 25×100 B, coma dia. ≈ 5′, DC = 5, 1°.5 tail in p.a. 130° [SEA]. May 13.70: coma less condensed than before, and outer coma more diffuse; no sign of starlike center in 20- or 40-cm telescopes; comet definitely much brighter [COO02]. May 14.36: w/ 25×100 B, "comet was a glorious sight with narrow ion tail, intense for ≈ 1°, traced for ≈ 4° in p.a. 133°, emerging from central region of coma; w/ 25.5-cm L (71× and 114×), central cond. seemed elongated ≈ ⊥ to tail p.a. but did not appear double; tail may have been glimpsed via naked eye for ≈ 1°, but presence of γ Lep made it difficult to be sure" [SEA].

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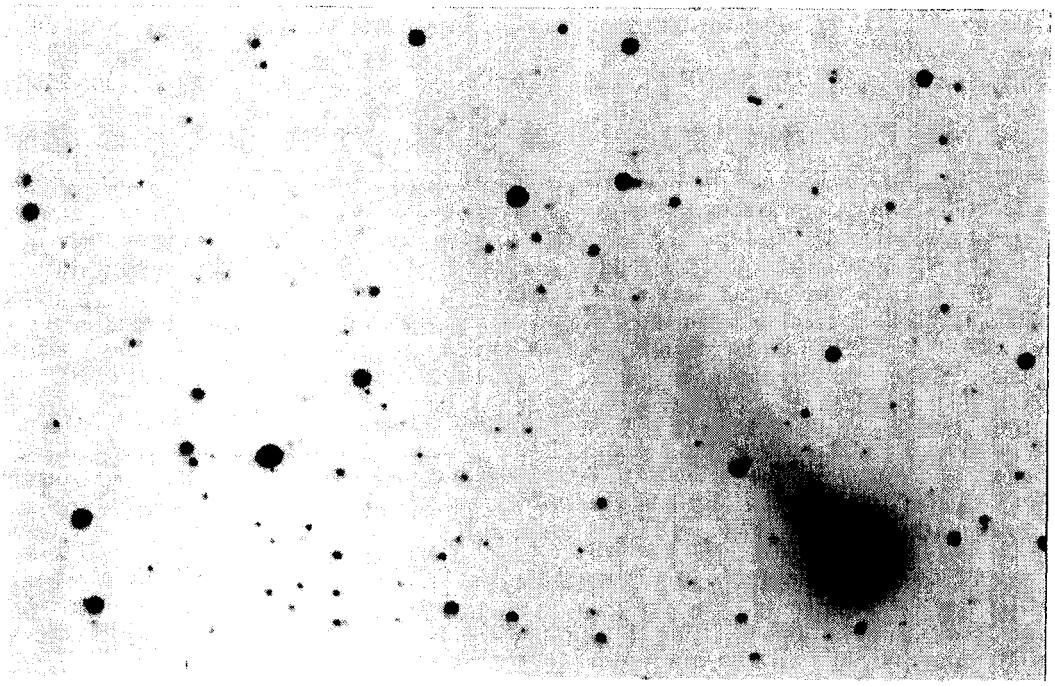

Unfiltered CCD image of comet C/2001 A2 taken on 2001 May 17.006 UT with a 21.5-cm f/2.9 Schmidt telescope by Victor Angel Buso at Rosario, Argentina. His CCD camera has a Kodak KAF 0400 chip. Sum of two images of 3-min exposure each; image size is 0°.7.

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May 15.36: w/ 25×100 B, "tail at least 2° long (bright near coma but w/ fainter portion ≈ 1° from coma); a diffuse 'cloud' was visible, detached from tail, at ≈ 1°.5 from coma (this was visible previous evening, but then seemed more continuous with tail); this was apparently a disconnection event"; tail p.a. = 128° [SEA]. May 15.41: w/ 20-cm L, ion tail more prominent and extends > 1°.2 in p.a. 135° [MAT08]. May 15.71: low alt., but still impressive; very condensed central cond. [BEG01]. May 16.36: w/ 25×100 B, "tail appeared broader and less intense than on previous two evenings and less concentrated toward center" — could be traced for ≈ 4° in p.a. 130° [SEA]. May 16.70: comet appears stellar to the unaided eye (faintest naked-eye star of mag 5.5) under slightly hazy conditions [BEG01]. May 16.71: coma has a distinct blue-green color [BEG01]. May 16.72: "same estimate in 10×50 B; comparison stars 10 Lep and HD 39070" [PRI04]. May 17.35: w/ 25×100 B, tail extends ≈ 4°.3 in p.a. 135°; "more intense than on previous night and more concentrated toward center again; similar to appearance on May 14; spectacular sight in binoculars" [SEA]. May 17.42: w/ 25×100 B, tail length > 1°.6 [MAT08]. May 17.70: "comet has faded slightly for me, but tail is more prominent" [BEG01]. May 18.70: "tail very pronounced tonight" [BEG01]. May 19.70: w/ 20-cm L, outer coma more diffuse but with very pronounced central cond. and sharp central point; tail appears shorter but wider than previously [COO02]. May 19.70: "tail even more prominent this evening, w/ the first degree or so being conspicuous" [BEG01]. May 19.89:

fan tail spanning 40° toward p.a. 138°; w/ 23-cm L (47×), central cond. very bright [DES01]. May 20.40: w/ 25×100 B, tail length > 3°.3 [MAT08]. May 20.42-20.46: w/ 30-cm L, "eight streamers ≈ 15′ long fanning out from nucleus between p.a. 70°-190°; tail appears forked out to ≈ 1°.5 from nucleus; the N fork extends faintly to 4°.0 length, and its extremity may curve slightly to the E(?); a search for nuclear fragments at 180× showed nothing except a few background stars"; w/ 7×50 B, "tail seems to end quite abruptly" at 1°.5 length; w/ 15-cm L, "forking in the tail more evident; S fork (possibly dust tail?) and most of tail ends at ≈ 1°.5-2° from nucleus, while N fork (ion tail?) extends faintly to 3°; comet visible via naked eye to alt. ~ 4°" [FAR01]. May 20.70: distinct stellar central cond. [BEG01]. May 20.89: central cond. very bright [DES01]. May 21.35: "conditions relatively poor; a star of mag 4.9 at similar alt. to comet was just visible via naked eye when in focus, and other stars of mag 4.7 were visible w/ difficulty when out-of-focus (w/o glasses); comet was visible w/ some difficulty in focus" [SEA]. May 21.40: w/ 25×100 B, tail length > 5°.3 (w/ the first 3° being fairly obvious, and the remainder very tenuous, w/ the last half-degree slightly more observable); a 5-min minute photo taken with a Canon 50-mm *f*/1.8 lens (+ Fuji Superia 800 film) captures > 6° of tail [MAT08]. May 21.41: seen briefly through small gaps in clouds [FAR01]. May 23.69: "slight haze this evening, which may be affecting the visibility of the tail; comet very close to comparison star of mag 5.1 and to M79; w/ 6-cm R (64×), I kept getting the impression w/ averted vision that two stellar points are visible in the central cond. — the fainter slightly E of the brighter" [BEG01]. May 24.69: "remarkable increase in brightness; through a 15-cm *f*/7 reflector (50×), the leading edge of the coma is sharply pronounced; the inner coma is diffuse but bright with a distinctly elongated central cond.; a jet of material leads from the coma to form a distinct spike in the tail" [BEG01]. May 24.70: "hazy sky, but comet clearly brighter and coma much more diffuse, though w/ sharp central point in 20-cm L; no sign of tail in haze" [COO02]. May 24.70: "first 30′ of tail prominent" [PRI04]. May 25.70: "coma larger and more diffuse, suddenly condensed in center w/ sharp central point; comet definitely fainter than last night" [COO02]. May 26.68: comet alt. < 15° [PRI04]. May 26.69: low alt.; tail faint but quite broad near the coma [BEG01]. May 27.68: very low alt. [BEG01]. May 28.93, June 5.91, 6.92, 7.40, 10.41, 13.39, 16.41, July 14.34, and 28.14: moonlight [MAN04]. May 28.93: moonlight [SAN13]. May 29.36: "conditions very poor; a quick obs. between rain clouds, but comet still strongly suspected via naked eye" [SEA]. May 29.68: "comet low now in evening, and the tail is lost in the haze residual from the grass fires in the area" [COO02]. May 30.35: "comet seen relatively easily with naked eye, despite moonlight and light pollution from Sydney; stars of mag 5 invisible to naked eye, and one of mag 4.7 only faintly seen, becoming invisible when placed out-of-focus to match comet; using 25×100 B, ≈ 1° of tail visible in bright sky, the S edge appearing more intense and having the appearance of a bright ray" [SEA].

June 2.34: bright moonlight and low alt.; comet was visible using 2.5×25 B, but not with naked eye [SEA]. June 3.38: comet alt. 12° [MAT08]. June 3.83: comet alt. 7° [MAT08]. June 4.14: comet also seen via naked eye, despite low alt. of only 9° over the Indian Ocean; obs. from Margate, KwaZulu Natal, RSA [BOU]. June 4.34: low alt. and very bright sky [SEA]. June 6.91: moonlight [SAN13]. June 11.17: moonlight; only hint of tail visible [BOU]. June 12.82: w/ 7×50 B, ion tail > 2°.5 long; w/ 20-cm L (160×), "nucleus still appears intact" [MAT08]. June 13.17: despite moonlight, the view of the comet is stunningly different from that 48 hr ago; in 7×50 B, the tail is quite bright and can be followed over 7°.2 in p.a. 204°; strongly condensed coma (DC = 7/) is ≈ 12′ in dia. [BOU]. June 13.17-24.12: obs. from southern Africa around time of June 21 total solar eclipse [COM]. June 13.39: clouds [MAN04]. June 13.76: "very conspicuous in last-quarter moonlight, but tail could not be seen w/ certainty via naked eye; tail was faintly visible in 2.5×25 O and for at least 2°.5 in 25×100 B; bright central cond. and coma extended toward E w/ extension of central cond. possibly traced as a brighter segment into the coma; coma had a somewhat 'triangular' shape, and there seemed to be a darker segment on the sunward side of the central cond.; comet had a greenish color, contrasting with the bluish appearance when in the evening sky" [SEA]. June 14.34: w/ 20.3-cm *f*/10 T (80×), coma dia. 20′, DC = 6/ [YUM]. June 14.78: tail possibly glimpsed via naked eye and appeared more readily visible in 25×100 B, being quite narrow and very straight [SEA].

June 16.15: "with the moon down to a 30% crescent this morning, the comet is an easy naked-eye object" [COO02]. June 16.41: moonlight [BUS02]. June 17.32: comet fainter than on previous nights [DES01]. June 17.75: the comet has faded by nearly a magnitude, along with reduced intensity of both the ion tail and nuclear cond.; w/ 25×100 B, the faint ion tail is > 5°.5 long in p.a. 217° [MAT08]. June 17.80: "to the naked eye, this comet is obviously non-stellar, and looks like a slightly smaller and fainter copy of the globular cluster 47 Tuc; this impression is reinforced by the views in 7×50 B, where both objects have a similar color, and the comet's tail is very faint and easily overlooked — the widest part (≈ 10′) of the tail occurs ≈ 1° from the nucleus" [FAR01]. June 18.12: "this is the most condensed coma I have ever seen, w/ almost no drop-off in brightness from center to edge, and a fairly sharp edge like a planetary disk; the tail is currently quite faint but broad; an amazing sight" [BEG01]. June 18.13-21.13: `GUIDE 6.0` software used; obs. from southern Africa during visit to view total solar eclipse [TSU02]. June 18.76: tail ≈ 3° in length, but quite faint in 25×100 B [SEA]. June 18.79: w/ 25×100 B, faint ion tail > 4°.5 long in p.a. 219°; "nucleus appears intact w/ 20-cm L (160×) [MAT08]. June 19.13 and 28.13: obs. from southern Africa [BUS01]. June 19.15: obs. from Nyamapanda, Zimbabwe [COO02]. June 19.77: w/ 25×100 B, ion tail > 3°.5 long in p.a. 222°, seems to be weakening in both length and intensity [MAT08]. June 20.09: from airplane above Zaire [BIV]. June 20.12: "comet impressive this morning; coma very large; tail broad and distinct" [BEG01]. June 20.13: obs. from airplane at 37000 feet over Africa [LIN04]. June 21.09: obs. from Chibombo, Zambia [LIN04]. June 21.11: obs. from Lusaka, Zambia [LUE]. June 21.11: w/ 10.0-cm M (50×), central cond. of mag 10.6; obs. from Chisamba, Zambia [BIV]. June 22.14: "coma much larger, very bright in center, but diffuse at edges; tail distinct for just over 1° and slightly curved, appears rather narrow; obs. from Nyamapanda, Zimbabwe, morning after the total solar eclipse; conditions dark, but sky hazy" [COO02]. June 23.77: w/ 25×100 B, ion tail > 2° long [MAT08]. June 24.12: "although comet has faded slightly, it is rather impressive in terms of the coma size — still highly condensed in the inner two-thirds, fading out slowly in the outer third; (dust?) tail is faint but quite broad w/ a sharp central spike" [BEG01]. June 26.75, 27.75, July 1.74, 2.74, 2.75, 4.75, 11.58, 12.55, 13.60, 14.67, 16.65, 19.54, 20.60, 21.61, 22.58,

23.63, and 24.59: GUIDE 6.0 software used for comparison-star mags [NAG08]. June 26.76 and 27.76: only one nuclear cond. visible (nucleus B; *note that, since no other nuclei were visible for long periods of time, the ICQ is refraining from giving C/2001 A2 a component letter in the tabulations – Ed.*) [KAD02]. June 27.11: tail not visible (naked eye); tail now exceedingly faint but still broad (binoculars) [BEG01]. June 28.05: low alt. [HOR02]. June 29.06: w/ 9×63 B, round diffuse coma, moderately condensed towards center; w/ 20-cm T (50×), no tail visible; at 167×, no false nucleus discernible; comet only 7° above horizon; twilight (sun 14° below horizon) [KAM01]. June 29.69: w/ 25×100 B, 2° ion tail in p.a. 242° [MAT08]. June 30.35: foggy; no sign of a tail except for an elongated coma [MAN04].

July 1.09: w/ 25.6-cm L (169×), central cond. (< 2″) of mag 12.4 [BIV]. July 1.70, 12.58, 15.61, 16.62, and 21.76: GUIDE 7.0 software used for comparison-star mags [MIY01]. July 1.83: w/ 25×100 B, 1° tail in p.a. 238° [MAT08]. July 2.95: w/ 5-cm *f*/9 R (16×), tail > 1° long; twilight, low alt. [FED03]. July 2.96: twilight, low alt.; city lights from Kharkov [SVE01]. July 3.04: interference from setting moon, low alt., twilight [MEY]. July 3.05: w/ 5.0-cm *f*/8 R (30×), coma dia. 13′, DC = 8 [DIE02]. July 3.05: w/ 9×63 B, rather condensed, conspicuous coma, no tail visible; w/ 20-cm T (50×), no tail visible; at 167×, starlike false nucleus of mag 12.5; very transparent sky, beginning twilight (sun 15° below horizon) [KAM01]. July 3.77: CCD frames taken w/ a 60-cm *f*/5.8 reflector show a type-I tail > 7′.1 long in p.a. 242° [NAK01]. July 3.99: w/ 9×63 B, comet a bit less conspicuous than on July 2/3; very faint extension towards p.a. 235°; very tranparent sky, so the moon in Oph (alt. 14°) posed no problems [KAM01]. July 4.04: moon interference; bright disklike center surrounded by faint outer halo; central cond. seemed elongated [MEY]. July 4.71: moonlight; w/ 5-cm R, comet not easy to see, but very large; w/ 25-cm *f*/6.3 T, no stellar cond. visible [YOS04]. July 5.04, 9.04, and 12.04: moonlight [GIA01]. July 5.06: w/ 25.4-cm T (64×), coma dia. 12′, DC = 4, tail > 0°.5 long in p.a. 280° [HOE]. July 5.63: moon 50% eclipsed [MAT08]. July 6.94, 7.94, 8.99, 11.04, 12.02: moonlight [CSU]. July 6.98: moonlight [BAR06]. July 7.96 and 31.94: strong moonlight [BAR06]. July 8.99: other tails 3°.45 long in p.a. 256° and 1°.73 long in p.a. 232° [CSU]. July 9.74, 14.56, and 17.64: GUIDE 7.0 software used for comparison-star mags [WAT01]. July 9.92: w/ 9×63 B, less conspicuous and more diffuse object than six nights before; rising moon caused some brightening of the sky [KAM01]. July 9.96: "comet has significantly faded, not only because of the strong moonlight; I also notice a clear fade of the false nucleus" [HOE]. July 9.97: waning moon only 25° away [MEY]. July 10.67, 12.64, 14.68, 16.70, 18.58, and 24.66: GUIDE 7.0 software used for comparison-star mags [YOS02]. July 11, 12, and 15: CCD images (scale 2″/pixel) taken w/ a 28-cm *f*/3.3 telescope show the comet brighter on July 12 than the previous night, and the inner coma showed on July 12 several features not present on July 11; "several images clearly show the presence of two jet-like features, making an angle of ≈ 90° w/ the tail direction, one for each side (forming a sort of 'T'); images on July 15 show no jets near the nuclear cond. (comet's appearance otherwise quite similar to that on July 12)" [Gianluca Masi, Ceccano, Italy]. July 11.02: 180-sec CCD exposure w/ 40-cm L shows coma dia. > 11′, DC = D5, tail > 27′ long in p.a. 230° [ROD01]. July 11.04: other tails 2°.73 long in p.a. 252° and 1°.73 long in p.a. 200° [CSU]. July 11.91: w/o moonlight, the coma appeared larger than on July 9; false nucleus seems to be clearly elongated [HOE]. July 11.93: w/ 20-cm T (167×), starlike false nucleus of mag 11.0 [KAM01]. July 12.02: other tails 2°.55 long in p.a. 266° and 1°.64 in p.a. 224° [CSU]. July 12.56: outburst [MAT08]. July 12.65: the coma is more pronounced; $m_2 \approx 10.0$ [MAT08]. July 12.92: other tails 2°.09 long in p.a. 266° and 1°.73 long in p.a. 230°; clouds; an arc-shaped 'condensation' appears on the sunward side of the coma [CSU]. July 12.99: comet only faintly seen due to nautical twilight (true solar alt. −8°) [GRA04]. July 12.99: w/ 20.3-cm L (95×), stellar central cond. of mag 11.2 (outburst) [BIV]. July 13.04: outburst [GIA01]. July 13.20: even with suburban light pollution, a hint of a W-pointing tail is glimpsed in 16×80 B [CRE01]. July 13.87: self-made monocular that consists of photographic *f*/2 lens (f = 58 mm) and a microscope eyepiece (f = 8.33 mm) that gives a 'refractor' w/ magnif. 7× [SVE01]. July 13.89: comet seen with the naked eye [TIT]. July 14.03 and 17.95: some faint foreground stars merged with the nuclear cond.; obs. made w/ 0.31-m *f*/2.8 Baker-Schmidt telescope + Hi-Sis 24 CCD (chip Kodak KAF0400) at Remanzacco, Italy [SOS]. July 14.06: w/ 0.23-m (45×), strong central cond.; 3° ion tail spanning 45° toward p.a. 230° [DES01]. July 14.2 and 15.2: 7×35 B used as a monocular for m_1 estimates, and even then, it could not quite be defocussed enough for proper VSS estimation (meaning that the true m_1 is likely up to a few tenths of a magnitude brighter) [GRE]. July 14.22: from dark sky on Spruce Knob, WV, comet was an obvious naked-eye object; w/ 16×80 B, 1°.7 tail in p.a. 230°, slightly curved [CRE01]. July 14.34: clouds [MAN04]. July 14.63 and 20.59: GUIDE 6.0 software used for comparison-star mags [TSU02]. July 14.89 and 15.84: haze [FED03]. July 14.89: w/ 11-cm *f*/7 L (50×), coma dia. 22′, DC = 2/, tails 0°.92 and 0°.83 long in p.a. 95° and 110°; there was a thick gas tail in the 'background' and two dust tails in p.a. 95° and 100° [SVE01]. July 14.91-22.93: obs. during botanical expedition in W Ukraine [BAR06].

July 15-25: "we shot a series of CCD frames (Hi-SIS33 camera, Thomson CCD, w/ 19 μm/pixel, resolution 1″.96/pixel), during the passage of the comet through the earth's orbital plane, w/ a 0.4-m reflector at the Stazione Astronomica di Sozzago; ten frames of 30-sec exposure each were added and treated with a median filter to eliminate the 'noise' of background stars; differences between pictures taken on different dates showed a phenomenon similar to that which we observed (with the same instrumentation) on 1996 Mar. 23 for comet C/1996 B2 — an increase in the coma brightness followed by an increase of the brighteness of the tail and the formation of a shell (anti-clockwise development) around the nuclear region (from July 15 to 20, the shell showed a double spiral and expanded, possibly indicating a slow rotation period — perhaps > 1 day — of the nucleus) [Federico Manzini, Cesare Guaita, Roberto Crippa, and Virginio Oldani, Sozzago (Novara), Italy]. July 14.90: also tails 0°.8 and 0°.5 long in p.a. 345° and 295° [SAJ]. July 14.92: another tail 2°.55 long in p.a. 253° (at 0°.64 from the nucleus, this tail is in p.a. 261°); also tail 2°.91 long in p.a. 230°; arc-shaped 'condensation' as yesterday, but the coma's extension toward the shortest (and faintest) tail is fainter; now the S tail is the brightest and the longest (previously, the middle tail was the most significant one) [CSU]. July 15.03: moonlight [TER02]. July 15.22: almost-stellar cond. to naked eye; still no tail visible to the naked eye, but 2°.0 tail in p.a. 230° visible in 16×80 B [CRE01]. July 15.58: GUIDE 7.0 software used for comparison-star mags [NAG08]. July 15.59: the outburst has quickly subsided; w/ 25×100 B, tail > 1°.5 long in p.a. 225° (the first 30′ being quite bright) [MAT08]. July 15.95: another tail 2°.64 long in p.a. 258° (at 1°.0 from the nucleus, this tail is in p.a. 283°); also tail 3°.10 long in p.a. 231°

(with p.a. hooking to p.a. 264° at 1°.0 from the nucleus); the S tail is the brightest and the longest, while the N one is the faintest and the shortest [CSU]. July 15.99-26.98: obs. affected by nautical twilight (solar alt. −8° to −10°.5 [GRA04]. July 16.07: w/ 20.3-cm L (95×), central cond. of mag 12.4 [BIV]. July 16.19: 12×50 B had detachable right eyepiece for the necessary VSS-method defocussing (for the large size of the comet), so m_1 estimate made with B as monocular; m_1 via VBM method not really practical due to comet's proximity to 6th-mag star (some 10′-20′ away from comet center); w/ 7×35 B, coma dia. ≈ 20′, DC ≈ 3-4; w/ 20×80 B, coma dia. ≈ 12′, DC ≈ 2-3 [GRE]. July 16.20: coma seems a little smaller tonight, both to naked eye and in 16×80 B; tail still about 2°.0 long in p.a. 230°, with ≈ 5° of curvature [CRE01]. July 16.95: w/ 20.3-cm L (95×), central cond. of mag 12.6 [BIV]. July 16.95: w/ 20.0-cm L (42×), weak tail 30′ long in p.a. 215° [SCH04]. July 16.98: at 112× and 172×, "there was a brighter center to the coma, but no false nucleus or strongly condensed 'core' (as was visible a week ago)" [HOE]. July 17.9-18.0: "we took some photos (Fujicolor Superia 400 film) using a 45-mm 1/4.5 camera and a 200-mm f/15 Zeiss R as a guide scope; the 18′ coma (DC = 3/) was seen the best on the photos with 6- and 5-min exposures (dia. ≈ 25′-27′ w/ asymmetry in p.a. 190°-200° [SVE01]. July 18.19: notable drop in brightness in two nights; much more difficult to see now with 7×35 B (DC ≈ 2, coma dia. ≈ 18′) [GRE]. July 18.93: other tails 1°.27 long in p.a. 255° and 1°.64 in p.a. 216° [CSU]. July 19.56: w/ 25×100 B, tail visible for 1° in p.a. 220° [SEA]. July 19.85: "the brighter region faded again since yesterday, and it looked like there were at least two brighter knots within that region" [HOE]. July 19.91: coma slightly elliptical; rather faint, broad tail; w/ 20-cm T (167×), starlike false nucleus of mag 12.5 [KAM01]. July 19.92: w/ 20.0-cm L (42×), weak tail 20′ long in p.a. 220° [SCH04]. July 19.98: comet not visible with the naked eye [COR01].

July 20.03: other tails 2°.73 long in p.a. 279° (at 0°.58 from the nucleus) and 2°.80 long in p.a. 227° [CSU]. July 20.15: 0°.8 narrow anti-tail near p.a. 55°, and 0°.5 parabolic dust tail centered near p.a. 210°; a faint nearly stellar nucleus is visible in 9×34 B (but it contributes little to m_1) and is superimposed on a rather flat coma profile [PER01]. July 20.92: w/ 25.6-cm L (169×), central cond. of mag 13.2 [BIV]. July 20.94: in 25.4-cm J (47×), rather narrow (gas) tail visible, 1°.0 long in p.a. 210°; obs. from Lusaka, Zambia [BOU]. July 21.03-21.11: "comet followed for 2 hr, going through different alignments w/ surrounding stars; no convincing evidence of the anti-tail seen on July 20.15, thus casting some doubt as to its reality (star-alignment effect?); 0°.4 dust tail seems narrower and more intense than on previous night; the nearly stellar nucleus also seems more prominent, but still contributes little to m_1"; in 14×100 B, the dust tail is 0°.5 in p.a. 215° [PER01]. July 21.56: w/ 25×100 B, tail 50′ long in p.a. 212° [MAT08]. July 21.92: coma less condensed than two nights before; w/ 30-cm T (75×), broad tail of length 0°.2 towards p.a. 220°; at 222×, starlike false nucleus of mag 13.5 w/in a small (10″) knot of material [KAM01]. July 21.99: w/ 25.6-cm L (169×), central cond. of mag 13.9 [BIV]. July 22.01: comparison stars SAO 107138 (mag 6.1) and SAO 107181 (mag 7.4) [MAR02]. July 22.65: w/ 25×100 B, tail 45′ in p.a. 210° [MAT08]. July 22.91: coma more condensed than last night, hints of a faint, broad tail towards p.a. 225°; w/ 30-cm T (75×), broad tail of length 0°.2 towards p.a. 225°; at 222×, starlike false nucleus of mag 13.5-14.0; central knot of material considerably fainter and more diffuse [KAM01]. July 24.14: comet only ~ 10′ from 4th-mag star (1 Peg), making m_1 estimate rather difficult [GRE]. July 24.92: w/ 20.3-cm L (95×), central cond. of mag 13.5 [BIV]. July 24.94: in 25.4-cm J (47×), 1°.0 (gas) tail visible in p.a. 207° [BOU]. July 24.94: in 25.4-cm J (47×), 57′ tail visible in p.a. 206° [DIJ]. July 25.08: 180-sec CCD exposure w/ 40-cm L shows coma dia. > 8′.6, DC = D5, tail > 28′.2 long in p.a. 214° [ROD01]. July 25.90: other tails 1°.64 long in p.a. 278° and 1°.73 in p.a. 224° [CSU]. July 25.93: coma less condensed than three nights before; w/ 30-cm T (75×), broad tail of length 0°.1 towards p.a. 200°; at 222×, starlike false nucleus of mag 13.5 w/in a small central cond. [KAM01]. July 25.95 and 25.96: tail not visible through binoculars [COR01, RIB]. July 26.85: other tails 1°.82 long in p.a. 257° and 1°.73 in p.a. 213° [CSU]. July 26.98: comet appeared diffuse and ill-defined; w/ 7×50 B, m_1 = 6.9, dia. = 10′ [GRA04]. July 28.86: other tails 1°.55 long in p.a. 253° and 1°.27 in p.a. 202° [CSU]. July 29.09: w/ 25.6-cm L (169×), central cond. of mag 13.6 [BIV]. July 29.86: other tails 1°.0 long in p.a. 261° and 1°.0 in p.a. 220° [CSU]. July 30.06: w/ 20.3-cm L (95×), central cond. of mag 13.0 [BIV]. July 30.28: strong moonlight [SPR]. July 30.98: visibility improved due to a darker sky (sun 11°.5 below horizon); also seen in 7×50 B [GRA04]. July 31.97-31.98: w/ 7×50 B, appearance similar to cluster NGC 7789 in Cas; nautical-astronomical twilight (sun 12° below horizon) [GRA04]. Aug. 1.09: w/ 20.3-cm L (95×), central cond. of mag 13.4 [BIV].

◇ *Comet C/2001 B2 (NEAT)* ⟹ 2001 May 12.50 and June 11.48: GUIDE 6.0 software used for comparison-star mags [TSU02]. June 11.49: GUIDE 7.0 software used for comparison-star mags [NAK01].

◇ *Comet C/2001 C1 (LINEAR)* ⟹ 2001 May 12.63: GUIDE 6.0 software used for comparison-star mags [TSU02].

◇ *Comet C/2001 K3 (Skiff)* ⟹ 2001 June 27.25: central cond. of dia. < 2″ and mag 16.23; coma appeared generally symmetrical; the comet's apparent motion was measured as ≈ 49″/hr in p.a. 317° [ROQ].

◇ *Comet C/2001 K5 (LINEAR)* ⟹ 2001 May 29.92: images were obtained by Peter Kušnirák at Ondřejov Observatory w/ CCD AP7 + R filter; stellar appearance with faint tail [HOR02]. June 11.60: GUIDE 7.0 software used for comparison-star mags [NAK01].

◇ *Comet 19P/Borrelly* ⟹ 2001 July 24.78: GUIDE 7.0 software used for comparison-star mags [YOS02].

◇ *Comet 24P/Schaumasse* ⟹ 2001 Feb. 21.91 and Apr. 12.89: see camera remarks for C/1999 T1 (2001 Apr. 13.00) [GRA04]. Apr. 24.86: near very bright star [HOR02]. Apr. 29.82: moonlight [HOR02]. May 10.45, 12.48, 19.49, June 11.50, and July 10.48: GUIDE 6.0 software used for comparison-star mags [TSU02]. May 10.47: GUIDE 6.0 software used for comparison-star mags [NAG08]. May 15.18: central cond. of dia. 3″ and mag 15.4; coma appeared asymmetrical in p.a. 90° w/ a short jet noted at p.a. 131°; tail was faint and very diffuse [ROQ]. May 19.51: GUIDE 7.0 software used for comparison-star mags [YOS02]. May 20.90: very faint object; Guide V.7 software used for reference-star mags [DES01]. May 22.93 and 24.94: twilight; comet close to star of mag 11 [BOU].

◇ *Comet 29P/Schwassmann-Wachmann* ⟹ 2001 May 19.73: GUIDE 7.0 software used for comparison-star mags [YOS02]. May 27.77 and July 24.58: GUIDE 7.0 software used for comparison-star mags [NAK01]. June 12.61, 26.58, and July 14.56: GUIDE 6.0 software used for comparison-star mags [TSU02]. June 15.12: very difficult object; small, circular coma [DES01]. July 15.66: outburst [MAT08]. July 22.59 and 24.58: coma extends westward [NAK01].

◇ *Comet 45P/Honda-Mrkos-Pajdušáková* ⟹ 2001 Apr. 13.85: alt. 7°; astronomical twilight; an attempt to observe 45P visually shortly afterwards was unsuccessful (probably due to clouds near horizon); see camera remarks for C/1999 T1 (2001 Apr. 13.00) [GRA04]. Apr. 26.80: twilight [HOR02]. May 10.45, 12.46, and 19.48: GUIDE 6.0 software used for comparison-star mags [TSU02]. May 10.90: twilight; alt. 13°.5 [BOU]. May 11.90: twilight; alt. 14°.5 [BOU]. May 12.90: twilight; alt. 14° [BOU].

◇ *Comet 51P/Harrington* ⟹ 2001 July 1.74: CCD image yields $m_1 = 15.1$, coma dia. 0'.4, diffuse w/ central cond.; faint tail 2' long in p.a. 250°; Syuichi Nakano thinks that this is what was called nucleus A in 1994 (astrometry contributed from obs. code 349) [KAD02]. July 4.77: obs. as on July 1.74; $m_1 = 14.9$, coma dia. 0'.35, faint tail 1' long in p.a. 249° [KAD02].

◇ *Comet 73P/Schwassmann-Wachmann* ⟹ 2001 June 18.6 and 19.6: *R*-band images from the University of Hawaii 2.2-m telescope show the second component located 133".0 ± 0".4 W and 77".1 ± 0".4 S of the photometric center of the main comet; the primary and secondary magnitudes are ≈ 17.72 ± 0.05 and 20.9 ± 0.2, respectively, measured in a 2".6-radius aperture (*B. G. Marsden adds: "So far as I can tell, nucleus C was observed until 2001 Jan. 1, nucleus B until 2000 Dec. 29, and nucleus E until 2000 Dec. 12; then there were single-nucleus observations until 2001 Apr. 28 that come closest to being nucleus C. So I suspect [that Jewitt's] brighter component [is] nucleus C, but an accurate measurement would reduce any ambiguity; it then seems to me that [Jewitt's] fainter component is likely to be nucleus B" – Ed.*) [David Jewitt].

◇ *Comet 74P/Smirnova-Chernykh* ⟹ 2001 May 12.53: GUIDE 6.0 software used for comparison-star mags [TSU02]. May 21.17: central cond. of dia. ≈ 2" and mag 17.1; coma appeared symmetrical w/o obvious internal structure; comet's obs. apparent motion was measured as ≈ 27"/hr in p.a. 110° [ROQ]. May 26.13: central cond. of dia. 2" and mag 16.5; coma appeared symmetrical at all corresponding radial levels; comet's apparent motion was measured as ≈ 12"/hr in p.a. 120° [ROQ].

◇ *Comet 95P/Chiron [(2060) Chiron]* ⟹ 2001 July 14.52: GUIDE 6.0 software used for comparison-star mags [TSU02].

◇ *Comet 110P/Hartley* ⟹ 2001 Apr. 12.91: see camera remarks for C/1999 T1 (2001 Apr. 13.00) [GRA04].

◇ *Comet 149P/Mueller* ⟹ 2001 May 12.74: GUIDE 6.0 software used for comparison-star mags [TSU02].

◇ *Comet P/1999 WJ$_7$ (Korlević)* ⟹ 2001 May 13.49: GUIDE 6.0 software used for comparison-star mags [TSU02].

◇ *Comet P/2001 BB$_{50}$ (LINEAR-NEAT)* ⟹ 2001 May 12.55: GUIDE 7.0 software used for comparison-star mags [NAK01]. May 12.61: GUIDE 6.0 software used for comparison-star mags [TSU02].

◇ *Comet P/2001 H5 (NEAT)* ⟹ 2001 May 12.60: GUIDE 7.0 software used for comparison-star mags [NAK01].

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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 [11 = Dutch Comet Section (via A. Scholten); 13 = Agrupacion Astronomica de Madrid (via J. Carvajal); 16 = Japanese observers (via Akimasa Nakamura, Kuma, Japan); 23 = Czech group (via P. Pravec and V. Znojil); 32 = Hungarian group (via K. Sarneczky); 35 = South American observers (via J. G. de Souza Aguiar, Brazil); 36 = Italian observers (via Antonio Milani); 37 = Ukrainian Comet Section (via A. R. Baransky); etc.]. Those with asterisks (*) preceding the 5-character code are new additions to the Observer Key:*

*AFA	47	Afanasév, Byurakan Obs., Armenia
AKA	16	Ayahiko Akahori, Nagano, Japan
*AKS	47	A. K. Aksenov, Kazakhstan
AMO01	35	Alexandre Amorim, Brazil
*AND08	47	A. D. Andrienko, Kyiv, Ukraine
BAK02	47	A. M. Bakcharev, Tadzhikstan
*BAL07	35	Gustavo E. Ballan, Argentina
BAR06	37	Alexandr R. Baransky, Ukraine
*BAR11	35	Nicolas Barrile, Argentina
BEG01	15	Mike Begbie, Harare, Zimbabwe
*BEI	47	I. R. Beitrishvili, Ukraine
BIE01		Doug A. Biesecker, MD, U.S.A.
BIL01	47	A. Bilyi, Kyiv, Ukraine
BIV		Nicolas Biver, France
BOU		Reinder J. Bouma, Netherlands
BRO07	47	N. M. Bronikova, Pulkovo, Russia
BUS01	11	E. P. Bus, The Netherlands
BUS02	35	Victor Angel Buso, Argentina
CHE03	33	Kazimieras T. Cernis, Lithuania
CHE05	47	V. Chernov, Zaporizhia, Ukraine
CHE06	47	N. S. Chernych, Crimea, Ukraine
*CHE07	47	K. F. Cherepanov, Kazakhstan
*CHE08	47	Yu. Cherepanov, Kazakhstan
*CHI01	47	V. Chistaikov, Usuriisk, Russia

CHU		Klim I. Churyumov, Kyiv, Ukraine
*COE	35	Antonio C. Coelho, Brasil
COM	11	Georg Comello, The Netherlands
COO02		Tim P. Cooper, South Africa
*COR01	40	Ana P. da S. Correia, Portugal
CRE01		Phillip J. Creed, OH, U.S.A.
CRE02	36	Claudio Cremaschini, Italy
CSU	32	Mátyás Csukás, Salonta, Romania
DAN02	47	L. I. Danylenko, Kyiv, Ukraine
*DEM02	47	A. A. Demenko, Kyiv, Ukraine
DES01		Jose G. de Souza Aguiar, Brazil
*DIA01	47	V. D. Diakonova, Russia
DIE02		Alfons Diepvens, Belgium
DIJ		Edwin van Dijk, The Netherlands
*DOB01	47	O. V. Dobrovol'sky, Tadzhikstan
DRO	47	S. V. Drozdov, Kharkov, Ukraine
*EGI01	47	P. Egibekov, Tadzhikstan
END	16	Tsunenobu Endo, Nagano, Japan
EZA	16	Yuusuke Ezaki, Osaka, Japan
FAR01		Fraser Farrell, South Australia
*FAT	47	N. V. Fatchikhin, Russia
FED03	48	D. V. Fedotov, Kharkov, Ukraine
*FEO	47	S. Feoktistova, Crimea, Ukraine
FIL02	17	V. S. Filonenko, Ukraine
*FIL07	47	G. S. Filatov, Dushanbe, Tadzhik
FUK02	16	Hideo Fukushima, Tokyo, Japan
*GEN02	47	L. M. Genkina, Kazakhstan
*GER02	47	S. I. Gerasimenko, Kazakhstan
GIA01		Antonio Giambersio, Italy
*GLU	47	Yu. Glushkov, Kazakhstan
*GOB	47	B. I. Gobachev, Kazakhstan
*GOL03	47	D. A. Golubev, Usuriisk, Russia
GON05		Juan Jose Gonzalez, Spain
*GOR03	47	G. A. Gorazdo-Lesnych, Ukraine
*GOR04	47	D. I. Gorodetskii, Tajikstan
*GOR05	47	N. S. Gorodetskaia, Tajikstan
GRA04	24	Bjoern Haakon Granslo, Norway
GRA09	18	Krzysztof Graczewski, Poland
GRE		Daniel W. E. Green, MA, U.S.A.
GRE03	15	Trevor Green, South Africa
*GRY	47	V. M. Grygorevs'kyi, Ukraine
GUL	21	O. H. Guldbrandsen, Norway
*GUL03	47	Ch. D. Gulmedov, Kazakhstan
HAS02		Werner Hasubick, Germany
HOD01	35	Felipe Hodar, Sao Paulo, Brazil
HOD02	35	Juan M. Hodar, Sao Paulo, Brazil
HOE		Sebastian F. Hoenig, Germany
HOR02	23	Kamil Hornoch, Czech Republic
*IBR	47	I. Ibragimov, Tadzhikstan
*IVA04	47	V. I. Ivanchuk, Kyiv, Ukraine
*IVA05	47	Yu. N. Ivaschenko, Ukraine
JON07	15	Tony Jones, Cape Town, S. Africa
KAD01	47	B. N. Kadomskyi, Kasan, Russia
KAD02	16	Ken-ichi Kadota, Saitama, Japan
KAM01		Andreas Kammerer, Germany
KAS	19	I. Kasirin, Tuapse, Russia
KAY	48	V. G. Kaydash, Kharkov, Ukraine
*KHO	47	P. M. Kholopov, Crimea, Ukraine
KON06	23	Jiří Konečný, Litovel, Czech Rep
KON08	47	V. P. Konopl'ova, Kiev, Ukraine
*KOP		Joerg Kopplin, Germany
*KOR03	47	L. S. Koroleva, Pulkovo, Russia
KOS		Attila Kósa-Kiss, Romania
KOS04	37	Denis S. Kosenkov, Russia
*KOV	47	G. U. Koval'chuk, Kyiv, Ukraine
*KRA05	47	F. I. Kravtsov, Ukraine
KRY	19	A. Krylov, Tuapse, Russia
*KUC	17	Arunas Kuchinskas, Lithuania
KUL	47	P. G. Kulikovkii, Russia
*KUR02	47	A. Kurchakov, Alma-Ata, Kazakhs.
*KYR	47	A. Kyrychenko, Uzgorod, Ukraine
KYS	23	J. Kysely, Czech Republic
LAB01	47	I. S. Laba, Lviv, Ukraine
LAZ	47	V. S. Lazarevskii, Russia
*LEO01		Simone Leonini, Siena, Italy
*LIL		William Liller, Chile
LIN04		Mike Linnolt, HI, U.S.A.
LOU	35	Romualdo Lourencon, Brazil
LUE		Hartwig Luethen, Germany
*LUT01	47	V. M. Lutyi, Crimea, Ukraine
*LVO	47	I. B. Lvova, Alma-Ata, Tajikstan
MAI	37	Alexander S. Maidic, Ukraine
*MAN04		Luis Alberto Mansilla, Argentina
MAR02	13	Jose Carvajal Martinez, Spain
MAR23	47	D. J. Martynoff, Kasan, Russia
*MAR25	07	Steve Martin, Devon, U.K.
MAT08		Michael Mattiazzo, S. Australia
MAT09	47	V. S. Matyagin, Kazakstan
*MEN04	35	Marcio Mendes, Brazil
MEY	28	Maik Meyer, Germany
*MIR	47	A. S. Miroshnichenko, Tadjikstan
MIT	16	Shigeo Mitsuma, Saitama, Japan
MIY01	16	Osamu Miyazaki, Ibaraki, Japan
MOE		Michael Moeller, Germany
MOR04	37	Vladimir G. Mormyl, Ukraine
MOR08	37	Alexandra M. Mormyl, Ukraine
MOR09		Philippe Morel, France
NAG04	16	Kazuro Nagashima, Nara, Japan
NAG08	16	Yoshimi Nagai, Yamanashi, Japan
NAK01	16	Akimasa Nakamura, Ehime, Japan
NES	37	Yurij V. Nesterov, Livny, Russia
NEV	42	Vitali S. Nevski, Belarus
NIK02	47	A. Nikitin, Dushanbe, Tadzhiksta
OHM	16	Fumihiko Ohmori, Miyazaki, Japan
*OKN	47	V. L. Oknianskii, Russia
OOT	16	Isao Ootsuki, Miyagi, Japan
ORI	16	Takaaki Oribe, Tottori, Japan
*PAS02	47	S. V. Pasichnyk, Ukraine
PEA	14	Andrew R. Pearce, Australia
PER01		Alfredo J. S. Pereira, Portugal
POG	47	A. I. Pogorilyi, Kiev, Ukraine
*POL01	47	T. A. Polyakova, Armenia

*POT01	47	I. N. Potapov, Vitebs, Belarus
PRI04	15	David Pringlewood, Zimbabwe
*RAU01	47	Ch. Raudsar, Tartu Obs., Estonia
*RIA	47	I. B. Riabenko, Russia
*RIB	40	Jose Rodrigues Ribeiro, Portugal
ROD01	13	Diego Rodriguez, Mallorca, Spain
ROM	42	Aleksandr M. Romancev, Belarus
*ROM01	47	G. S. Romashin, Ural, Russia
ROQ		Paul Roques, AZ, U.S.A.
ROS03	47	D. A. Roshkovskiy, Kazakstan
*RSP	47	F. K. Rspaev, Kazakhstan
*RUB	47	G. Rubo, Kiev, Ukraine
SAJ	32	András Sajtz, Satu-Nou, Romania
SAL01	42	Michail V. Saltanov, Belarus
SAL02	35	Erwin Salazar G., Cusco, Peru
SAN04	38	Juan M. San Juan, Madrid, Spain
*SAN13	36	Jose Luis Sanchez, Argentina
SAR02	32	Krisztián Sárneczky, Hungary
SCH04	11	Alex H. Scholten, Netherlands
SCO01		James V. Scotti, AZ, U.S.A.
SEA	14	David A. J. Seargent, Australia
SEG	38	Carlos Segarra, Valencia, Spain
*SEM01	47	A. A. Semenkin, Tajikstan
SER02		Jérome Serant, Chevillon, France
SHA02	07	Jonathan D. Shanklin, England
SHI03	19	A. Shirokov, Ryazan, Russia
SHU	42	Sergey E. Shurpakov, Belarus
SIK	19	L. L. Sikoruk, Russia
*SMI09	47	T. M. Smirnova, Crimea, Ukraine
SOS		Giovanni Sostero, Italy
*SOS01	47	S. V. Sosov, Russia
SOU01	35	Willian Carlos de Souza, Brazil
SPR		Christopher E. Spratt, Canada
*STU01	47	V. I. Stupin, Kyiv, Ukraine
SVE01	48	Denis A. Svechkarev, Ukraine
*SVE02	47	M. L. Sveshnikov, Russia
*SYZ	47	Yu. V. Syzonenko, Kyiv, Ukraine
*TAR01	47	V. P. Taraschuk, Crimea, Ukraine
TAY	07	Melvyn D. Taylor, England
*TEA	47	A. R. Tearo, Russia
*TEA01	47	A. V. Tearo, Russia
TER02	48	I. A. Tereshchenko, Ukraine
TIC		Milos Tichy, Czech Republic
TIT	48	R. E. Titarenko, Ukraine
*TRU02	47	L. Trunova, Crimea, Ukraine
TSU02	16	Mitsunori Tsumura, Japan
TSV	19	T. Tsvetkov, Vilnius, Lithuania
*USO	47	L. A. Usol'tseva, Tajikstan
VAZ		Edvard V. Vazhorov, Russia
*VOI	47	G. A. Voitenko, Kyiv, Ukraine
VSE	47	S. K. Vsekhsvyatskij, Ukraine
WAT01	16	Nobuo Watanabe, Hokkaido, Japan
*WEL01		William Wells, NE, U.S.A.
*YAK02	47	V. Yakovleva, Byurakan, Armenia
YOS02	16	Katsumi Yoshimoto, Hirao, Japan
YOS04	16	Seiichi Yoshida, Ibaraki, Japan
YUM	35	Raquel Yumi, Sao Paulo, Brazil
*YUT	47	N. Yu. Yutanov, Tadjikstan
ZAN01	11	W. T. Zanstra, The Netherlands
*ZHU01	47	L. V. Zhukov, Pulkovo, Russia

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TABULATED DATA

The headings for the tabulated data are as follows: "DATE (UT)" = Date and time to hundredths of a day in Universal Time; "N" = notes [* = correction to observation published in earlier issue of the *ICQ*; an exclamation mark (!) in this same location indicates that the observer has corrected his estimate in some manner for atmospheric extinction (prior to September 1992, this was the standard symbol for noting extinction correction, but following publication of the extinction paper — July 1992 *ICQ* — this symbol is only to be used to denote corrections made using procedures different from that outlined by Green 1992, *ICQ* 14, 55-59, and in Appendix E of the *ICQ Guide to Observing Comets* — and then only for situations where the observed comet is at altitude > 10°); '&' = comet observed at altitude 20° or less with no atmospheric extinction correction applied; '$' = comet observed at altitude 10° or lower, observations corrected by the observer using procedure of Green (*ibid.*); for a correction applied by the observer using Tables Ia, Ib, or Ic of Green (*ibid.*), the letters 'a', 'b', or 'c', respectively, should be used; x indicates that a secondary source (often amateur computer software) was used to get supposedly correct comparison-star magnitudes from an accepted catalogue].

"MM" = the method employed for estimating the total (visual) magnitude; see article on page 186 of the Oct. 1996 issue [B = VBM method, M = Morris method, S = VSS or In-Out method, I = in-focus, C = unfiltered CCD, c = same as 'C', but for 'nuclear' magnitudes, V = electronic observations — usually CCD — with Johnson *V* filter, *etc.*]. "MAG." = total (visual) magnitude estimate; a colon indicates that the observation is only approximate, due to bad weather conditions, *etc.*; a left bracket ([) indicates that the comet was not seen, with an estimated limiting magnitude given (if the comet IS seen, and it is simply estimated to be fainter than a certain magnitude, a "greater-than" sign (>) must be used, not a bracket). "RF" = reference for total magnitude estimates (see pages 98-100 of the October 1992 issue, and Appendix C of the *ICQ Guide to Observing Comets*, for all of the 1- and 2-letter codes; an updated list is also maintained at the *ICQ* World Wide Website). "AP." = aperture in centimeters of the instrument used for the observations, usually given to tenths. "T" = type of instrument used for the observation (R = refractor, L = Newtonian reflector, B = binoculars, C = Cassegrain reflector, A = camera, T = Schmidt-Cassegrain reflector, S = Schmidt-Newtonian reflector, E = naked eye, *etc.*). "F/" and "PWR" are the focal ratio and power or magnification, respectively, of the instrument used for the observation — given to nearest whole integer (round even); note that for CCD observations, in place of magnification is given the exposure time in seconds [see page 11 of the January 1997 issue; a lower-case "a" indicates an exposure time under 1000 seconds, an upper-case "A" indicates an exposure time of 1000-1999 seconds (with the

thousands digit replaced by the "A"), an upper-case "B" indicates an exposure time of 2000-2999 seconds (with the thousands digit replaced by the "B"), etc.].

"COMA" = estimated coma diameter in minutes of arc; an ampersand (&) indicates an approximate estimate; an exclamation mark (!) precedes a coma diameter when the comet was not seen (*i.e.*, was too faint) and where a limiting magnitude estimate is provided based on an "assumed" coma diameter (a default size of 1′ or 30″ is recommended; cf. *ICQ* **9**, 100); a plus mark (+) precedes a coma diameter when a diaphragm was used electronically, thereby specifying the diaphragm size (i.e., the coma is almost always larger than such a specified diaphragm size). "DC" = degree of condensation on a scale where 9 = stellar and 0 = diffuse (preceded by lower- and upper-case letters S and D to indicate the presence of stellar and disklike central condensations; cf. July 1995 issue, p. 90); a slash (/) indicates a value midway between the given number and the next-higher integer. "TAIL" = estimated tail length in degrees, to 0.01 degree if appropriate; again, an ampersand indicates a rough estimate. Lower-case letters between the tail length and the p.a. indicate that the tail was measured in arcmin ("m") or arcsec ("s"), ***in which cases the decimal point is shifted one column to the right.*** "PA" = estimated measured position angle of the tail to nearest whole integer in degrees (north = 0°, east = 90°). "OBS" = the observer who made the observation (given as a 3-letter, 2-digit code).

A complete list of the Keys to abbrevations used in the *ICQ* is available from the Editor for $4.00 postpaid (available free of charge via e-mail); these Keys (with the exception of the Observer Codes) are also now available in the new *Guide to Observing Comets* and via the *ICQ*'s World Wide Web site. ***Please note that data in archival form, and thus the data to be sent in machine-readable form, use a format that is different from that of the Tabulated data in the printed pages of the ICQ;*** see pages 59-61 of the July 1992 issue, p. 10 of the January 1995 issue, and p. 100 of the April 1996 issue for further information [note correction on page 140 of the October 1993 issue]. Further guidelines concerning reporting of data may be found on pages 59-60 of the April 1993 issue, and in the *ICQ Guide to Observing Comets.*

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Comet C/1959 Y1 (Burnham)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1960 04 19.06		S	5.7	HD	12	B		40		4			POG
1960 04 20.02		S	5.6	HD	5.0	B		7		3			POG
1960 04 20.06		P	5.0:	HD	10	A			30	4	<1		GRY
1960 04 20.06		S	5.0	HD	5.0	B		7		3			POG
1960 04 20.08		S	5.2	HD	5.0	B		7	5	2			VSE
1960 04 20.99		S	4.9	HD	5.0	B		7		3			POG
1960 04 21.03					12	A	5		2.5	4	0.5	257	VSE
1960 04 21.06		S	5.0	HD	5.0	B		7		4			VSE
1960 04 22.01		S	5.5	HD	5.0	B		7					VSE
1960 04 22.05					12	A	5		3.5	4	1.5	265	VSE
1960 04 22.05		S	5.4	HD	0.0	E		1					VSE
1960 04 23.03		B	5.1	HD	3.0	B		6					CHE05
1960 04 23.03		S	4.9	HD	5.0	B		7		3			POG
1960 04 23.05		S	4.7	HD	5.0	B		7		4			VSE
1960 04 25.89		S	5.0	HD	5.0	B		7	6.0				VSE
1960 04 25.94		S	4.6	HD	5.0	B		7					VSE
1960 04 26.02		S	5.1:	HD	5.0	B		7					POG
1960 04 26.02		S	5.4:	HD	5.0	B		7					DAN02
1960 04 27.02		B	4.6	HD	3.0	B		6					CHE05
1960 04 27.83		S	4.4	HD	5.0	B		7		4			VSE
1960 04 27.92		S	4.5	HD	5.0	B		7	4				VSE
1960 04 27.96		S	4.6	HD	0.0	E		1					VSE
1960 04 27.96		S	4.7	HD	5.0	B		7					VSE
1960 04 27.97		B	4.7	HD	3.0	B		6					CHE05
1960 04 28.77		B	4.8	HD	3.0	B		6					CHE05
1960 04 28.78		S	4.7	HD	5.0	B		7		S6			DAN02
1960 04 28.78		S	4.8	HD	5.0	B		7		5			POG
1960 04 28.79		S	4.9	HD	5.0	B		7					VSE
1960 04 28.83		S	4.8	HD	5.0	B		7		S6			DAN02
1960 04 28.88		S	4.4	HD	5.0	B		7		S6			DAN02
1960 04 28.89		S	5.0	HD	0.0	E		1					VSE
1960 04 28.90		S	4.2	HD	5.0	B		7		S6	2		DAN02
1960 04 28.93		S	4.9	HD	5.0	B		7					VSE
1960 04 29.00		S	4.5	HD	0.0	E		1					VSE
1960 04 29.80		B	4.9	HD	3.0	B		6					CHE05
1960 04 29.92		B	5.2	BD	8.0	B		10					MAR23
1960 04 30.78		S	5.2:	HD	0.0	E		1	3				VSE
1960 04 30.86		S	4.5	HD	5.0	B		7		S6	6		POG
1960 04 30.86		S	4.6	HD	5.0	B		7		S6	6		DAN02
1960 04 30.88		B	5.3	BD	5.0	B		10					MAR23

Comet C/1959 Y1 (Burnham) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1960 04 30.91		S	4.8	HD	5.0	B		7					VSE
1960 05 01.81		S	5.2	HD	5.0	B		7					VSE
1960 05 01.87		S	5.2	HD	0.0	E		1					VSE
1960 05 01.88		S	5.0	HD	5.0	B		7		S6	3		DAN02
1960 05 01.88		S	5.0	HD	5.0	B		7		S6	3		POG
1960 05 02.81		S	4.6	HD	5.0	B		7					VSE
1960 05 02.82		S	4.4	HD	5.0	B		7		S6	3		DAN02
1960 05 02.86					12	A	5		6	D5	>3.0	134	VSE
1960 05 02.86		S	4.7	HD	5.0	B		7		S6	3		DAN02
1960 05 02.86		S	4.8	HD	0.0	E		1					VSE
1960 05 04.78		S	5.5	HD	5.0	B		7					VSE
1960 05 04.78		S	5.7	HD	0.0	E		1					VSE
1960 05 04.82		S	5.2	HD	5.0	B		7		S6	3		POG
1960 05 04.86		S	5.6	HD	5.0	B		7					VSE
1960 05 05.80		S	5.8	HD	5.0	B		7					VSE
1960 05 05.85		S	5.9	HD	5.0	B		7		5			POG
1960 05 06.85		S	6.1:	HD	5.0	B		7					VSE
1960 05 07.85		P	6.7:	HD	12	A	5						VSE
1960 05 09.83		P	7.0:	HD	12	A	5						VSE
1960 05 15.85		I[	9.0	HD	5.0	B		7					VSE
1960 05 16.95		I[	9.0	HD	5.0	B		7					VSE
1960 05 16.95		P	7.5	HD	12	A	5						VSE
1960 05 18.90		P	9.0	HD	12	A	5						VSE
1960 05 20.91		S	8.6:	HD	25.3	R	21	60	1.5				VSE
1960 05 23.84		P[	11.0:	HD	12	A	5						VSE
1960 05 26.84		P	10.5:	HD	12	A	5						VSE
1960 05 26.86		S[	11.0:	HD	25.3	R	21	60					VSE
1960 05 27.87		P[	11.0:	HD	12	A	5						VSE

Comet C/1961 O1 (Wilson-Hubbard)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1961 07 25		N	2.0:		5.0	B		7		6	30		NIK02

Comet C/1961 R1 (Humason)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1961 12 30.10		N	12.6		50	M			1.7	S4	>0.2		ROS03
1961 12 30.12		N	12.6		50	M							CHE07
1962 01 15.98		N	14.5		50	M			1.0	3			CHE07
1962 02 11.87		N	14.5		50	M			1.0	3			CHE08
1962 05 07.77		N	13.5		50	M			1.0	4			GLU
1962 05 28.67		N	10.5		50	M			1.0	5			ROS03
1962 05 29.66		N	10.6		50	M			1.0	5			KUR02
1962 05 30.69		N	10.2		50	M			1.0	5			GLU
1962 05 31.70		N	10.9		50	M			1.0	4			MAT09
1962 06 04.92		P	8.0	BD	10	A	3		1.7				GLU
1962 06 07.68		N	10.6		17	D			2.0	4			ROS03
1962 06 07.68		N	10.9		50	M			0.4	4	3.3m		MAT09
1962 06 09.67		N	12.5		50	M			0.4	3	3.3m		GLU
1962 06 11.64		N	12.2		50	M			0.4	3			ROS03
1962 06 11.70		P	9.0		50	M			17.2	4			MAT09
1962 10 18.19		P	7.7:		40	A	5		1.0	5	0.2	65	VSE

Comet C/1961 T1 (Seki)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1961 10 17.02		B	8 :	BD	8.0	B		20		1			BAK02
1961 10 18.02		B	7.0	BD	8.0	B		20		4			BAK02
1961 10 20.00		B	7.1	BD	8.0	B		20	6	2			BAK02
1961 10 20.26		P	7.0		20.0	A							EGI01
1961 10 21.00		B	6.9	BD	5.0	B		7					BAK02
1961 10 21.00		B	7.0	BD	8.0	B		20		3			BAK02
1961 10 22.00		B	7.4	BD	8.0	B		20	3				BAK02
1961 10 22.26		P	7.0		20.0	A							IBR

Comet C/1961 T1 (Seki) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1961 10 30.98		B	7.0	BD	8.0	B		20	5				BAK02
1961 11 02.00		B	6.7	BD	8.0	B		20	4.5	D6			BAK02
1961 11 03.00		B	6.5	BD	5.0	B		7					BAK02
1961 11 03.00		B	6.7	BD	8.0	B		20					BAK02
1961 11 04.00		B	6.6	BD	8.0	B		20	3.6	D5			BAK02
1961 11 05.00		B	6.3	BD	8.0	B		20	6				BAK02
1961 11 06.00		B	6.0	BD	5.0	B		7			<1		BAK02
1961 11 06.00		B	6.3	BD	8.0	B		20		4	<1		BAK02
1961 11 07.00		B	6.0	BD	8.0	B		20					BAK02
1961 11 10.00		B	5.2:	BD	8.0	B		20	2	1			BAK02
1961 11 11.03		B	5.2	BD	8.0	B		20					BAK02

Comet C/1962 C1 (Seki-Lines)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1962 04 09.13		N	2 :	BD	5.0	B		7		S7	>15		BAK02
1962 04 11.13		B	3.7	BD	5.0	B		7		S7	12		BAK02
1962 04 12.77		P	3.2:		20.0	A	5						BRO07
1962 04 13.13		B	4.0:	BD	5.0	B		7		S6	4		BAK02
1962 04 15.79		P	3.7:		20.0	A	5						BRO07
1962 04 16.79		P	4.0:		20.0	A	5						BRO07
1962 04 17.79		S	4.5		3.0	B		8			1.1		DRO
1962 04 17.80		B	3.9		3.0	B		8					DRO
1962 04 17.80		P	4.3:		20.0	A	5						BRO07
1962 04 19.82		S	5.5		3.0	B		8					DRO
1962 04 20.81		P	4.8:		20.0	A	5						BRO07
1962 04 20.81		P	5.3:		20.0	A	5						BRO07
1962 04 20.81		S	5.4		3.0	B		8			0.4		DRO
1962 04 21.14		B	5.5	BD	5.0	B		7		S6	2.5		BAK02
1962 04 21.81		S	5.5		3.0	B		8					DRO
1962 04 24.81					40	A	4	4	15	5	1.1		GOB
1962 04 24.81		P	5.5:		40	A	4	4	15	5	2.7		KUL
1962 04 24.82		S	6.0		3.0	B		8					DRO
1962 04 25.82		S	5.8		3.0	B		8					DRO
1962 04 27.17		B	5.5	BD	5.0	B		7		S6	0.5		BAK02
1962 05 03.15		B	7.1	BD	5.0	B		7		S6	0.5		BAK02
1962 05 03.15		B	7.3	BD	8.0	B		20		D6			BAK02
1962 05 04.15		B	7.1	BD	5.0	B		7		S6	0.5		BAK02
1962 05 04.16		B	7.1	BD	8.0	B		20		6			BAK02
1962 05 07.15		B	7.0	BD	8.0	B		20		5			BAK02
1962 05 10.15		B	7.7	BD	8.0	B		20		4			BAK02

Comet C/1963 A1 (Ikeya)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1963 03 09.63		B	3.9	HD	5.0	B		7					BAK02
1963 03 09.71	!	B	4.5	HD	3.0	B		6					VSE
1963 03 09.71	!	P	4.8	HD	2.3	A	5						VSE
1963 03 09.72	!	B	4.5	HD	3.0	B		6					VSE
1963 03 09.72	!	P	4.9	HD	2.3	A	5						BEI
1963 03 10.63		B	4.0	HD	2.3	B		6	7				BAK02
1963 03 10.71	!	B	4.4	HD	3.0	B		6					VSE
1963 03 10.71	!	P	4.7	HD	2.3	A	5						BEI
1963 03 10.71	!	P	5.0	HD	2.3	A	5						BEI
1963 03 10.72	!	B	4.3	HD	3.0	B		6					VSE
1963 03 10.72	!	P	4.8	HD	2.3	A	5						VSE
1963 03 12.58		B	4.0	HD	5.0	B		7			2		BAK02
1963 03 14.59		B	4.2	HD	5.0	B		7			&2		BAK02
1963 03 19.72	!	P	4.7	HD	2.3	A	5						BEI
1963 03 19.73	!	B	4.2	HD	3.0	B		6					VSE
1963 03 19.74	!	P	4.5	HD	2.3	A	5						VSE
1963 03 20.73	!	B	4.3	HD	3.0	B		6					VSE
1963 03 20.73	!	P	4.6	HD	2.3	A	5						VSE
1963 09 27		P[	10.5	BD	12	A	5						KON08

Comet C/1963 F1 (Alcock)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1963 04 05.96		P	9.5	HD	12	A	5						DEM02
1963 05 30.80		S	4.2	HD	5.0	B		7					VSE
1963 07 28.95		B	9.8	HD	5.0	B		7		3			BAK02
1963 07 30.92		B	9.1	HD	5.0	B		7		3			BAK02

Comet C/1964 N1 (Ikeya)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1964 08 03.94		P	5.5	HD	14	A	5						AKS
1964 08 03.95		B	5.0	HD	5.0	B		7					AKS
1964 08 04.93		P	5.5	HD	14	A	5						AKS
1964 08 04.95		B	5.0	HD	5.0	B		7					AKS
1964 08 06.94		P	5.5	HD	14	A	5						AKS
1964 08 06.95		B	5.0	HD	5.0	B		7					AKS

Comet C/1964 P1 (Everhart)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1964 09 01.76		P	9.0	BD	16	A	5			4			VSE
1964 09 04.87		P	9.0	BD	12	A	6			5			VSE
1964 09 06.78		P	10.0	BD	12	A	6			4			VSE
1964 09 07.74		P	7.4		17	D			14.2				ROS03
1964 09 08.88		P	10.0		50	M			1.6				ROS03
1964 09 08.88		P	10.0		50	M			3.2				ROS03
1964 09 08.88		P	10.5		50	M			2.8				ROS03
1964 09 25.8		P	10.3	BD	12	A	5			5			VSE
1964 09 26.8		P	10.3	BD	12	A	5			5			VSE
1964 09 28.8		P	9.5	BD	12	A	5			3			VSE
1964 09 29.74		P	9.7		16	A	10		4	4			POL01
1964 09 29.8		P	9.4	BD	12	A	5			3			VSE
1964 09 30.72		P	9.9		16	A	10		4	4			ROM01
1964 09 30.8		P	9.5	BD	12	A	5			4			VSE
1964 09 30.85		P	9.1		50	M			3.2				ROS03
1964 09 30.85		P	10.4		50	M			1.4				ROS03
1964 10 01.7		P	9.8		25	A							SVE02
1964 10 01.72		P	9.8		16	A	10		6	4			POL01
1964 10 02.8		P	10.3	BD	12	A	5			3			VSE
1964 10 03.72		P	12.0:		16	A	10		4	4			ROM01
1964 10 06.73		P	11.3:		16	A	10		4	4			ROM01
1964 10 06.8		P	10.5	BD	12	A	5			4			VSE
1964 10 08.8		P	10.3	BD	12	A	5			5			VSE
1964 10 08.8		P	10.7		25	A							SVE02
1964 10 09.62		P	11.5		50	M			1.8				ROS03
1964 10 09.8		P	10.5		15	A							ROM01
1964 10 10.8		P	11.3:	BD	12	A	5			3			VSE
1964 10 24.8		P	11.5:	BD	12	A	5			3			VSE
1964 10 28.8		P	11.5:	BD	12	A	5			3			VSE
1964 10 31.7		P	12.1		25	A							LAB01
1964 10 31.71		P	12.1		16	A	10		3	3			POL01
1964 12 02.62		P	14.6		50	M			0.6				GEN02

Comet C/1965 S1 (Ikeya-Seki)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1965 09 26.00		B	7.5	BD	5.0	B		7		2	<1		BAK02
1965 09 26.05		B	7.5		5.0	B		7		2			DOB01
1965 10 01.25		P	5.8:		50	L				4			POL01
1965 10 29.10		P	2 :		17	D				5	20		BEI
1965 11 01		S	2 :		0.0	E		1			35		GUL
1965 11 04.06		N	4 :		0.0	E		1		S6	>13		KAD01
1965 11 05.13		P	3.5:		40	A	4		2	6	25		CHE06
1965 12 03.08		P	8.0:		40	A	4			5			CHE06

Comet C/1965 S2 (Alcock)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1965 10 01		P	10.4:		16	A	5						RAU01
1965 10 02		P	10.6:		16	A	5						RAU01
1965 10 03		P	10.8:		16	A	5						RAU01

Comet C/1966 P1 (Kilston)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1966 08 12.8		B	8.8	S	8.0	B		20			3	m	CHU
1966 08 12.89		P	9.9	HD	30	A	2		0.7	6			KON08
1966 08 13.67		S	8.1:		8.0	B		20					FIL07
1966 08 13.83		P	8.2:		40	A	4			4			CHE06
1966 08 13.85		P	9.5	HD	30	A	2		0.3	7			KON08
1966 08 13.92		P	9.8	HD	30	A	2		0.5	7/	0.1		KON08
1966 08 14.75		P	10.0:		50	M				5	<1		ROS03
1966 08 14.80		P	8.5:		40	A	4			4			CHE06
1966 08 15.77	!	V	10.0	HD	12	A	2		+ 0.9	3			STU01
1966 08 15.81		P	8.5:		40	A	4			4			CHE06
1966 08 15.86		P	10.5:	HD	12	A	2		1.0	6			GOR03
1966 08 15.86	!	V	10.1	HD	12	A	2		+ 0.6	6			GOR03
1966 08 16.81		P	10.9:	HD	12	A	2		0.6	3			STU01
1966 08 16.81	!	V	10.1	HD	12	A	2		+ 0.6	3			STU01
1966 08 16.83		P	8.5:		40	A	4			4			CHE06
1966 08 16.84		P	10.8:	HD	12	A	2		0.5	4			STU01
1966 08 16.84	!	V	10.1	HD	12	A	2		+ 0.5	4			STU01
1966 08 17.86		P	9.0:		40	A	4			4			CHE06
1966 08 17.94		P	10.2	HD	30	A	2		0.5		0.1		KON08
1966 08 18.83		P	8.8:		40	A	4			4			CHE06
1966 08 18.85		P	9.8	HD	30	A	2		0.5	5	0.1		KON08
1966 08 19.80		P	10.7:	HD	30	A	2		0.6	4			KON08
1966 08 19.82	!	V	10.2	HD	12	A	2		+ 0.5	3			STU01
1966 08 19.84		P	9.0:		40	A	4			4			CHE06
1966 08 19.94		P	10.6:	HD	12	A	2		0.3	4			STU01
1966 08 20.81		P	9.0:		40	A	4			4			CHE06
1966 08 20.83		P	10.5:	HD	12	A	2		0.4	4			STU01
1966 08 20.83	!	V	10.2	HD	12	A	2		+ 0.4				STU01
1966 08 20.87		P	10.5:	HD	12	A	2		0.4	3			STU01
1966 08 21.84		P	9.0:		40	A	4			4			TRU02
1966 08 22.74		P	8.5:		50	M				4	<1		ROS03
1966 08 22.80		B	8.8	S	8.0	B		20			3	m	CHU
1966 08 22.83		P	9.0:		40	A	4			4			FEO
1966 08 23.85		P	9.0:		40	A	4			4			SMI09
1966 08 28.84		P	9.9	HD	30	A	2		0.4	4			KON08
1966 08 28.84		P	10.1	HD	30	A	2		0.8	4			KON08
1966 08 31.81		P	9.5:		16	A	5						RAU01
1966 09 01.83		B	9.2	S	8.0	B		20			3	m	BIL01
1966 09 02.80		B	9.6	S	8.0	B		20			3	m	AND08
1966 09 03.80		B	9.6	S	8.0	B		20			3	m	CHU
1966 09 04.76		B	9.6	S	8.0	B		20					BIL01
1966 09 05.75		B	9.6	S	8.0	B		20					IVA04
1966 09 06.80		B	9.7	S	8.0	B		20					CHU
1966 09 07.75		B	9.7	S	8.0	B		20					RUB
1966 09 07.80		B	9.8	S	8.0	B		20					IVA04
1966 09 07.85		B	9.5	S	8.0	B		20					AND08
1966 09 08.78		B	9.7	S	8.0	B		20					CHU
1966 09 08.83		B	9.6	S	8.0	B		20					IVA04
1966 09 12.77		P	9.5:		16	A	5						RAU01
1966 09 12.77		P	9.9:		16	A	5						RAU01
1966 09 15.75		P	10.2:	HD	12	A	2		0.8	4			STU01
1966 09 16.74		P	9.7:		16	A	5						RAU01
1966 09 18.74		P	9.5:		16	A	5						RAU01
1966 09 18.76		P	9.8:		16	A	5						RAU01
1966 09 20.8		P	9.0	BD	12	A	4			4	2	m	VSE
1966 09 21.8		P	8.9	BD	12	A	4			5	2	m	VSE
1966 09 22.8		P	8.9	BD	12	A	4			6	2	m	VSE
1966 09 23.8		P	9.0	BD	12	A	4			5	2	m	VSE

Comet C/1966 P1 (Kilston) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1966 09 23.8		P	9.0	BD	12	A	4			6	2 m		VSE
1966 09 24.8		B	9.0	BD	12	R	17	60		5			VSE
1966 09 24.8		B	9.1	BD	12	R	17	60		5			VSE
1966 09 27.74		P	9.2:		16	A	5						RAU01
1966 09 28.75		P	9.3:		16	A	5						RAU01
1966 09 29.74		P	9.5:		16	A	5						RAU01
1966 10 01.73		P	9.8:		16	A	5						RAU01
1966 10 04.72		P	10.0:		16	A	5						RAU01
1966 10 06.8		B	11.0:	BD	25	R	17	60	0.8	2			VSE
1966 10 08.73		P	10.0:		16	A	5						RAU01
1966 10 10.74		P	10.2:		16	A	5						RAU01
1966 10 15.72		P	10.2:		16	A	5						RAU01
1966 11 05.71		P	9.0:		40	A	4		2	3			CHE06
1966 11 07.75		P	9.0:		40	A	4		2	3			CHE06
1966 11 22.80	!	V	11.5		50	R							YAK02

Comet C/1966 P2 (Barbon)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1966 08 21.79		P	10.4:		40	A	4		0.5	5	2 m		CHE06
1966 08 22.79		B	11 :		8.0	B		20		3	< 1 m		IVA04
1966 08 22.79		P	11.0		50	M				3	< 1 m		ROS03
1966 08 23.80		P	10.5:		40	A	4		0.5	5	2 m		CHE06
1966 08 24.80		B	10.0		8.0	B		20					RUB
1966 08 25.80		P	10.6:		40	A	4		0.5	5	2 m		CHE06
1966 08 25.82		B	10.0		8.0	B		20					AND08
1966 08 26.79		P	10.5:		40	A	4		0.5	5	1 m		CHE06
1966 08 27.80		B	9.5		8.0	B		20					BAK02
1966 08 27.80		P	10.7:		40	A	4		0.5	5	1 m		CHE06
1966 08 29.79		B	10.2		8.0	B		20					BAK02

Comet C/1966 R1 (Ikeya-Everhart)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1966 09 15		P	9.0:		40	A	4		2	4			CHE06
1966 09 15.8		I[	8.0	BD	8.0	B		20					VSE
1966 09 16		P	9.2:		40	A	4		2	4			CHE06
1966 09 17.8		I[	8.5	BD	8.0	B		20					VSE
1966 09 18		P	9.4:		40	A	4		2	4			CHE06
1966 09 19		P	9.5:		40	A	4		2	4			CHE06
1966 09 20		P	9.5:		40	A	4		2	4			CHE06
1966 09 20.8		I[	8.5	BD	8.0	B		20					VSE
1966 09 21		P	9.8:		40	A	4		2	4			CHE06
1966 09 22		P	9.6:		40	A	4		2	4			CHE06
1966 10 07		P	10.5:		40	A	4		2				CHE06
1966 10 13		P	10.5:		40	A	4		2				CHE06

Comet C/1966 T1 (Rudnicki)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1966 11 06.78		P	10.3:		40	A	4		1.6	3			CHE06
1966 11 07.82		P	10 :		40	A	4		2	3			CHE06
1966 11 08.81		P	10 :		40	A	4		2	5			CHE06
1966 11 11.83		P	10 :		40	A	4		1.5	4			SMI09
1966 11 12.81		P	10 :		40	A	4		2	3			CHE06
1966 11 13.80		P	10 :		40	A	4		2	5			CHE06
1966 11 16.80		P	10 :		40	A	4		2	4			SMI09
1966 12 06.64		B	8.3	BD	8.0	B		20	5	1			BAK02
1966 12 09.64		B	7.8	BD	8.0	B		20	5	2			BAK02
1966 12 13.64		B	7.7	BD	8.0	B		20	5	3			BAK02
1966 12 16.69		B	7.2	BD	8.0	B		20	5	3			BAK02
1966 12 17.65		B	7.0	BD	8.0	B		20	5	4			BAK02
1966 12 18.62		B	7.3	BD	8.0	B		20	5	4			BAK02
1966 12 25.56		B	6.5	BD	8.0	B		20	5	d4			BAK02
1966 12 26.66		B	6.7	BD	8.0	B		20	5	d4			BAK02

Comet C/1966 T1 (Rudnicki) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1966 12 27.64		B	6.6	BD	8.0	B		20	5	d5	0.5		BAK02
1966 12 29.66		P	6.0		40	A	4		2	3			CHE06
1966 12 30.56		B	6.1	BD	8.0	B		20	5	d6	0.5		BAK02
1966 12 30.66		P	6.0		40	A	4		2				CHE06
1966 12 31.55		B	6.2	BD	8.0	B		20	5	d5	0.6		BAK02
1967 01 01.56		B	6.1	BD	8.0	B		20	5	d6	0.6		BAK02
1967 01 02.56		B	6.2	BD	8.0	B		20	5	d6	0.8		BAK02

Comet C/1967 C1 (Seki)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1967 02 12.16		P	9.0	BD	12	A	5						KON08
1967 02 17.16		P	9.1	BD	12	A	5						KON08
1967 02 17.16	!	V	8.2	BD	12	A	5			3			STU01
1967 02 18.12		B	8.5	BD	8.0	B		20		2		270	VSE
1967 02 18.16		P	9.6	BD	12	A	5						KON08
1967 02 18.16	!	V	8.6	BD	12	A	5			4			STU01

Comet C/1967 C2 (Wild)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1967 03 01.75		P	11.5:	BD	12	A	4						VSE
1967 03 02.71		P	11.5	BD	12	A	4						STU01
1967 03 02.72		P	12.0	BD	12	A	4						VSE
1967 03 09.72		P	12.5:	BD	12	A	4						VSE
1967 03 09.75		P	12.0:	BD	12	A	4						GOR03

Comet C/1967 Y1 (Ikeya-Seki)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1967 12 22.13		B	8.6	BD	8.0	B		20		4			BAK02
1967 12 24.15		B	8.4	BD	8.0	B		20		d5			BAK02
1967 12 30.09		B	8.2	BD	8.0	B		20		d6			BAK02
1968 02 06.10		P	7.5:		40	A	4		2	6	0.35		CHE06
1968 02 20.12		P	7.0		12	A	4			5			RAU01
1968 02 20.12		P	7.0		40	A	4		2	6	0.3		CHE06
1968 02 21.12		P	7.0		40	A	4		2	6	0.3		CHE06
1968 02 21.13		P	7.0		12	A	4			5			RAU01
1968 02 27.15		B	7.5	BD	8.0	B		20		5			BAK02
1968 02 28.10		B	7.5	BD	8.0	B		20		5			BAK02
1968 02 28.10		P	6.5		40	A	4		3	7	0.2	90	CHE06
1968 02 29.10		B	7.5	BD	8.0	B		20		5			BAK02
1968 03 01.11		B	7.7	BD	8.0	B		20		5			BAK02
1968 03 02.98		B	7.7	BD	8.0	B		20		5			BAK02
1968 03 03.12		P	7.2		12	A	4			5			RAU01
1968 03 10.05		B	8.0:	HD	8.0	B		20		6			VSE
1968 03 11.99		B	8.0:	S	8.0	B		20		6			CHU
1968 03 13.97		B	7.5		8.0	B		20		6			RAU01
1968 03 14.87		B	7.5	S	8.0	B		20		5			RAU01
1968 03 15.89		B	7.5	S	8.0	B		20		4			RAU01
1968 04 02.87		S	9.0	S	20	R	9	80		S5			CHU
1968 04 02.90		S	8.9	HD	20	R	9	80		S5			VSE
1968 04 15.91		S	8.4	S	20	R	9	80		4			CHU
1968 04 16.98		P	8.5	HD	12	A	4			4			KYR
1968 05 04.97		S	10.0	HD	20	R	9	80		3			VSE
1968 05 04.99		S	10.0:	S	20	R	9	80		3			CHU
1968 05 09.98		S	9.6	S	20	R	9	80		3			CHU

Comet C/1968 H1 (Tago-Honda-Yamamoto)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1968 05 01		P	7.5		40	A	4						CHE06
1968 05 03		P	7.7		40	A	4						CHE06
1968 05 05		P	8.0		40	A	4						CHE06
1968 05 09		P	9.5:	BD	15	A	4						VSE

Comet C/1968 H1 (Tago-Honda-Yamamoto) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1968 05 10		P	9.3:	BD	12	A	4						CHU

Comet C/1968 L1 (Whitaker-Thomas)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1968 06 21.80		S	9.2	S	8.0	B		20	4	4			CHU
1968 06 24.80		P	9.5:	BD	12	A	4		3	3			VSE
1968 06 24.80		S	9.0	S	8.0	B		20	4	4			CHU
1968 06 26.90		P	9.5:	BD	12	A	4		3	3			VSE

Comet C/1968 N1 (Honda)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1968 07 16.00		S	8.0:	S	8.0	B		20					GUL03
1968 08 28.80		B	5.9	S	5.0	B		7	5				VSE
1968 08 29.80		B	5.7	S	5.0	B		7	5				VSE
1968 08 30.88		B	5.6	S	5.0	B		7	6				VSE
1968 08 31.85		B	5.8	S	5.0	B		7	6		2		VSE
1968 09 03.80		B	6.2:	S	5.0	B		7	3				VSE
1968 09 04.80		B	6.5:	S	5.0	B		7	2				VSE
1968 09 06.80		B	5.9	S	5.0	B		7	5				VSE
1968 09 21.70		B	5.7	S	5.0	B		7	5				VSE

Comet C/1968 Q1 (Bally-Clayton)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1968 08 27.80		P	11.0		40	A	4		1	6			CHE06
1968 08 28.80		P	11.0		40	A	4		1	6			CHE06
1968 09 15.80		P	11.5		40	A	4		1				CHE06

Comet C/1969 O1 (Kohoutek)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1969 08 04.90		P	14.0		40	A	4			8	1	m 170	CHE06
1969 08 05.90		P	14.0		40	A	4			8	1	m 170	CHE06
1969 08 11.80		P	14.0		40	A	4			8			CHE06
1969 11 07.10		P	12.5		50	D	4						AFA
1969 11 13.21		P	13.0		50	D	4						AFA
1969 11 14.84		P	13.0		50	D	4						AFA
1969 11 27.80		P	12.0		50	D	4		0.4		3	m 128	VSE
1969 11 27.85		P	11.5		50	D	4		0.6		3	m 128	AFA

Comet C/1969 P1 (Fujikawa)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1969 09 10.00		P	7.3		50	M							CHU
1969 09 18.00		P	6.7		50	M							GER02
1969 09 21.00		P	6.2		50	M					1.0		GER02

Comet C/1969 T1 (Tago-Sato-Kosaka)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1970 01 23.69		B	4.2		5.0	B		7	4				VSE
1970 01 24.26		B	4.3		5.0	B		7	4				VSE
1970 01 26.68		B	5.5:		3.0	B		6	15				CHE05
1970 01 30.75		B	4.5		3.0	B		6	4				DRO
1970 01 31.70		B	5.2		5.0	B		7	4				VSE
1970 03 03.80		P	9.5:		40	A	4			4			CHE06

Comet C/1969 Y1 (Bennett)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1970 03 20.11		B	0.7	S	0.0	E		1					DEM02
1970 03 26.80		B	0.4	S	0.0	E		1					CHI01
1970 03 29.01		B	0.7	S	0.0	E		1					CHU

Comet C/1969 Y1 (Bennett) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1970 03 30.82		B	1.2	S	0.0	E		1					CHI01
1970 03 31.01		B	1.5:	S	3.0	B		6					CHE05
1970 03 31.82		B	1.1	S	0.0	E		1					CHI01
1970 03 31.98		B	0.5:	BD	5.0	0					6		LAZ
1970 04 01.00		B	1.2	S	0.0	E		1					VSE
1970 04 01.10		B	1.5:	BD	3.0	B		6					CHE05
1970 04 01.83		B	1.0	S	0.0	E		1					CHI01
1970 04 02.06		B	0.9	BD	5.0	0					5		LAZ
1970 04 03.79		B	1.2	S	0.0	E		1					CHI01
1970 04 04.87		B	1.3	S	0.0	E		1					CHI01
1970 04 05.02		B	1.5	S	0.0	E		1					VSE
1970 04 06.98		B	1.9	S	0.0	E		1					KRY
1970 04 07.80		B	2.3:	S	0.0	E		1					CHI01
1970 04 07.94		B	1.4	S	0.0	E		1					VSE
1970 04 08.12		B	1.5	BD	3.0	B		6					CHE05
1970 04 10.00			1.7	BD	5.0	0					4		LAZ
1970 04 10.10		B	1.4	BD	0.0	E		1					CHE05
1970 04 11.04		B	2.3	S	0.0	E		1					VSE
1970 04 12.84		B	2.2	S	0.0	E		1					CHI01
1970 04 14.82		B	2.9	S	0.0	E		1					CHI01
1970 04 16.11		B	2.8	S	0.0	E		1					DRO
1970 04 16.83		B	3.5	S	0.0	E		1					VSE
1970 04 17.03		B	3.3	S	3.0	B		6					CHE05
1970 04 17.05		B	2.7	S	3.0	B		6					DRO
1970 04 17.86			2.5	BD	5.0	0					3		LAZ
1970 04 23.01		B	4.2	S	0.0	E		1					CHE06
1970 04 24.72		B	4.5	S	5.0	B		7					VSE
1970 04 24.80		B	4.3	S	0.0	E		1					VSE
1970 04 25.84		B	4.2	S	5.0	B		7					VSE
1970 04 26.75			4.0	BD	5.0	0					1.5		LAZ
1970 04 26.92		B	4.8:	S	3.0	B		6					DRO
1970 04 27.79			4.2	BD	5	0					1.5		LAZ
1970 05 03.91		B	5.3:	S	3.0	B		6					DRO
1970 05 04.79			4.9	BD	5	0					1		LAZ
1970 05 05.79			4.9	BD	5	0					1		LAZ
1970 05 05.86		B	4.9	S	5.0	B		7					VSE
1970 05 05.93		B	5.7:	S	3.0	B		6					DRO
1970 05 06.91		B	5.9:	S	3.0	B		6					DRO
1970 05 06.93		B	4.8	S	5.0	B		7					VSE
1970 05 07.84		B	5.3	S	5.0	B		7					VSE
1970 05 08.82		B	5.4	S	5.0	B		7					VSE
1970 05 08.86		B	5.9:	S	3.0	B		6					DRO
1970 05 09.75			5.0	BD	5.0	0					1		LAZ
1970 05 10.94		B	6.0:	S	3.0	B		6					DRO
1970 05 11.88		B	5.3	S	5.0	B		7					VSE
1970 05 11.88		B	5.3	S	5.0	B		7					VSE
1970 05 12.03		B	6.2:	S	3.0	B		6					DRO
1970 05 15.85		B	6.2	S	5.0	B		7					VSE
1970 06 09.10		B	8.5	S	8.0	B		20					VSE

Comet C/1975 V1 (West)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 03 01.88		S	0.0	S	0.0	E		1	10		1.5		GOL03
1976 03 02.86		B	0.4	S	0.0	E		1			6		DIA01
1976 03 02.86		S	0.4	S	0.0	E		1	10		6		GOL03
1976 03 03.84		B	1.0	S	0.0	E		1			20		GOL03
1976 03 03.85		B	0.8	S	0.0	E		1			20		GOL03
1976 03 04.85		B	1.1	S	0.0	E		1			18		GOL03
1976 03 08.85		B	2.0	S	0.0	E		1			22		DIA01
1976 03 09.83		B	1.7	S	0.0	E		1			18		GOL03
1976 03 11.82		B	2.1	S	0.0	E		1					DIA01
1976 03 12.83		B	2.3	S	0.0	E		1			20		GOL03
1976 03 13.82		B	2.5	S	0.0	E		1					DIA01
1976 03 14.15		B	1.2	S	0.0	E		1					VSE

Comet C/1975 V1 (West) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 03 15.16		B	1.2	S	0.0	E		1					VSE
1976 03 15.83		B	2.4	S	0.0	E		1			5		GOL03
1976 03 18.81		B	3.0	S	0.0	E		1			3		DIA01
1976 03 22.79		B	4.0	S	0.0	E		1			3		DIA01
1976 03 23.80		B	3.5	S	0.0	E		1			4		GOL03
1976 03 24.77		B	3.7	S	0.0	E		1			5		DIA01
1976 03 27.02		P	5.7:	S	50	C							VOI
1976 03 27.02		P	5.8:	S	50	C							KOV
1976 03 27.79		B	3.8	S	0.0	E		1			4		GOL03
1976 03 29.03		P	5.7:	S	50	C							SYZ
1976 03 29.08		B	4.8	BD	0.0	E		1			4		VSE
1976 04 01.82		B	4.3	S	0.0	E		1			1		GOL03
1976 04 02.00		P	4.7	HD	50	M	2		6.25	4	1.5		GOR03
1976 04 02.77		B	4.1	S	0.0	E		1			3		GOL03
1976 04 03.09		B	4.9	BD	0.0	E		1					VSE
1976 04 03.77		B	4.1	S	0.0	E		1			2.5		DIA01
1976 04 04.11		B	4.7	BD	0.0	E		1					VSE
1976 04 04.77		B	4.5	S	0.0	E		1			1.5		DIA01
1976 04 06.11		B	5.1	BD	0.0	E		1					VSE
1976 04 06.76		B	4.6	S	0.0	E		1			2		GOL03
1976 04 07.10		B	5.2	BD	0.0	E		1					VSE
1976 04 07.77		B	4.6	S	0.0	E		1			2		GOL03
1976 04 08.77		B	4.7	S	0.0	E		1			3		DIA01
1976 04 09.79		B	4.9	S	10.0	B		20			2		DIA01
1976 04 11.81		B	5.2	S	10.0	B		20			1.5		GOL03
1976 04 14.78		B	5.8	S	10.0	B		20					GOL03
1976 04 15.80		B	6.2	S	10.0	B		20					GOL03
1976 04 16.78		B	6.4	S	5.0	B		7					GOL03
1976 04 24.71		B	6.1	S	8.0	B		20			0.67		GOL03
1976 04 26.72		B	6.2	S	8.0	B		20			0.5		GOL03
1976 04 27.71		B	6.2	S	8.0	B		20			0.5		GOL03
1976 04 29.73		B	6.7	S	8.0	B		20			0.47		GOL03
1976 05 01.71		B	7.1	S	8.0	B		20			0.42		GOL03
1976 05 04.73		B	7.8	S	8.0	B		20			0.35		DIA01
1976 05 06.73		B	7.4	S	8.0	B		20			0.25		GOL03
1976 05 07.71		B	7.1	S	8.0	B		20			0.25		GOL03
1976 05 08.72		B	6.8	S	8.0	B		20			0.2		GOL03
1976 05 18.63		B	7.2	S	8.0	B		20					GOL03
1976 05 23.63		B	7.8	S	8.0	B		20					GOL03
1976 05 25.60		B	7.6	S	8.0	B		20					GOL03
1976 05 26.60		B	7.8	S	8.0	B		20					DIA01
1976 05 27.60		B	8.1	S	8.0	B		20					DIA01
1976 05 28.61		B	8.1	S	8.0	B		20					DIA01
1976 05 31.69		B	7.4	S	8.0	B		20					DIA01
1976 06 01.70		B	8.7	S	8.0	B		20					DIA01
1976 06 03.69		B	8.1	S	8.0	B		20					GOL03

Comet C/1975 V1 (West) -- Component A

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 04 07.08	!	L	10.9:		60	C							TAR01
1976 04 07.08	!	U	11.3:		60	C							TAR01
1976 04 07.08	!	V	10.1:		60	C							TAR01
1976 04 08.01	!	L	11.0:		60	C							LUT01
1976 04 08.01	!	U	11.1:		60	C							LUT01
1976 04 08.01	!	V	10.2:		60	C							LUT01

Comet C/1975 V1 (West) -- Component B

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 04 07.08	!	L	10.9:		60	C							TAR01
1976 04 07.08	!	U	11.0:		60	C							TAR01
1976 04 07.08	!	V	10.1:		60	C							TAR01
1976 04 08.01	!	L	10.9:		60	C							LUT01
1976 04 08.01	!	U	10.8:		60	C							LUT01

Comet C/1975 V1 (West) -- Component B [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 04 08.01	!	V	10.2:		60	C							LUT01

Comet C/1975 V1 (West) -- Component D

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1976 04 07.08	!	L	11.4:		60	C							TAR01
1976 04 07.08	!	U	11.4:		60	C							TAR01
1976 04 07.08	!	V	10.6:		60	C							TAR01
1976 04 08.01	!	L	11.4:		60	C							LUT01
1976 04 08.01	!	U	11.3:		60	C							LUT01
1976 04 08.01	!	V	10.7:		60	C							LUT01

Comet C/1977 R1 (Kohler)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 09 09.48		B	9.3	S	10.0	B		25	6	3			GOL03
1977 09 11.58		B	9.0	S	10.0	B		25	6	3			GOL03
1977 09 15.46		B	8.7	S	10.0	B		25	4.3	3			GOL03
1977 09 16.47		B	8.6	S	10.0	B		25	6	3			GOL03
1977 09 22.46		B	9.1:	S	10.0	B		25		3			GOL03
1977 09 23.48		B	9.3:	S	10.0	B		25		3			GOL03
1977 10 06.49		B	8.0	S	10.0	B		25	6	3			GOL03
1977 10 07.44		B	7.9	S	10.0	B		25	4	4			GOL03
1977 10 08.46		B	7.6	S	10.0	B		25	4	3			GOL03
1977 10 09.43		B	7.8	S	10.0	B		25					GOL03
1977 10 10.43		B	7.8	S	10.0	B		25					GOL03
1977 10 11.43		B	7.4	S	10.0	B		25					GOL03
1977 10 12.43		B	7.5	S	10.0	B		25		3			GOL03
1977 10 13.42		B	8.0	S	10.0	B		25		3			GOL03
1977 10 16.41		B	6.8	S	10.0	B		25		3			GOL03
1977 10 17.43		B	6.9	S	10.0	B		25		3			GOL03
1977 10 18.42		B	6.6	S	10.0	B		25		4			GOL03
1977 10 19.46		B	6.5	S	10.0	B		25					GOL03
1977 10 20.46		B	6.5	S	10.0	B		25	5	4			GOL03
1977 10 24.42		B	7.1:	S	10.0	B		25	5	3			GOL03
1977 10 26.43		B	6.7:	S	10.0	B		25					GOL03
1977 10 28.07		B	7.9	S	8	R	10	28	10				MAI
1977 10 30.44		B	6.6	S	10.0	B		25	5	4			GOL03
1977 10 30.70		B	7.7	S	8	R	10	28	11				MAI
1977 10 31.63		B	7.6	S	8	R	10	28	12				MAI
1977 11 01.41		B	6.1	S	10.0	B		25		3			GOL03
1977 11 02.41		B	6.3	S	10.0	B		25	4	3			GOL03
1977 11 03.44		B	6.6	S	10.0	B		25	4	3			GOL03
1977 11 06.64		B	7.7	S	8	R	10	28	10				MAI
1977 11 06.77		B	6.5	S	8	R	10	28	6				MOR04
1977 11 07.77		B	7.3	S	8	R	10	28	5				MOR04
1977 11 08.45		B	6.5	S	10.0	B		25	4	3			GOL03
1977 11 08.79		B	7.2	S	8	R	10	28	3				MOR04
1977 11 09.42		B	6.7	S	10.0	B		25					GOL03
1977 11 09.67		B	7.5	S	8	R	10	28	10				MAI
1977 11 10.42		B	6.5	S	10.0	B		25		3			GOL03
1977 11 11.41		B	6.4	S	10.0	B		25					GOL03
1977 11 11.42		B	6.5	S	10.0	B		25					GOL03
1977 11 11.78		B	7.0	S	8	R	10	28	6				MOR04
1977 11 13.78		B	6.9	S	8	R	10	28	7				MOR04
1977 11 14.41		B	6.2	S	10.0	B		25					GOL03
1977 11 15.42		B	6.8	S	10.0	B		25	6	3			GOL03
1977 11 15.78		B	7.2	S	8	R	10	28	6				MOR04
1977 11 27.77		B	6.8	S	8	R	10	28	6				MOR04
1977 11 28.42		B	6.4	S	10.0	B		25	7	3			GOL03
1977 11 29.42		B	6.5	S	10.0	B		25	6	4			GOL03
1977 11 29.76		B	6.9	S	8	R	10	28					MOR04
1977 11 30.42		B	6.7	S	10.0	B		25	6	3			GOL03
1977 11 30.70		P	7.0:	HD	40	A	2						ZHU01
1977 11 30.77		B	6.9	S	8	R	10	28	4				MOR04

Comet C/1977 R1 (Kohler) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1977 12 01 40		B	6.9	S	10.0	B		25					DIA01
1977 12 01.44		B	7.1	S	10.0	B		25	5	4			GOL03
1977 12 01.67		P	7.0:	HD	40	A	2						FAT
1977 12 01.76		B	7.0	S	8	R	10	28	4.5				MOR04
1977 12 02.42		B	6.5	S	10.0	B		25	5	3			GOL03
1977 12 05.40		B	7.5	S	10.0	B		25	4	3			GOL03
1977 12 05.77		B	7.5	S	8	R	10	28	4				MOR04
1977 12 06.40		B	7.2	S	10.0	B		25					DIA01
1977 12 06.42		B	7.0	S	10.0	B		25		3			GOL03
1977 12 07 40		B	7.2	S	10.0	B		25	4				DIA01
1977 12 07.42		B	7.2	S	10.0	B		25	4	3			GOL03
1977 12 07.77		B	7.3	S	8	R	10	28	3.5				MOR04
1977 12 09.40		B	7.5	S	10.0	B		25	3				DIA01
1977 12 10.40		B	7.6	S	10.0	B		25	3	3			DIA01
1977 12 11 40		B	8.0	S	10.0	B		25	2				DIA01
1977 12 11.42		B	7.9	S	10.0	B		25	3	3			GOL03
1977 12 13.40		B	8.1	S	10.0	B		25	3				DIA01
1977 12 13.41		B	8.0	S	10.0	B		25	4	4			GOL03

Comet C/1978 H1 (Meier)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1979 11 13.64		P	15.3		50	M							DIA01
1979 11 14.61		P	15.6		50	M							DIA01
1979 11 15.58		P	15.2		50	M							USO
1979 11 15.59		P	15.0		50	M							DIA01
1979 11 16.57		P	14.9		50	M							USO
1979 11 17.59		P	15.2		50	M							DIA01
1979 11 17.60		P	15.1		50	M							USO
1979 11 18.58		P	15.1		50	M							DIA01

Comet C/1979 Y1 (Bradfield)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1980 02 08.72		P	6.2:	S	50	M							GOR04
1980 02 09.61		P	6.5:	S	50	M							USO
1980 02 13.74		P	6.5:	S	80	D	3		4		0.2	115	IVA05
1980 02 17.7		B	8.5:	S	70	C			5	1			CHU
1980 02 18.7		B	9.5:	S	8	R		30					NES
1980 02 19.79		V	10.3:	BD	60	L			2.5		0.02		TAR01
1980 02 20.78		V	10.6:	BD	60	L			2.5				LUT01
1980 03 03.44		B	6.3:	AA	8.0	B		20	12	3			DIA01
1980 03 04.42		B	6.5:	AA	8.0	B		20	10	3			DIA01
1980 03 05.42		B	8.4	AA	8.0	B		20	10	3			OKN
1980 03 06.44		B	8.3	AA	8.0	B		20	10	4			DIA01
1980 03 07.42		B	8.4	AA	8.0	B		20	8.5	3			OKN
1980 03 08.43		B	8.2	AA	8.0	B		20	6	3			DIA01
1980 03 09.44		B	8.2	AA	8.0	B		20	6	4			DIA01
1980 03 10.46		B	8.3	AA	8.0	B		20	7	3			DIA01
1980 03 11.42		B	8.4	AA	8.0	B		20	7	3			OKN
1980 03 12.54		B	8.1	AA	8.0	B		20	7	3			DIA01
1980 03 13.45		B	8.2	AA	8.0	B		20	9	3			OKN
1980 03 14.48		B	8.3	AA	8.0	B		20	8	3			DIA01
1980 03 16.49		B	8.6	AA	8.0	B		20	5	3			DIA01
1980 03 17.43		B	8.1	AA	8.0	B		20	6	3			DIA01

Comet C/1980 Y2 (Panther)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 02 04.42		B	9.1	BD	8.0	B		20	3.5	3			DIA01
1981 02 05.42		B	9.1	BD	8.0	B		20	4	3			DIA01
1981 02 06.44		B	8.9	BD	8.0	B		20	3.5	3			OKN
1981 02 21.46		B	9.0	BD	8.0	B		20	3	5			OKN
1981 02 23.45		B	9.0	BD	8.0	B		20	3	5			DIA01
1981 02 27.44		B	9.0	BD	8.0	B		20	3	4			OKN

Comet C/1980 Y2 (Panther) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1981 03 01.44		B	8.8	BD	8.0	B		20	3.5	4			DIA01
1981 03 07.56		B	9.1	BD	8.0	B		20	2.5	4			DIA01
1981 03 09.50		B	8.8	BD	8.0	B		20	4.5	3			OKN
1981 03 10.55		B	8.9	BD	8.0	B		20	5	3			DIA01
1981 03 13.90		P	8.5:	BD	40	D				5			SEM01
1981 03 13.95		P	8.5:	BD	40	D				5			GOR04
1981 03 25.81		P	9.0:	BD	40	D				4			GOR05
1981 04 06.50		B	9.3	BD	8.0	B		20	3	2			DIA01
1981 04 07.51		B	9.5	BD	8.0	B		20	5	2			OKN

Comet C/1982 M1 (Austin)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1982 08 01.75		B	6.2	S	5	R	10	28	5	4	0.5		NES
1982 08 19.09		B	4.6	S	8.0	B		20					CHU
1982 08 20.77		B	4.7	S	8.0	B		20					CHU
1982 08 21.77		B	5.2	S	8	R	10	28	7	4	0.2		MAI
1982 08 22.75		B	5.1	S	8	R	10	28	6	4	0.2		MAI
1982 08 23.76		B	5.1	S	8	R	10	28	6	4	0.3		MAI
1982 08 23.80		B	4.8	S	5.0	B		7					POT01
1982 08 24.79		B	5.0	S	5.0	B		7					POT01
1982 08 25.74		B	5.6	S	8	R	10	28	5	4	0.15		MAI
1982 08 25.80		B	5.5	S	5.0	B		7					POT01
1982 08 26.75		B	5.7	S	8	R	10	28	5	4	0.12		MAI
1982 08 26.78		B	5.0	S	5.0	B		7					CHU
1982 08 26.79		B	5.3	S	5.0	B		7					POT01
1982 08 27.75		B	5.3	S	8	R	10	28	5	4	0.12		MAI
1982 08 27.76		B	5.2	S	5.0	B		7					CHU
1982 08 27.78		B	4.8	S	8	R	10	29	4.5	4			NES
1982 08 27.78		B	5.4	S	5.0	B		7					POT01
1982 08 27.79		B	5.0	S	5	R		20	9	5	1.0		NES
1982 08 28.78		B	5.4	S	8	R	10	28	5	4	0.1		MAI
1982 08 28.81		B	6.1	S	5	L		25					CHU
1982 08 28.86		P	5 :	HD	33	R			0.5				BRO07
1982 08 29.74		B	5.5	S	8	R	10	28	5	4	0.1		MAI
1982 08 29.76		B	5.0	S	8	R	10	28	4	4	0.5	335	NES
1982 08 29.77		B	5.1	S	5	R		20	7	5	1.0		NES
1982 08 29.79		B	5.4	S	5.0	B		7					POT01
1982 08 30.74		B	5.6	S	8	R	10	28	6	4	0.1		MAI
1982 08 30.76		B	5.3	S	8	R	10	28	3	5			NES
1982 08 30.77		B	5.4	S	5	R		20	7	5			NES
1982 08 30.80		B	5.2	S	5.0	B		7					POT01
1982 08 30.80		B	5.3	S	5.0	B		7					GOL03
1982 08 30.80		P	5 :	HD	33	R			0.8		0.08		BRO07
1982 08 30.81		P	5 :	HD	33	R			1.5		0.33		BRO07
1982 08 31.74		B	5.9	S	8	R	10	28	4	5	0.5	342	NES
1982 08 31.76		B	6.0	S	5	R		20	6	5	1.0		NES
1982 09 01.74		B	6.2	S	8	R	10	28	3.5	5	0.5	335	NES
1982 09 01.76		B	6.4	S	5	L		25					CHU
1982 09 01.77		B	5.8	S	8	R	10	28	5	4	0.1		MAI
1982 09 02.74		B	5.9	S	8	R	10	28	4	4	0.08		MAI
1982 09 02.75		B	6.4	S	8	R	10	28	3.5	5	0.3	325	NES
1982 09 02.77		B	6.8	S	5	L		25					CHU
1982 09 04.74		B	6.2	S	8	R	10	28	4.5	5	0.5	333	NES
1982 09 04.75		B	5.8	S	8	R	10	28			1		CHU
1982 09 04.75		B	5.8	S	8	R	10	28			1		CHU
1982 09 04.75		B	6.2	S	8	R	10	28	4	4	0.08		MAI
1982 09 05.74					6.5	L	8	33	& 2.9	4	&0.5	50	FIL02
1982 09 05.74		B	6.0	S	8	R	10	28					CHU
1982 09 05.74		B	6.0	S	8	R	10	28					CHU
1982 09 05.75		B	6.5	S	8	R	10	28	6	5			NES
1982 09 06.75		B	6.7	S	8	R	10	28	4.5	5			NES
1982 09 06.75		E	6.7	S	6.5	L	8	33	1.7	4			FIL02
1982 09 06.77		B	6.2	S	8	R	10	28					CHU
1982 09 07.74		B	6.3	S	8	R	10	28					CHU

Comet C/1982 M1 (Austin) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1982 09 07.74		E	7.0	S	6.5	L	8	33	2.0	4	&0.5	51	FIL02
1982 09 08.76		B	6.3	S	8	R	10	28					CHU
1982 09 08.80		B	6.5	S	5.0	B		7					GOL03
1982 09 08.80		B	6.5	S	5.0	B		7					POT01
1982 09 09.73		B	6.4	S	8	R	10	28					CHU
1982 09 09.77		B	6.2	S	5.0	B		7					GOL03
1982 09 09.77		B	6.2	S	5.0	B		7					POT01
1982 09 10.73		B	6.8	S	8	R	10	28	4.5	5	0.5	340	NES
1982 09 10.74		E	7.4	S	6.5	L	8	33	2.0	4	&0.6	46	FIL02
1982 09 10.75		B	6.4	S	8	R	10	28					CHU
1982 09 10.76		B	6.2	S	5.0	B		7					POT01
1982 09 10.76		B	6.3	S	5.0	B		7					GOL03
1982 09 10.84		B	6.5:	HD	8	R		30					KOR03
1982 09 11.77		B	6.5	S	8	R	10	28					CHU
1982 09 11.78		B	6.2	S	5.0	B		7					GOL03
1982 09 11.78		B	6.2	S	5.0	B		7					POT01
1982 09 12.69		B	6.3	S	5.0	B		7					GOL03
1982 09 12.75		B	7.0	S	8	R	10	28	5.5	5	0.5	324	NES
1982 09 12.76		B	6.5:	HD	8	R		30			0.3		KOR03
1982 09 12.79		B	6.3	S	5.0	B		7					POT01
1982 09 12.79		B	6.6	S	8	R	10	28					CHU
1982 09 13.73		B	7.0	S	8	R	10	28	4.0	4			NES
1982 09 13.77		B	6.3	S	5.0	B		7					POT01
1982 09 14.75		B	6.4	S	5.0	B		7					GOL03
1982 09 14.81		B	6.3	S	5.0	B		7					POT01
1982 09 16.77		B	6.5	S	5.0	B		7					POT01
1982 09 16.83		B	6.5:	HD	8	R		30			0.05		BRO07
1982 09 17.72		B	7.9	S	8	R	10	28	4	5			NES
1982 09 17.74		V	10.0:	HD	125	C	13						TAR01
1982 09 17.76		B	6.5:	HD	8	R		30			0.12		KOR03
1982 09 17.76		B	6.7	S	5.0	B		7					GOL03
1982 09 17.79		B	6.5	S	5.0	B		7					POT01
1982 09 18.72		B	7.5	S	8	R	10	28	4.3	4			NES
1982 09 18.73		B	7.3	S	8	R	10	28	3		0.05		MAI
1982 09 18.73		B	7.3	S	8	R	10	28	3	4	0.05		MAI
1982 09 18.75		B	6.7	S	5.0	B		7					POT01
1982 09 18.76		B	6.8	S	5.0	B		7					GOL03
1982 09 19.71		B	7.0	S	8	R	10	28	3	4	0.08		MAI
1982 09 19.72		B	7.3	S	8	R	10	28	4	4			NES
1982 09 19.75		B	6.9	S	5.0	B		7					GOL03
1982 09 20.71		B	6.9	S	8	R	10	28	3	4	0.1		MAI
1982 09 21.71		B	7.2	S	8	R	10	28	3	4	0.05		MAI
1982 09 21.72		B	7.6	S	8	R	10	28	4.5	5			NES
1982 09 21.75		B	6.8	S	5.0	B		7					POT01
1982 09 21.77		B	7.0	S	13	R		50					GOL03
1982 09 22.76		B	6.8	S	5.0	B		7					POT01
1982 09 22.77		B	7.1	S	5.0	B		7					GOL03
1982 09 23.72		B	7.7	S	8	R	10	28	3.4	3			NES
1982 09 23.72		B	7.7	S	8	R	10	28	3.5	5			NES
1982 09 23.73		B	7.5:	HD	8	R		30		2			BRO07
1982 09 23.75		B	7.0	S	5.0	B		7					POT01
1982 09 26.74		B	7.5:	HD	8	R		30		2			BRO07
1982 09 27.09		B	7.5:	HD	8	R		30		2			BRO07
1982 10 02.74		B	8.0:	HD	8	R		30		2			BRO07
1982 10 06.70		B	8.5:	HD	8	R		30		3			BRO07
1982 10 07.68		B	9.0:	S	8	R	10	28	3.5	3			NES

Comet C/1983 H1 (IRAS-Araki-Alcock)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1983 05 08.59		B	2.5	S	5.0	B		7		4			SIK
1983 05 09.83		P	3.0:	HD	50	M			&20	5			ROS03
1983 05 11.80		B	2.0	S	11.0	B		20	12	5	0.5		SHI03
1983 05 11.89		B	3.5	S	8	R		30	4	5	1.9		MAI

Comet C/1984 N1 (Austin)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1984 09 04.05		B	6.8	S	8.8	B		20					CHU
1984 09 05.05		B	7.0	S	8.8	B		20					CHU
1984 09 06.04		E	7.4	BD	6.5	L	8	33	2.5	4			FIL02
1984 09 07.04		E	7.1	BD	6.5	L	8	33	2.9	4			FIL02
1984 09 07.06		B	7.2	S	8.8	B		20					CHU
1984 09 07.06		B	7.3	S	8.0	B		12		5			KUC
1984 09 08.05		B	7.3	S	8.8	B		20					CHU
1984 09 09.06		E	7.0	BD	6.5	L	8	33	3.3	4			FIL02
1984 09 10.06		B	7.0	S	8.8	B		20					CHU
1984 09 11.05		B	7.5	S	8.8	B		20					CHU
1984 09 11.06		E	7.5:	BD	6.5	L	8	33		4			FIL02
1984 09 14.05		E	7.2	BD	6.5	L	8	33	3.6	4			FIL02
1984 09 16.05		E	7.7:	BD	6.5	L	8	33					FIL02
1984 09 18.03		E	7.4:	BD	6.5	L	8	33					FIL02

Comet C/1984 V1 (Levy-Rudenko)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1985 01 20.69		B	8.3	S	20	L		20	4	2/			TSV
1985 01 29.39		B	9.0	S	8.0	B		12	12.5	5			SHI03
1985 01 30.27		B	9.1	S	8.0	B		12	11	5			SHI03
1985 01 30.31		B	8.9	S	8.0	B		12	10	6			SHI03
1985 02 09.07		B	9.4	S	8.0	B		12	8.5	5			SHI03
1985 02 15.98		B	9.5	S	8.0	B		12	9	6			SHI03
1985 02 16.23		B	9.5	S	8.0	B		12	8	4			SHI03
1985 02 16.38		B	9.4	S	8.0	B		12	7	4			SHI03
1985 02 22.05		B	9.9	S	8.0	B		12	5	3			SHI03

Comet C/1987 P1 (Bradfield)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1987 10 26.69		B	5.6	HD	8	L		30	3.5	4			NES
1987 10 26.69		B	6.1	HD	8	L		30	3.5	4			NES
1987 10 27.65		B	5.8	HD	8	L		30	3.5	3	0.5	295	NES
1987 10 28.65		B	5.7	HD	8	L		30	3.0	4			NES
1987 10 30.77		B	5.5	HD	8	L		30	3.0	3			NES
1987 11 01.63		B	5.5	HD	8	L		30	4.5	3	0.7	230	NES

Comet C/1987 Q1 (Rudenko)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1987 10 30.15		B	7.3	S	8	R	10	28	2	6			NES
1987 10 31.10		B	7.1	S	8	R	10	28	1.5	5			NES

Comet C/1989 T1 (Helin-Roman-Alu)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 10 28.65		P	12.0	BD	50	M	2						GOR05
1990 11 17.62		P	11.4	BD	50	M	2						LVO

Comet C/1989 Y1 (Skorichenko-George)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1990 01 13.59		P	11.3	BD	50	M	2						ROS03

Comet C/1995 O1 (Hale-Bopp)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 04 25.97	x	G	3.9:	TJ	20.3	D	2	a013	+ 0.57				LIL
1997 04 27.96	x	G	3.7:	TJ	20.3	D	2	a002	+ 0.57				LIL
1997 04 28.96	x	G	3.3:	TJ	20.3	D	2	a012	+ 0.57				LIL
1997 04 30.96	x	G	3.5:	TJ	20.3	D	2	a006	+ 0.57				LIL
1997 05 05.96	x	G	3.6:	TJ	20.3	D	2	a011	+ 0.57				LIL
1997 05 06.96	x	G	3.8:	TJ	20.3	D	2	a019	+ 0.57				LIL
1997 05 08.95	x	G	3.6:	TJ	20.3	D	2	a013	+ 0.57				LIL

Comet C/1995 01 (Hale-Bopp) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 05 12.95	x	G	4.3:	TJ	20.3	D	2	a020	+ 0.57				LIL
1997 05 13.95	x	G	4.2:	TJ	20.3	D	2	a014	+ 0.57				LIL
1997 05 18.95	x	G	4.5:	TJ	20.3	D	2	a016	+ 0.57				LIL
1997 05 19.95	x	G	4.5:	TJ	20.3	D	2	a006	+ 0.57				LIL
1997 05 21.96	x	G	4.3:	TJ	20.3	D	2	a006	+ 0.57				LIL
1997 05 23.96	x	G	4.3:	TJ	20.3	D	2	a013	+ 0.57				LIL
1997 06 01.95	x	G	5.2:	TJ	20.3	D	2	a008	+ 0.57				LIL
1997 06 04.95	x	G	5.0:	TJ	20.3	D	2	a005	+ 0.57				LIL
1997 06 05.94	x	G	5.3:	TJ	20.3	D	2	a010	+ 0.57				LIL
1997 06 25.95	x	G	6.4:	TJ	20.3	D	2	a022	+ 0.57				LIL
1997 06 26.95	x	G	6.8:	TJ	20.3	D	2	a018	+ 0.57				LIL
1997 08 01.44	x	G	7.6	TJ	20.3	D	2	a055	+ 0.57				LIL
1997 10 05.37	x	G	9.1	TJ	20.3	D	2	a011	+ 0.57				LIL
1997 10 06.30	x	G	9.2	TJ	20.3	D	2	a039	+ 0.57				LIL
1997 10 08.30	x	G	9.4	TJ	20.3	D	2	a042	+ 0.57				LIL
1997 10 16.33	x	G	9.5	TJ	20.3	D	2	a060	+ 0.57				LIL
1997 10 17.36	x	G	9.5	TJ	20.3	D	2	a033	+ 0.57				LIL
1997 10 20.29	x	G	9.4	TJ	20.3	D	2	a055	+ 0.57				LIL
1997 10 22.35	x	G	9.5	TJ	20.3	D	2	a090	+ 0.57				LIL
1997 10 23.24	x	G	9.5	TJ	20.3	D	2	a057	+ 0.57				LIL
1997 10 24.26	x	G	9.5	TJ	20.3	D	2	a051	+ 0.57				LIL
1997 10 25.24	x	G	9.6	TJ	20.3	D	2	a042	+ 0.57				LIL
1997 10 26.24	x	G	9.6	TJ	20.3	D	2	a066	+ 0.57				LIL
1997 10 27.24	x	G	9.6	TJ	20.3	D	2	a066	+ 0.57				LIL
1997 10 29.31	x	G	9.4	TJ	20.3	D	2	a044	+ 0.57				LIL
1997 10 30.24	x	G	9.5	TJ	20.3	D	2	a045	+ 0.57				LIL
1997 11 01.23	x	G	9.4	TJ	20.3	D	2	a088	+ 0.57				LIL
1997 11 09.23	x	G	9.4	TJ	20.3	D	2	a051	+ 0.57				LIL
1997 11 11.33	x	G	9.5	TJ	20.3	D	2	a072	+ 0.57				LIL
1997 11 13.19	x	G	9.6	TJ	20.3	D	2	a072	+ 0.57				LIL
1997 11 16.31	x	G	9.8	TJ	20.3	D	2	a078	+ 0.57				LIL
1997 11 17.31	x	G	10.0	TJ	20.3	D	2	a066	+ 0.57				LIL
1997 11 18.26	x	G	9.7	TJ	20.3	D	2	a065	+ 0.57				LIL
1997 11 21.30	x	G	9.9	TJ	20.3	D	2	a072	+ 0.57				LIL
1997 11 22.27	x	G	9.9	TJ	20.3	D	2	a065	+ 0.57				LIL
1997 11 23.31	x	G	9.6	TJ	20.3	D	2	a065	+ 0.57				LIL
1997 11 26.31	x	G	9.6	TJ	20.3	D	2	a104	+ 0.57				LIL
1997 11 27.31	x	G	9.8	TJ	20.3	D	2	a088	+ 0.57				LIL
1997 11 28.26	x	G	9.8	TJ	20.3	D	2	a063	+ 0.57				LIL
1997 11 29.27	x	G	9.8	TJ	20.3	D	2	a088	+ 0.57				LIL
1997 12 01.25	x	G	9.9	TJ	20.3	D	2	a104	+ 0.57				LIL
1997 12 02.22	x	G	9.7	TJ	20.3	D	2	a112	+ 0.57				LIL
1997 12 03.31	x	G	9.7	TJ	20.3	D	2	a075	+ 0.57				LIL
1997 12 04.20	x	G	9.7	TJ	20.3	D	2	a075	+ 0.57				LIL
1997 12 05.23	x	G	9.8	TJ	20.3	D	2	a088	+ 0.57				LIL
1997 12 06.28	x	G	9.9	TJ	20.3	D	2	a075	+ 0.57				LIL
1997 12 07.27	x	G	9.8	TJ	20.3	D	2	a075	+ 0.57				LIL
1997 12 13.17	x	G	10.0	TJ	20.3	D	2	a078	+ 0.57				LIL
1997 12 14.30	x	G	10.0	TJ	20.3	D	2	a075	+ 0.57				LIL
1997 12 19.28	x	G	10.1	TJ	20.3	D	2	a088	+ 0.57				LIL
1997 12 20.18	x	G	9.9	TJ	20.3	D	2	a090	+ 0.57				LIL
1997 12 23.29	x	G	9.8	TJ	20.3	D	2	a088	+ 0.57				LIL
1997 12 24.10	x	G	10.0	TJ	20.3	D	2	a063	+ 0.57				LIL
1997 12 27.20	x	G	10.0	TJ	20.3	D	2	a078	+ 0.57				LIL
1997 12 28.19	x	G	9.9	TJ	20.3	D	2	a057	+ 0.57				LIL
1998 01 02.30	x	G	10.3	TJ	20.3	D	2	a075	+ 0.57				LIL
1998 01 03.21	x	G	10.3	TJ	20.3	D	2	a090	+ 0.57				LIL
1998 01 04.17	x	G	10.4	TJ	20.3	D	2	a085	+ 0.57				LIL
1998 01 05.29	x	G	10.4	TJ	20.3	D	2	a078	+ 0.57				LIL
1998 01 06.15	x	G	10.3	TJ	20.3	D	2	a075	+ 0.57				LIL
1998 01 07.20	x	G	10.4	TJ	20.3	D	2	a090	+ 0.57				LIL
1998 01 08.08	x	G	10.4	TJ	20.3	D	2	a090	+ 0.57				LIL
1998 01 09.11	x	G	10.2	TJ	20.3	D	2	a077	+ 0.57				LIL
1998 01 10.18	x	G	10.1	TJ	20.3	D	2	a099	+ 0.57				LIL
1998 01 11.32	x	G	9.5	TJ	20.3	D	2	a099	+ 0.57				LIL

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

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 01 12.13	x	G	9.5	TJ	20.3	D	2	a088	+ 0.57				LIL
1998 01 14.13	x	G	9.4	TJ	20.3	D	2	a090	+ 0.57				LIL
1998 01 16.09	x	G	9.6	TJ	20.3	D	2	a099	+ 0.57				LIL
1998 01 17.23	x	G	9.8	TJ	20.3	D	2	a088	+ 0.57				LIL
1998 01 18.13	x	G	10.1	TJ	20.3	D	2	a088	+ 0.57				LIL
1998 01 19.32	x	G	10.1	TJ	20.3	D	2	a099	+ 0.57				LIL
1998 01 21.11	x	G	10.3	TJ	20.3	D	2	a066	+ 0.57				LIL
1998 01 22.14	x	G	10.3	TJ	20.3	D	2	a078	+ 0.57				LIL
1998 01 23.09	x	G	10.4	TJ	20.3	D	2	a068	+ 0.57				LIL
1998 01 24.09	x	G	10.4	TJ	20.3	D	2	a060	+ 0.57				LIL
1998 01 28.08	x	G	10.3	TJ	20.3	D	2	a088	+ 0.57				LIL
1998 01 29.34	x	G	10.3	TJ	20.3	D	2	a090	+ 0.57				LIL
1998 01 30.09	x	G	10.4	TJ	20.3	D	2	a090	+ 0.57				LIL
1998 02 03.09	x	G	10.6	TJ	20.3	D	2	a088	+ 0.57				LIL
1998 02 05.17	x	G	10.3	TJ	20.3	D	2	a078	+ 0.57				LIL
1998 02 09.08	x	G	10.4	TJ	20.3	D	2	a136	+ 0.57				LIL
1998 02 12.12	x	G	10.5	TJ	20.3	D	2	a120	+ 0.57				LIL
1998 03 03.11	x	G	10.8	TJ	20.3	D	2	a 60	+ 0.57				LIL
1998 03 07.08	x	G	10.9	TJ	20.3	D	2	a 91	+ 0.57				LIL
1998 03 08.07	x	G	11.0	TJ	20.3	D	2	a 88	+ 0.57				LIL
1998 03 13.11	x	G	11.0	TJ	20.3	D	2	a120	+ 0.57				LIL
1998 03 17.00	x	G	11.1	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 03 18.00	x	G	11.2	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 03 20.15	x	G	11.0	TJ	20.3	D	2	a143	+ 0.57				LIL
1998 03 21.01	x	G	11.0	TJ	20.3	D	2	a 88	+ 0.57				LIL
1998 04 06.98	x	G	11.2	TJ	20.3	D	2	a 66	+ 0.57				LIL
1998 04 14.02	x	G	11.3	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 04 14.99	x	G	11.3	TJ	20.3	D	2	a 84	+ 0.57				LIL
1998 04 16.13	x	G	11.4	TJ	20.3	D	2	a 72	+ 0.57				LIL
1998 04 17.11	x	G	11.4	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 04 19.04	x	G	11.4	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 04 22.97	x	G	11.2	TJ	20.3	D	2	a 64	+ 0.57				LIL
1998 04 27.97	x	G	11.3	TJ	20.3	D	2	a 72	+ 0.57				LIL
1998 05 02.98	x	G	11.4	TJ	20.3	D	2	a 63	+ 0.57				LIL
1998 05 07.97	x	G	11.5	TJ	20.3	D	2	a 88	+ 0.57				LIL
1998 05 08.98	x	G	11.3	TJ	20.3	D	2	a 88	+ 0.57				LIL
1998 05 13.04	x	G	9.9	TJ	20.3	D	2	a116	+ 0.57				LIL
1998 05 13.96	x	G	9.9	TJ	20.3	D	2	a 65	+ 0.57				LIL
1998 05 14.98	x	G	10.0	TJ	20.3	D	2	a 55	+ 0.57				LIL
1998 05 15.98	x	G	10.1	TJ	20.3	D	2	a 55	+ 0.57				LIL
1998 05 16.98	x	G	10.2	TJ	20.3	D	2	a 45	+ 0.57				LIL
1998 05 23.96	x	G	10.6	TJ	20.3	D	2	a 91	+ 0.57				LIL
1998 05 29.97	x	G	10.6	TJ	20.3	D	2	a168	+ 0.57				LIL
1998 05 31.98	x	G	10.8	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 06 03.97	x	G	11.0	TJ	20.3	D	2	a 96	+ 0.57				LIL
1998 06 06.95	x	G	11.1	TJ	20.3	D	2	a 99	+ 0.57				LIL
1998 06 07.97	x	G	11.1	TJ	20.3	D	2	a120	+ 0.57				LIL
1998 06 11.95	x	G	11.1	TJ	20.3	D	2	a 53	+ 0.57				LIL
1998 06 12.96	x	G	11.4	TJ	20.3	D	2	a105	+ 0.57				LIL
1998 06 15.97	x	G	11.5	TJ	20.3	D	2	a 72	+ 0.57				LIL
1998 06 29.96	x	G	11.4	TJ	20.3	D	2	a110	+ 0.57				LIL
1998 06 30.99	x	G	11.2	TJ	20.3	D	2	a 99	+ 0.57				LIL
1998 07 02.97	x	G	11.4	TJ	20.3	D	2	a 78	+ 0.57				LIL
1998 07 06.95	x	G	11.6	TJ	20.3	D	2	a 78	+ 0.57				LIL
1998 07 08.96	x	G	11.6	TJ	20.3	D	2	a 78	+ 0.57				LIL
1998 07 12.96	x	G	12.0:	TJ	20.3	D	2	a 75	+ 0.57				LIL
1998 07 16.96	x	G	11.8	TJ	20.3	D	2	a 70	+ 0.57				LIL
1998 07 21.96	x	G	11.8	TJ	20.3	D	2	a 78	+ 0.57				LIL
1998 07 24.96	x	G	11.9	TJ	20.3	D	2	a 72	+ 0.57				LIL
1998 07 28.96	x	G	11.9	TJ	20.3	D	2	a 99	+ 0.57				LIL
1998 08 04.39	x	G	12.2	TJ	20.3	D	2	a165	+ 0.57				LIL
1998 08 09.40	x	G	12.0	TJ	20.3	D	2	a120	+ 0.57				LIL
1998 08 12.41	x	G	12.4	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 08 14.40	x	G	12.5	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 08 15.44	x	G	12.6	TJ	20.3	D	2	a 88	+ 0.57				LIL

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

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 08 17.41	x	G	11.1	TJ	20.3	D	2	a102	+ 0.57				LIL
1998 09 14.35	x	G	11.7	TJ	20.3	D	2	a120	+ 0.57				LIL
1998 09 15.39	x	G	11.8	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 09 23.37	x	G	12.0	TJ	20.3	D	2	a121	+ 0.57				LIL
1998 10 11.34	x	G	12.4	TJ	20.3	D	2	a112	+ 0.57				LIL
1998 10 14.35	x	G	12.6	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 10 17.35	x	G	12.4	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 10 23.35	x	G	12.5	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 10 26.35	x	G	12.3	TJ	20.3	D	2	a120	+ 0.57				LIL
1998 10 28.35	x	G	12.2	TJ	20.3	D	2	a 60	+ 0.57				LIL
1998 11 04.22	x	G	12.5	TJ	20.3	D	2	a 99	+ 0.57				LIL
1998 11 07.33	x	G	12.5	TJ	20.3	D	2	a 88	+ 0.57				LIL
1998 11 11.33	x	G	12.6	TJ	20.3	D	2	a 60	+ 0.57				LIL
1998 11 12.33	x	G	12.7	TJ	20.3	D	2	a 88	+ 0.57				LIL
1998 11 14.29	x	G	12.5	TJ	20.3	D	2	a 60	+ 0.57				LIL
1998 11 15.30	x	G	12.6	TJ	20.3	D	2	a 60	+ 0.57				LIL
1998 11 16.31	x	G	12.5	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 11 17.29	x	G	12.6	TJ	20.3	D	2	a 66	+ 0.57				LIL
1998 11 19.20	x	G	12.7	TJ	20.3	D	2	a 52	+ 0.57				LIL
1998 11 20.23	x	G	12.7	TJ	20.3	D	2	a 75	+ 0.57				LIL
1998 11 22.25	x	G	12.5	TJ	20.3	D	2	a112	+ 0.57				LIL
1998 11 23.27	x	G	12.4	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 11 24.35	x	G	12.2	TJ	20.3	D	2	a 84	+ 0.57				LIL
1998 11 25.26	x	G	12.3	TJ	20.3	D	2	a 60	+ 0.57				LIL
1998 11 26.30	x	G	12.3	TJ	20.3	D	2	a 51	+ 0.57				LIL
1998 11 27.32	x	G	12.3	TJ	20.3	D	2	a 54	+ 0.57				LIL
1998 11 28.31	x	G	12.6	TJ	20.3	D	2	a 66	+ 0.57				LIL
1998 11 29.31	x	G	12.5	TJ	20.3	D	2	a 84	+ 0.57				LIL
1998 12 05.19	x	G	12.3	TJ	20.3	D	2	a 96	+ 0.57				LIL
1998 12 06.19	x	G	12.5	TJ	20.3	D	2	a102	+ 0.57				LIL
1998 12 08.30	x	G	12.4	TJ	20.3	D	2	a 84	+ 0.57				LIL
1998 12 09.23	x	G	12.5	TJ	20.3	D	2	a104	+ 0.57				LIL
1998 12 13.31	x	G	12.5	TJ	20.3	D	2	a 96	+ 0.57				LIL
1998 12 14.19	x	G	12.6	TJ	20.3	D	2	a 96	+ 0.57				LIL
1998 12 15.09	x	G	12.6	TJ	20.3	D	2	a 96	+ 0.57				LIL
1998 12 17.18	x	G	12.8	TJ	20.3	D	2	a108	+ 0.57				LIL
1998 12 20.19	x	G	11.5	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 12 22.25	x	G	11.5	TJ	20.3	D	2	a 84	+ 0.57				LIL
1998 12 24.13	x	G	11.6	TJ	20.3	D	2	a102	+ 0.57				LIL
1998 12 27.10	x	G	11.7	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 12 28.09	x	G	11.6	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 12 29.30	x	G	11.8	TJ	20.3	D	2	a 90	+ 0.57				LIL
1998 12 31.15	x	G	11.9	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 01 04.16	x	G	12.1	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 01 05.20	x	G	12.1	TJ	20.3	D	2	a 75	+ 0.57				LIL
1999 01 06.18	x	G	12.1	TJ	20.3	D	2	a 66	+ 0.57				LIL
1999 01 08.17	x	G	12.4	TJ	20.3	D	2	a 66	+ 0.57				LIL
1999 01 09.31	x	G	12.4	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 01 11.19	x	G	12.4	TJ	20.3	D	2	a 66	+ 0.57				LIL
1999 01 12.19	x	G	12.4	TJ	20.3	D	2	a 75	+ 0.57				LIL
1999 01 21.14	x	G	12.6	TJ	20.3	D	2	a 66	+ 0.57				LIL
1999 01 22.11	x	G	12.5	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 01 24.13	x	G	12.8	TJ	20.3	D	2	a 96	+ 0.57				LIL
1999 01 27.10	x	G	13.0	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 01 31.09	x	G	12.8	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 02 01.13	x	G	12.6	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 02 04.13	x	G	12.6	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 02 06.09	x	G	12.5	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 02 08.11	x	G	12.7	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 02 13.11	x	G	12.8	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 02 16.11	x	G	12.7	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 02 22.09	x	G	12.9	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 02 24.08	x	G	12.6	TJ	20.3	D	2	a 66	+ 0.57				LIL
1999 02 26.09	x	G	12.8	TJ	20.3	D	2	a 78	+ 0.57				LIL
1999 03 05.02	x	G	12.9	TJ	20.3	D	2	a102	+ 0.57				LIL

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

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1999 03 10.01	x	G	12.8	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 03 12.08	x	G	12.7	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 03 15.01	x	G	13.0	TJ	20.3	D	2	a 96	+ 0.57				LIL
1999 03 16.00	x	G	12.8	TJ	20.3	D	2	a104	+ 0.57				LIL
1999 03 18.00	x	G	12.9	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 03 21.00	x	G	12.8	TJ	20.3	D	2	a 96	+ 0.57				LIL
1999 03 26.99	x	G	13.3:	TJ	20.3	D	2	a 96	+ 0.57				LIL
1999 04 06.98	x	G	13.2:	TJ	20.3	D	2	a138	+ 0.57				LIL
1999 04 10.00	x	G	12.8	TJ	20.3	D	2	a114	+ 0.57				LIL
1999 04 13.98	x	G	12.4	TJ	20.3	D	2	a102	+ 0.57				LIL
1999 04 16.02	x	G	12.4	TJ	20.3	D	2	a 60	+ 0.57				LIL
1999 04 20.97	x	G	12.3	TJ	20.3	D	2	a 76	+ 0.57				LIL
1999 04 26.98	x	G	12.4	TJ	20.3	D	2	a 96	+ 0.57				LIL
1999 05 28.96	x	G	12.8	TJ	20.3	D	2	a108	+ 0.57				LIL
1999 06 03.95	x	G	12.8	TJ	20.3	D	2	a 90	+ 0.57				LIL
1999 07 03.96	x	G	12.9	TJ	20.3	D	2	a120	+ 0.57				LIL
1999 10 17.39	x	G	13.8:	TJ	20.3	D	2	a 99	+ 0.57				LIL
1999 10 29.33	x	G	13.3:	TJ	20.3	D	2	a 96	+ 0.57				LIL
1999 11 06.32	x	G	13.5:	TJ	20.3	D	2	a176	+ 0.57				LIL
1999 11 07.35	x	G	13.6:	TJ	20.3	D	2	a176	+ 0.57				LIL
1999 11 08.34	x	G	13.3:	TJ	20.3	D	2	a150	+ 0.57				LIL
1999 11 11.29	x	G	13.7:	TJ	20.3	D	2	a176	+ 0.57				LIL
1999 11 28.29	x	G	13.2:	TJ	20.3	D	2	a102	+ 0.57				LIL
1999 12 03.29	x	G	13.3:	TJ	20.3	D	2	a168	+ 0.57				LIL
1999 12 06.27	x	G	13.4:	TJ	20.3	D	2	a144	+ 0.57				LIL
1999 12 07.21	x	G	13.2:	TJ	20.3	D	2	a168	+ 0.57				LIL
1999 12 08.31	x	G	13.3:	TJ	20.3	D	2	a168	+ 0.57				LIL
1999 12 14.31	x	G	13.7:	TJ	20.3	D	2	a168	+ 0.57				LIL
1999 12 15.34	x	G	13.6:	TJ	20.3	D	2	a182	+ 0.57				LIL
1999 12 19.31	x	G	13.4:	TJ	20.3	D	2	a165	+ 0.57				LIL
1999 12 25.30	x	G	13.7:	TJ	20.3	D	2	a114	+ 0.57				LIL
1999 12 27.31	x	G	13.5:	TJ	20.3	D	2	a168	+ 0.57				LIL
1999 12 31.30	x	G	13.9:	TJ	20.3	D	2	a168	+ 0.57				LIL
2000 01 04.23	x	G	13.7:	TJ	20.3	D	2	a138	+ 0.57				LIL
2000 01 09.13	x	G	14.2:	TJ	20.3	D	2	a168	+ 0.57				LIL
2000 01 15.11	x	G	13.6:	TJ	20.3	D	2	a128	+ 0.57				LIL
2000 01 18.30	x	G	14.1:	TJ	20.3	D	2	a168	+ 0.57				LIL
2000 01 21.18	x	G	13.4:	TJ	20.3	D	2	a126	+ 0.57				LIL

Comet C/1996 J1 (Evans-Drinkwater)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1996 12 22.94		C	8.3	HI	1.0	G	9	a 19	+ 2.8				BIE01

Comet C/1997 BA_6 (Spacewatch)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 11.77		C	16.1	TJ	18.0	L	6	a180	0.3				KAD02
2001 06 02.73		C	15.8	TJ	18.0	L	6	a180	0.35				KAD02
2001 07 24.64		C	15.0	GA	60.0	Y	6	a120	1.1				NAK01

Comet C/1998 M6 (Montani)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1998 10 16.10		c	22.0	FA	91.4	L	5		0.17				SC001
1998 10 16.11		C	19.4	FA	91.4	L	5		0.17				SC001

Comet C/1999 H3 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 02 20.80		C	15.5	U0	57.0	P	5	a 60					TIC
2001 02 23.90		C	15.6	U0	57.0	P	5	a 60					TIC
2001 04 24.92	d	k	16.5	LB	35	L	5	a660	0.3				HOR02
2001 04 27.95	d	k	16.0	LB	35	L	5	a540	0.4				HOR02

Comet C/1999 J2 (Skiff)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 12.59		C	16.4	TJ	18.0	L	6	a180	0.35				KAD02
2001 05 19.64		C	16.5	GA	60.0	Y	6	a120	0.4		2.4m	14	NAK01
2001 05 22.24		J	14.4	SC	25.4	T	5	a100	0.72	s5	2.3m	9	ROQ
2001 05 26.05	d	k	16.1	LB	35	L	5	a630	0.4		1.1m	27	HOR02
2001 06 11.17		J	14.7	SC	25.4	T	5	a100	1.14	s4	2.5m	8	ROQ
2001 06 15.98	d	k	16.0	LB	35	L	5	a600	0.4		1.4m	13	HOR02
2001 06 20.97	d	k	16.3	LB	35	L	5	a660	0.35		2.4m	13	HOR02
2001 06 24.94	d	k	16.1	FD	35	L	5	a660	0.45		2.3m	14	HOR02
2001 06 25.96	d	k	16.2	LB	35	L	5	a600	0.4		2.3m	12	HOR02
2001 06 27.98	d	k	16.2	LB	35	L	5	a540	0.35		2.1m	13	HOR02
2001 07 16.14		J	15.4	SC	25.4	T	5	a100	0.52	s2	1.5m	13	ROQ
2001 07 23.52		C	17.0	GA	60.0	Y	6	a120	0.4		1.5m	21	NAK01

Comet C/1999 N4 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 19.64		C	17.1	GA	60.0	Y	6	a240	0.45		1.3m	98	NAK01

Comet C/1999 S4 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 05 29.77		B	11.0	HS	30.4	L	5	100	0.75	2/			NAG04
2000 06 04.75		B	10.3	HS	30.4	L	5	100	0.8	4			NAG04
2000 07 08.59		B	7.6	SC	10.0	R	4	21	1.3	8	20 m	270	NAG04
2000 07 09.61		B	7.6	SC	10.0	R	4	21	1.3	8	45 m	270	NAG04
2000 07 16.62		B	7.9	SC	30.4	L	5	61	1.3	8	20 m	320	NAG04
2000 07 21.54		B	7.4	SC	16.0	H	3	28	2.4	8	35 m	20	NAG04
2000 07 22.91		S	6.7:	S	5.0	B		10	& 6		&1	350	RIB
2000 07 26.49		B	7.2	SC	30.4	L	5	47	1.6	4/	50 m	65	NAG04
2000 07 30.51		B	8.2	S	30.4	L	5	47	2.0	2	0.9	65	NAG04
2000 07 31.52		B	8.1	S	16.0	H	3	28	2.3	1	1.1	95	NAG04

Comet C/1999 T1 (McNaught-Hartley)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 11 24.85		B	8.0	S	30.4	L	5	61	1.9	5			NAG04
2000 11 28.84		B	7.9	SC	30.4	L	5	47	1.8	5	3.5m	220	NAG04
2000 12 01.84		B	8.0	S	30.4	L	5	61	2.1	5	4 m	280	NAG04
2000 12 04.85		B	8.2	S	30.4	L	5	61	1.9	5	4 m	255	NAG04
2000 12 07.84		B	8.2	S	30.4	L	5	50	2.2	5/	4 m	265	NAG04
2000 12 22.83		B	8.2	S	10.0	B	5	26	3.1	6	6 m	285	NAG04
2000 12 28.85		B	8.0	S	30.4	L	5	47	2.4	7	18 m	280	NAG04
2001 01 24.08	w	S[	8.0	S	15	M	15	90	! 5				SVE01
2001 04 03.17		S	11.6	TK	25.6	L	5	84	2	3			BIV
2001 04 11.94		S	11.7	TK	25.6	L	5	42	1.5	2			BIV
2001 04 11.94		S	11.9	TK	25.6	L	5	84	1.5	2			BIV
2001 04 13.00		C	11.4	HS	25.4	L	6		3.0		>0.27	284	GRA04
2001 04 13.91		S	11.9	TK	25.6	L	5	84	2	3			BIV
2001 04 23.01		S	11.2	TJ	25.4	L	6	76	2	2			GRA04
2001 04 24.99	d	k	12.0	LB	35	L	5	a840	+ 4.0		>11 m	287	HOR02
2001 04 25.01		M	11.8	TI	35	L	5	68	2.0	3			HOR02
2001 04 26.84		S	11.6	TI	35	L	5	68	2.7	2/			HOR02
2001 04 27.86		S	11.5:	TI	35	L	5	68	2.4	3			HOR02
2001 04 29.97		M	11.0	TT	35	L	5	68	2.9	2/			HOR02
2001 04 30.72		C	12.7	TJ	18.0	L	6	a180	1.5		10 m	283	KAD02
2001 05 01.05		S	11.0	TT	35	L	5	68	3.1	2			HOR02
2001 05 01.82		S	11.1	TT	35	L	5	68	2.6	2			HOR02
2001 05 03.86	d	k	12.6	LB	35	L	5	a720	+ 3		3.5m	288	HOR02
2001 05 10.48	x	S	12.3	HS	32.0	L	5	91	1.0	3			NAG08
2001 05 10.90		S	11.4	TI	35	L	5	68	2.7	2/			HOR02
2001 05 10.92		S	11.9	GA	31.0	J	6	72	2.5	0/			BOU
2001 05 11.74		C	13.0	TJ	18.0	L	6	a180	1.3		2.5m	260	KAD02
2001 05 11.93		S	11.8	GA	31.0	J	6	72	2.4	1			BOU
2001 05 11.96		S	12.7	HS	25.6	L	5	84	1	3			BIV
2001 05 11.96		S	12.8	HS	25.6	L	5	169	1.2	3			BIV

Comet C/1999 T1 (McNaught-Hartley) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR		COMA	DC	TAIL	PA	OBS.
2001 05 11.99		S	11.3	TT	35	L	5	68		2.6	2/			HOR02
2001 05 12.50		S	11.2	HS	25.4	T	6	116		1.5	2			YOS04
2001 05 12.55		C	13.1	TJ	18.0	L	6	a180		1.3		2.0m	256	KAD02
2001 05 12.93		S	11.8	GA	31.0	J	6	58		2.3	1			BOU
2001 05 13.94		S	11.5	TT	35	L	5	68		2.4	2/			HOR02
2001 05 14.88		S	11.5	TT	35	L	5	68		2.5	2/			HOR02
2001 05 15.88		S[	12.6	HS	20	L	5	70	!	1.5				BAR06
2001 05 17.67		C	13.6	TJ	18.0	L	6	a180		1.2				KAD02
2001 05 18.97		S	12.0	GA	25.4	J	6	72		2.5	1			BOU
2001 05 19.55	x	S	12.0:	HS	25.4	L	4	113		1.0				YOS02
2001 05 19.90		S	11.5	HS	44.5	T	4	146		1.8	2/			SAR02
2001 05 19.97		S	12.5	HS	20.3	L	6	79		1.3	5			BIV
2001 05 20.66		C	13.8	TJ	18.0	L	6	a240		1.0				KAD02
2001 05 20.91		S	11.7	TK	35	L	5	68		2.7	2/			HOR02
2001 05 20.98		S	12.0	GA	31.0	J	6	72		2.3	0/			BOU
2001 05 21.10		S	12.9	HS	20.3	L	6	159		1	5			BIV
2001 05 22.87		S	11.7	TK	35	L	5	68		2.8	2/			HOR02
2001 05 22.96		S	12.1	GA	31.0	J	6	72		2.0	1			BOU
2001 05 23.91		S	11.8	TK	35	L	5	68		2.6	2/			HOR02
2001 05 24.86		S	11.8	TK	35	L	5	68		2.4	2/			HOR02
2001 05 24.98		S	12.0	GA	31.0	J	6	72		2.1	1			BOU
2001 05 25.91		S	11.9	TK	35	L	5	68		2.5	3			HOR02
2001 05 25.99		S	12.2	HS	31.0	J	6	72		2.0	0/			BOU
2001 05 25.99		S	12.2	HS	31.0	J	6	72		2.2	1			DIJ
2001 05 26.96		S	13.0	NP	25	L	5	96		1	3			SEG
2001 05 27.70		C	13.8:	GA	60.0	Y	6	a120		1.6				NAK01
2001 05 28.55	x	C	14.7	TT	35.0	C	14	A320		0.6	4			TSU02
2001 05 30.88	d	k	13.2	LB	35	L	5	a270	+	2.3		2.3m	224	HOR02
2001 06 02.64		C	14.5	TJ	18.0	L	6	a180		0.65				KAD02
2001 06 11.61		C	14.1:	GA	60.0	Y	6	a120		1.5				NAK01
2001 06 16.02	d	k	13.4	LB	35	L	5	a630	+	2.2				HOR02
2001 06 20.93		S	13.2	NP	21	L	6	55		1.5	1			MAR02
2001 06 21.02	d	k	13.5	LB	35	L	5	A200	+	3.6				HOR02
2001 06 23.92		S	13.5	HS	44.0	L	5	156		0.5	4			HAS02
2001 06 24.99	d	k	13.8	FD	35	L	5	a600		2.8				HOR02
2001 06 25.02		S	12.7	HS	35	L	5	158		1.7	2/			HOR02
2001 06 26.00	d	k	13.7	LB	35	L	5	a720		2.8				HOR02
2001 06 26.01		S	12.8	HS	35	L	5	158		1.6	3			HOR02
2001 06 28.03	d	k	13.8	LB	35	L	5	A 80		2.5				HOR02
2001 06 30.03	d	k	13.8:	LB	35	L	5	a600		2.5				HOR02
2001 07 10.93		S	13.1	HS	35	L	5	158		1.4	3			HOR02
2001 07 14.59	x	C	15.7	HV	35.0	C	14	A440		0.4	4			TSU02
2001 07 20.90		S	13.6	NP	25	L	5	133		1	2			SEG
2001 07 23.54		C	15.9:	GA	60.0	Y	6	a120		1.0				NAK01

Comet C/1999 T2 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR		COMA	DC	TAIL	PA	OBS.
2000 10 01.94		C	14.1	HS	14.3	D	4	a 60		0.5	2			MOR09
2001 04 12.97		C	13.3	HS	25.4	L	6			1.7		0.16	53	GRA04
2001 04 24.89	d	k	13.0	LB	35	L	5	a720		1.6				HOR02
2001 04 24.90		M	12.3	HS	35	L	5	158		1.7	2/			HOR02
2001 04 26.87		S	12.2	HS	35	L	5	158		1.6	2/			HOR02
2001 04 27.87		S	12.4	HS	35	L	5	158		1.8	3			HOR02
2001 04 28.00	d	k	12.4:	LB	35	L	5	a720		1.6				HOR02
2001 04 29.85	d	k	13.1	LB	35	L	5	a720	+	1.9				HOR02
2001 04 29.98		S	12.0	HS	35	L	5	158		1.8	2/			HOR02
2001 04 30.68		C	13.6	TJ	18.0	L	6	a120		1.2				KAD02
2001 05 01.07		S	12.0	HS	35	L	5	158		1.9	2			HOR02
2001 05 01.84		S	12.0	HS	35	L	5	158		1.7	2			HOR02
2001 05 10.91		S	13.0:	HS	35	L	5	158		1.7	2/			HOR02
2001 05 10.92	d	k	13.2	LB	35	L	5	a630	+	1.9		3.0m	46	HOR02
2001 05 10.93		S	12.7	AC	31.0	J	6	89		1.7	4			BOU
2001 05 11.71		C	13.5	TJ	18.0	L	6	a120		1.3				KAD02
2001 05 11.94		S	12.7	AC	31.0	J	6	89		1.8	3/			BOU

Comet C/1999 T2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 11.95		S	13.5	VB	30	R	20	230	0.8	2			SHA02
2001 05 11.96		S	12.5	AC	30.5	T	10	115	& 1.5	2			COM
2001 05 11.96	d	k	13.2	LB	35	L	5	a600	+ 1.9		2.7m	51	HOR02
2001 05 11.98		S	12.4	HS	35	L	5	158	1.9	2/			HOR02
2001 05 12.51		S	12.3	HS	25.4	T	6	116	1.6	3/			YOS04
2001 05 12.66	x	C	14.1	HV	35.0	C	14	a960	0.6	5			TSU02
2001 05 12.94		S	12.8	AC	31.0	J	6	89	1.7	4			BOU
2001 05 13.95		S	12.9	HS	35	L	5	158	1.7	2/			HOR02
2001 05 13.96	d	k	13.3	LB	35	L	5	a600	+ 1.8		1.8m	50	HOR02
2001 05 14.89		S	12.8	HS	35	L	5	158	1.6	2/			HOR02
2001 05 16.60		C	13.5	GA	60.0	Y	6	a120	2.0				NAK01
2001 05 17.65		C	13.7	TJ	18.0	L	6	a120	1.1				KAD02
2001 05 18.95		S	12.9	AC	25.4	J	6	88	1.5	3			BOU
2001 05 19.60	a	V	14.3	LA	30.0	L	6	a240	0.7				EZA
2001 05 19.61	a	k	14.0	LA	30.0	L	6	a240	0.8				EZA
2001 05 19.62	a	H	13.4	LA	30.0	L	6	a240	0.8				EZA
2001 05 19.63	a	C	13.0	LA	30.0	L	6	a 60	0.8				EZA
2001 05 19.86		S	13.3	HS	44.5	T	4	146	1.5	4			SAR02
2001 05 19.88		S	12.8	HS	25.0	C	10	125	0.8	4			HAS02
2001 05 19.94	d	k	12.7	LB	60	L	5	a600	+ 2.0				HOR02
2001 05 20.56		C	14.1	TJ	18.0	L	6	a120	0.8				KAD02
2001 05 20.93		S	13.0	HS	35	L	5	158	1.9	2/			HOR02
2001 05 20.95	d	k	13.5	LB	35	L	5	a690	+ 1.8		5.0m	57	HOR02
2001 05 20.96		S	12.9	AC	31.0	J	6	89	1.3	3			BOU
2001 05 22.87		S	13.2	HS	35	L	5	158	2.0	2/			HOR02
2001 05 22.95		S	13.1	AC	31.0	J	6	89	1.7	2/			BOU
2001 05 23.93		S	13.3	HS	35	L	5	158	2.0	2/			HOR02
2001 05 23.94	d	k	13.5	LB	35	L	5	a630	+ 1.8		2 m	55	HOR02
2001 05 24.93		S	13.3	HS	35	L	5	158	2.1	2/			HOR02
2001 05 24.94	d	k	13.5	LB	35	L	5	a810	+ 2.0		7 m	50	HOR02
2001 05 24.97		S	13.0	AC	31.0	J	6	89	1.5	3			BOU
2001 05 25.56		L	15.0	LA	30.0	L	6	a240	1.4				EZA
2001 05 25.57		V	14.4	LA	30.0	L	6	a240	1.4				EZA
2001 05 25.58		k	14.0	LA	30.0	L	6	a240	1.4				EZA
2001 05 25.59		H	13.3	LA	30.0	L	6	a240	1.4				EZA
2001 05 25.92		S	13.2	HS	35	L	5	158	1.9	3			HOR02
2001 05 25.94	d	k	13.6	LB	35	L	5	a540	+ 1.9		4.3m	36	HOR02
2001 05 25.97		S	13.0	HS	31.0	J	6	89	1.6	3			BOU
2001 05 25.98		S	13.3	HS	31.0	J	6	89	1.7	1/			DIJ
2001 05 26.93		S	13.5	NP	25	L	5	96	1	4			SEG
2001 05 27.99		C	14.3	HS	10.5	R	5	a120	0.3	0			MOR09
2001 05 30.92	d	k	13.7	LB	35	L	5	a 90	1.1				HOR02
2001 06 02.57		C	14.4	TJ	18.0	L	6	a120	0.7				KAD02
2001 06 08.73		S	13.5	HS	40.6	L	4	70	1.0	3			BOU
2001 06 09.71		S	13.6	HS	40.6	L	4	122	1.3	2			BOU
2001 06 10.74		S	13.8	HS	40.6	L	4	122	1.2	2/			BOU
2001 06 11.51		L	15.1	LA	30.0	L	6	a240	0.8				EZA
2001 06 11.51		V	14.4	LA	30.0	L	6	a240	0.7				EZA
2001 06 11.52		k	14.3	LA	30.0	L	6	a240	0.7				EZA
2001 06 11.53		C	13.4	LA	30.0	L	6	a 30	0.7				EZA
2001 06 11.53		C	14.3:	GA	60.0	Y	6	a120	1.3				NAK01
2001 06 11.53		H	13.7	LA	30.0	L	6	a240	0.7				EZA
2001 06 11.56	x	C	14.3	HV	35.0	C	14	A320	0.7	4			TSU02
2001 06 11.75		S	13.7	HS	40.6	L	4	122	0.9	3			BOU
2001 06 12.75		S	13.6	HS	40.6	L	4	122	1.2	2/			BOU
2001 06 12.96	d	k	13.6	LB	35	L	5	a540	+ 1.9		6 m	51	HOR02
2001 06 13.74		S	13.7	HS	40.6	L	4	122	0.9	2/			BOU
2001 06 14.78		S	13.7	HS	40.6	L	4	122	0.8	2			BOU
2001 06 15.91	d	k	13.7	LB	35	L	5	a630	1.3		2.1m	49	HOR02
2001 06 15.92		S	13.1	HS	35	L	5	158	1.5	2/			HOR02
2001 06 20.94	d	k	13.8	LB	35	L	5	a720	1.6		5 m	45	HOR02
2001 06 20.95		S	13.2	HS	35	L	5	158	1.5	2/			HOR02
2001 06 23.93		S	13.0	HS	44.0	L	5	156	0.9	4			HAS02
2001 06 24.88	d	k	13.7	FD	35	L	5	a540	1.8		3 m	47	HOR02
2001 06 24.91		S	13.3	HS	35	L	5	158	1.4	2/			HOR02

Comet C/1999 T2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 25.93		d k	13.9	LB	35	L	5	a630	1.6		3.5m	56	HOR02
2001 06 25.94		S	13.3	HS	35	L	5	158	1.6	2/			HOR02
2001 06 26.54		x C	15.2	HV	35.0	C	14	a600	0.8	5			TSU02
2001 06 27.96		d k	13.9:	LB	35	L	5	a270	1.3				HOR02
2001 07 10.54		x C	14.9	TT	35.0	C	14	A200	0.5	4			TSU02
2001 07 23.48		a C	14.8	GA	60.0	Y	6	a120	1.3				NAK01

Comet C/1999 Y1 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 11 16.76		S	12.4	AC	25.4	L	5	65	1.7	3/			MEY
2001 02 21.75		C	13.4:	UO	25.4	L	6		0.5		0.03	25	GRA04
2001 05 31.77		C	13.4	TJ	18.0	L	6	a 60	0.6				KAD02
2001 06 02.77		C	13.3	TJ	18.0	L	6	a 60	0.5				KAD02
2001 06 03.81		S	13.0:	NO	20	L	7	160	0.8	4			MAT08
2001 06 18.75		S	12.8	GA	25.4	L	4	71					SEA
2001 06 18.82		S	13.0:	NO	20	L	7	160	0.8	4			MAT08
2001 06 19.83		S	12.9	HS	20	L	7	160	1.0	4/			MAT08
2001 07 15.65		S	13.2:	HS	20	L	7	160	1.0	4/			MAT08
2001 07 21.65		S	13.0:	HS	20	L	7	160	0.8	5			MAT08
2001 07 22.67		S	13.1:	HS	20	L	7	160	0.8	5			MAT08

Comet C/2000 CT_54 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 04 26.84		x S	[14.0	VN	41	L	4	200	! 0.5				PEA
2001 06 17.68			[13.8	HS	20	L	7	160					MAT08
2001 06 23.59			[13.8	HS	20	L	7	160					MAT08
2001 07 22.66		S	[13.7	NO	20	L	7	160					MAT08

Comet C/2000 K1 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 19.66		C	17.2	GA	60.0	Y	6	a240	0.45		1.5m	149	NAK01

Comet C/2000 OF_8 (Spacewatch)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 04 26.84		x S	[14.0	VN	41	L	4	200	! 0.5				PEA
2001 06 12.48			[13.5	HS	20	L	7	160					MAT08
2001 06 14.52			[13.5	HS	20	L	7	160					MAT08
2001 06 17.50			[14.0	HS	20	L	7	160					MAT08

Comet C/2000 W1 (Utsunomiya-Jones)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 12 15.39		B	6.3	SC	30.4	L	5	47	1.3	7	5 m	110	NAG04
2000 12 28.61		C	7.5	HI	1.0	G	9	a 19	+ 2.8		&0.25		BIE01
2001 01 04.35		C	8.5:	HI	1.0	G	9	a 19	+ 2.8				BIE01
2001 01 28.77		S	12.0:	HS	20	L	7	160	2.0	1			MAT08

Comet C/2000 WM_1 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 03 21.89		C	16.7	UO	25.4	L	6		0.2				GRA04
2001 04 12.92		C	16.8	HS	25.4	L	6		0.2				GRA04
2001 06 02.76		C	16.3:	TJ	18.0	L	6	a180	0.25				KAD02
2001 07 03.78	a	C	16.3	GA	60.0	Y	6	a120	0.35			300	NAK01
2001 07 11.11	!	C	16.9	GA	40	L	5	a240	> 0.4	s7	> 0.6m	296	ROD01
2001 07 14.09	!	C	16.9	GA	40	L	5	a240	> 0.4	s7	> 0.8m	300	ROD01
2001 07 26.13	!	C	16.7	GA	40	L	5	a240	> 0.4	s7	> 0.8m	305	ROD01

Comet C/2000 Y2 (Skiff)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 11.50	x	C	18.0:	HV	60.0	Y	6	a240	0.3				NAK01

Comet C/2001 A2 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 02 21.94		C	16.0	UO	25.4	L	6		0.3				GRA04
2001 03 31.95		S	8.5	TT	11.0	L	8	40		3			MEN04
2001 03 31.97	x	S	8.7	TT	23.0	L	5	45	8	3	0.10	103	DES01
2001 04 01.05		S	8.3	TT	20.0	L	6	40	12	4			HOD01
2001 04 02.59	x	S	8.6	TT	8.0	B		20	4	3			PEA
2001 04 03.94		S	8.5	TT	11.0	L	8	40	4				MEN04
2001 04 04.43		V	9.1	TJ	30.0	L	6	a120	3.7				EZA
2001 04 04.77	s	S[	9.5	S	20	R	15	50	! 3				SVE01
2001 04 04.83		S	8.5	TK	25.6	L	5	42	4	4			BIV
2001 04 04.84		S	8.4	TK	5.0	B		7	5	4			BIV
2001 04 06.83		S	8.5:	TK	25.6	L	5	42	3	5			BIV
2001 04 11.83		S	8.2	TK	25.6	L	5	42	4	5	0.1	280	BIV
2001 04 11.86		S	7.9	TK	5.0	B		7	6	6			BIV
2001 04 12.59	x	S	8.5	TT	8.0	B		20	6.5	3			PEA
2001 04 12.83		C	10.7:	HS	25.4	L	6		1.2				GRA04
2001 04 12.99	x	S	7.9	TK	20.0	L	6	48	8	3/	0.15		DES01
2001 04 13.78		S	7.2	AA	6.3	R	13	52	6	4	0.50	30	KOS
2001 04 13.84		S	7.8	TK	25.6	L	5	42	5	5	0.15	285	BIV
2001 04 13.86		S	7.7	TK	5.0	B		7	5	5			BIV
2001 04 13.94		S	8.1	TT	20.0	L	6	40	10	2			HOD01
2001 04 14.00		S	8.0	TK	20.0	L	6	48	5	3	0.15		SAL02
2001 04 14.51	x	S	8.0	TT	8.0	B		20	6.5	4			PEA
2001 04 14.92		S	7.8	TT	11.0	L	8	40	15				MEN04
2001 04 15.50	x	S	8.0	TT	8.0	B		20	6	4			PEA
2001 04 15.85		S	7.6	TK	5.0	B		7	7	5			BIV
2001 04 15.94		S	7.8	TT	11.0	L	8	40	15	5			MEN04
2001 04 15.94	x	S	8.0	TT	23.0	L	5	45	8	3	0.15		DES01
2001 04 16.52	x	S	8.0	TT	8.0	B		20	6.5	3			PEA
2001 04 16.94		S	8.0	TT	11.0	L	8	40	15	5			MEN04
2001 04 16.95	x	S	8.1	TT	23.0	L	5	45	8	3	>0.15		DES01
2001 04 17.94	x	S	8.2	TT	23.0	L	5	45	10	3	>0.15		DES01
2001 04 18.95		S	7.8	TT	11.0	L	8	40	15	5			MEN04
2001 04 18.95	x	S	7.7	TT	23.0	L	5	45	10	3/	>0.15		DES01
2001 04 19.00		B	7.8	TT	20.0	L	6	48		5	0.15		SAL02
2001 04 19.95	x	S	7.3	TT	23.0	L	5	45	10	3/	>0.15		DES01
2001 04 20.51	x	S	7.1	TT	8.0	B		20	6	4/			PEA
2001 04 20.92	x	S	7.3	TT	23.0	L	5	45	10	3/	>0.15		DES01
2001 04 20.94		S	8.0	TT	10.0	L	10	50	10	5			HOD02
2001 04 20.97		S	7.5	TT	11.0	L	8	40	15	6			MEN04
2001 04 21.77		S	7.8	AA	20.0	C	10	130		5			JON07
2001 04 22.50	x	S	7.3	TT	8.0	B		20	5	4/			PEA
2001 04 23.02		S	7.3	TT	10.0	L	10	50	10	5			HOD02
2001 04 23.51	x	S	7.2	TT	8.0	B		20	5.5	4			PEA
2001 04 23.91		S	7.1	TT	10.0	L	10	50	10	6			HOD02
2001 04 23.92		S	7.3	TK	5.0	B		12	7				YUM
2001 04 23.92	x	S	6.9	TT	23.0	L	5	45	12	5	>0.20		DES01
2001 04 25.46	x	S	6.6	TT	8.0	B		20	8	4/			PEA
2001 04 25.92		S	7.0	TT	5.0	B		10		6			MEN04
2001 04 25.99		S	6.5	TT	10.0	L	10	50	12	6			HOD02
2001 04 26.49	x	S	6.5	TT	8.0	B		20	6	5			PEA
2001 04 26.92		S	6.6	TK	5.0	B		12	7				YUM
2001 04 26.92		S	7.0	TT	5.0	B		10	12	6			MEN04
2001 04 26.93		S	6.8	TT	11.0	L	8	40		6			MEN04
2001 04 27.48	x	S	6.5	TT	4.0	B		8	8	5			PEA
2001 04 27.48	x	S	6.5	TT	8.0	B		20	6.5	5			PEA
2001 04 27.75		S	7.3	AA	20.0	C	10	130		6	0.6	116	JON07
2001 04 27.94		S	6.5	TK	5.0	B		12	7				YUM
2001 04 28.46	x	S	6.3	TT	8.0	B		20	7	5			PEA
2001 04 28.93		S	6.4	YG	5.0	B		10	15	8			HOD01
2001 04 29.50	x	S	6.4	TT	4.0	B		8	8	5			PEA

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 04 29.50	x	S	6.5	TT	8.0	B		20	6.5	5			PEA
2001 04 29.91		S	6.3	YG	11.0	L	8	40	18	6			MEN04
2001 04 29.92		S	6.4	YG	5.0	B		10	15	8			HOD01
2001 04 29.99		S	6.5	TT	5.0	B		7					HOD02
2001 04 30.49	x	S	6.3	TT	4.0	B		8	8	5			PEA
2001 04 30.49	x	S	6.5	TT	8.0	B		20	6.5	4/			PEA
2001 04 30.96		B	6.3	AA	8.0	B		20	8	8			LOU
2001 05 01.01		B	6.1	TT	5.0	B		12	6				SAL02
2001 05 01.46		B	5.9	TJ	5.0	B		7	5	6			MAT08
2001 05 01.49	x	S	5.9	TT	8.0	B		20	7	5			PEA
2001 05 01.50	x	S	5.9	TT	4.0	B		8		5			PEA
2001 05 01.89	x	S	6.2	TT	23.0	L	5	45	15	5/			DES01
2001 05 01.98		S	6.2	TJ	8.0	B		11	10	4			SOU01
2001 05 02.00		B	6.0	TT	5.0	B		12	6				SAL02
2001 05 02.25		M	6.1	TK	5.0	B		10	6	7			LIN04
2001 05 02.50	x	S	6.3	TT	4.0	B		8	8	5			PEA
2001 05 02.50	x	S	6.3	TT	8.0	B		20	6	5			PEA
2001 05 02.90		S	6.2	TJ	8.0	B		11	8	4			SOU01
2001 05 02.91	x	S	6.2	TT	23.0	L	5	45		6			DES01
2001 05 02.92		S	6.2	YG	5.0	B		10	18	6			MEN04
2001 05 02.97		B	6.3	AA	8.0	B		20	7	7			LOU
2001 05 03.25		M	6.1	TK	5.0	B		10	5	7			LIN04
2001 05 03.49	x	S	6.2	TT	8.0	B		20	6	5/			PEA
2001 05 03.92	x	S	6.1	TT	23.0	L	5	45		6			DES01
2001 05 03.93		S	5.9	YG	5.0	B		10	18	6			MEN04
2001 05 03.95		B	6.2	AA	8.0	B		20	7	7			LOU
2001 05 04.25		M	5.9	TK	5.0	B		10	5	7			LIN04
2001 05 04.38		B	6.1	TJ	5.0	B		7	3	6			MAT08
2001 05 04.38		M	5.6	AA	5.0	B		10					SEA
2001 05 04.50	x	S	6.2	TT	8.0	B		20	6	5/			PEA
2001 05 04.92		S	5.7	YG	5.0	B		10	18	6			MEN04
2001 05 04.98		B	5.9	TT	5.0	B		12	7				SAL02
2001 05 05.25		M	5.8	TK	5.0	B		10	5	7			LIN04
2001 05 05.69		M	6.0	AA	5.0	B		7	5	5			BEG01
2001 05 05.89		S	5.9	YG	3.0	B		8	5	4			SOU01
2001 05 05.90		B	6.0:	TJ	5.0	B		7		7			AMO01
2001 05 05.90		S	5.9	YG	5.0	B		7	5	4			SOU01
2001 05 05.91		S	5.8	YG	8.0	B		11	5	5			SOU01
2001 05 05.91	x	S	6.0	TT	8.0	B		11					DES01
2001 05 05.92		B	6.1	TJ	5.0	B		12	8	5			YUM
2001 05 05.92		S	5.8	YG	13.5	L	5	21	5	5			SOU01
2001 05 05.92		S	5.8	YG	13.5	L	5	51	5	5			SOU01
2001 05 05.93		S	5.9	YG	5.0	B		10	15	7			MEN04
2001 05 05.95		S	5.9	YG	5.0	B		10	18	7			HOD01
2001 05 06.40		B	6.0	TJ	5.0	B		7	3	6			MAT08
2001 05 06.89	x	S	5.9	YG	8.0	B		11	15	5			DES01
2001 05 06.90		B	5.9	TJ	5.0	B		7	9	7			AMO01
2001 05 06.90		S	5.7	YG	5.0	B		10	18	6			MEN04
2001 05 06.91		B	6.1	TJ	5.0	B		12	6	5			YUM
2001 05 06.91		S	5.7	YG	5.0	B		10	20	7			HOD01
2001 05 06.94		B	6.1	AA	8.0	B		20	6	7			LOU
2001 05 06.96		S	5.7	YG	5.0	B		7	10	7			HOD02
2001 05 07.44		B	6.0	TJ	5.0	B		7	3	6			MAT08
2001 05 07.89		B	6.0	TJ	5.0	B		12	8	6			YUM
2001 05 07.91	x	S	6.0	YG	8.0	B		11	15	6			DES01
2001 05 07.94		B	6.1:	TJ	5.0	B		7		7			AMO01
2001 05 07.94		B	6.1:	TJ	5.0	B		7		7			AMO01
2001 05 08.01		B	6.0	TT	5.0	B		12	7				SAL02
2001 05 08.68		S	6.2	AA	5.0	B		10		7			C0002
2001 05 08.69		S	6.1	AA	20.0	L	8	82	3	6	0.3	110	C0002
2001 05 08.89		B	6.2	TJ	5.0	B		7	8	6			AMO01
2001 05 08.90		S	6.1	YG	5.0	B		10	15	5			MEN04
2001 05 08.91	x	S	6.1	TT	8.0	B		11	15	6			DES01
2001 05 08.92		S	5.7	YG	5.0	B		7	10	7			HOD02
2001 05 09.44		B	6.1	TJ	5.0	B		7	3	6			MAT08

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 09.71		M	6.0	AA	6.0	R	13	40	5.8	5	0.5	110	BEG01
2001 05 09.71		S	6.2	AA	5.0	B		10		7			C0002
2001 05 09.89		B	6.2	TJ	5.0	B		7	10	7			AM001
2001 05 09.91		S	6.3	YG	5.0	B		10	18	6			MEN04
2001 05 09.91	x	S	6.2	TT	8.0	B		11	15	6			DES01
2001 05 09.93		B	6.3	TJ	5.0	B		12	6	5			YUM
2001 05 09.96		B	6.0	AA	8.0	B		20	6	7			LOU
2001 05 09.98		B	6.1	TT	5.0	B		12	7				SAL02
2001 05 10.25		M	5.9	TK	5.0	B		10	4	7			LIN04
2001 05 10.40		B	6.1	TJ	5.0	B		7	5	6			MAT08
2001 05 10.70		S	6.0	AA	5.0	B		10	4	7			C0002
2001 05 10.71		M	5.7	AA	5.0	B		7	4	6			BEG01
2001 05 10.89		B	5.7	TJ	5.0	B		7	12	6			AM001
2001 05 11.01		B	6.2	TT	5.0	B		12	7				SAL02
2001 05 11.35		M	5.2	AA	2.8	B		4					SEA
2001 05 11.36		I	5.3	AA	0.0	E		1					SEA
2001 05 11.40		B	5.4	TJ	5.0	B		7	4	6/			MAT08
2001 05 11.70		M	5.4	AA	5.0	B		7	6	6	40 m	130	BEG01
2001 05 12.25		M	5.3	TK	5.0	B		10	6	6			LIN04
2001 05 12.88	x	S	5.3	YG	8.0	B		11	18	7	0.30		DES01
2001 05 12.89		B	5.5	YG	5.0	B		7	12	6			AM001
2001 05 12.91		S	5.5	YG	5.0	B		7					HOD02
2001 05 13.00		B	5.6	TT	5.0	B		7					SAL02
2001 05 13.38		S	5.0	AA	2.8	B		4					SEA
2001 05 13.70		B	5.8	AA	20.0	L	8	82	3.8	5	24 m	130	C0002
2001 05 13.70		S	5.5	AA	5.0	B		10	4	7	12 m	130	C0002
2001 05 13.90		B	5.3	YG	5.0	B		7	10	7			AM001
2001 05 13.91		S	5.5	YG	14.3	L	6	45	6	6	0.10	135	AM001
2001 05 13.95		S	5.5	YG	5.0	B		10	20	6			MEN04
2001 05 14.00		B	5.5	TT	5.0	B		7					SAL02
2001 05 14.36		S	4.8	AA	0.0	E		1					SEA
2001 05 14.70		S	5.0	S	20.0	C	8	75	4.5	4	14 m	107	GRE03
2001 05 14.72		S	5.3	AA	5.0	B		10		7			C0002
2001 05 14.89		B	5.3	YG	5.0	B		7	9	7			AM001
2001 05 14.90	x	S	5.3	YG	8.0	B		11	15	7/			DES01
2001 05 14.91		S	5.3	YG	5.0	B		10	20	7			MEN04
2001 05 15.36		S	4.9	AA	0.0	E		1					SEA
2001 05 15.41		B	5.5	TJ	5.0	B		7	7	6			MAT08
2001 05 15.71		M	5.3	AA	5.0	B		7	6	7	20 m	135	BEG01
2001 05 16.01		B	5.4	TT	5.0	B		7					SAL02
2001 05 16.36		S	5.0	AA	0.0	E		1					SEA
2001 05 16.70		M	5.2	AA	0.0	E		1		9			BEG01
2001 05 16.70		M	5.5	AA	3.5	B		7		6			PRI04
2001 05 16.71		M	5.3	AA	5.0	B		7	6	7	20 m	135	BEG01
2001 05 16.98		S	5.5	YF	20.0	L	6	80	6	7	0.25	130	BAR11
2001 05 17.01		B	5.4	TT	5.0	B		7					SAL02
2001 05 17.35		S	4.9	AA	0.0	E		1			1	135	SEA
2001 05 17.42		B	5.2	TJ	5.0	B		7	7	7	1	140	MAT08
2001 05 17.69		M	5.4	AA	5.0	B		10		7			PRI04
2001 05 17.70		M	5.4	AA	5.0	B		7	7	7	1.2	138	BEG01
2001 05 17.71		S	5.5	S	5.0	B		10					JON07
2001 05 17.89		B	5.3	TJ	5.0	B		12	6	6			YUM
2001 05 17.89		B	5.3	TJ	5.0	B		12	6	6			YUM
2001 05 17.89		B	5.3	YG	5.0	B		7	10	7			AM001
2001 05 17.90		S	5.3	YG	3.0	B		8	15	6/			SOU01
2001 05 17.90		S	5.3	YG	5.0	B		10	18	6	0.05		MEN04
2001 05 17.90		S	5.3	YG	8.0	B		11	15	7	0.1	135	SOU01
2001 05 17.91		S	5.4	YG	5.0	B		7					HOD02
2001 05 17.91	x	S	5.3	YG	8.0	B		11	18	7			DES01
2001 05 18.70		M	5.3	AA	5.0	B		7	6	7	1.5	140	BEG01
2001 05 18.89		B	5.3	YG	5.0	B		7	10	7			AM001
2001 05 18.89	x	S	5.3	YG	8.0	B		11	18	6/	0.85	138	DES01
2001 05 18.90		B	5.3	TJ	5.0	B		12	9	7			YUM
2001 05 18.90		S	5.2	YG	5.0	B		7					HOD02
2001 05 18.91		S	5.2	YG	5.0	B		10	20	6			MEN04

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 18.98		B	5.3	TT	5.0	B		12	7				SAL02
2001 05 19.68		M	5.5	AA	5.0	B		10		7			PRI04
2001 05 19.69		S	5.3	AA	5.0	B		10		7	0.3	132	C0002
2001 05 19.70		M	5.2	AA	5.0	B		7	6	7	2.0	140	BEG01
2001 05 19.70		S	5.2	AA	20.0	L	8	82	3.5	5	16 m	132	C0002
2001 05 19.89		B	5.3	TJ	5.0	B		12	10	7			YUM
2001 05 19.89		B	5.4:	YG	8.0	B		20	10	6			AM001
2001 05 19.89		S	5.2	YG	3.0	B		8	12	6			SOU01
2001 05 19.89		S	5.2	YG	8.0	B		11	12	6			SOU01
2001 05 19.89	x	S	5.3	YG	8.0	B		11	18	6	0.90	138	DES01
2001 05 19.90		S	5.3	YG	5.0	B		10	20	6			MEN04
2001 05 19.92		B	5.6	TJ	5.0	B		7	6	7			MAN04
2001 05 20.40		B	5.1	TJ	5.0	B		7	7	6/	2	142	MAT08
2001 05 20.42		B	5.0	TJ	30	L	5	60	8	6	4.0	150	FAR01
2001 05 20.43		B	5.1	TJ	5.0	B		7	7	7	1.5	150	FAR01
2001 05 20.46		B	5.1	TJ	15	L	5	26	8	7	3.0	150	FAR01
2001 05 20.69		M	5.6	AA	5.0	B		10		6			PRI04
2001 05 20.70		M	5.3	AA	5.0	B		7	6	6	1.6	140	BEG01
2001 05 20.70		S	5.2	AA	5.0	B		10		6			C0002
2001 05 20.89	x	S	5.3	YG	8.0	B		11	18	6	0.90	138	DES01
2001 05 20.90		S	5.4	YG	5.0	B		10	15	6	0.5	140	MEN04
2001 05 20.98		S	5.0	YF	20.0	L	6	50	6	7	0.68	135	BAR11
2001 05 21.35		S	4.7	AA	0.0	E		1					SEA
2001 05 21.40		B	5.1	TJ	5.0	B		7	7	6/	3	143	MAT08
2001 05 21.41		B	5.3:	TJ	5.0	B		7	7	7	&0.5	155	FAR01
2001 05 21.68		M	5.0	AA	5.0	B		7	6	7	3.0	142	BEG01
2001 05 21.69		S	5.2	AA	5.0	B		10		6	0.9	140	C0002
2001 05 21.90		S	5.1	YG	5.0	B		7					HOD02
2001 05 21.90		S	5.3	YG	5.0	B		10	18	7	<0.5	145	MEN04
2001 05 21.90	x	S	5.3	YG	8.0	B		11					DES01
2001 05 21.92		B	5.5	TJ	5.0	B		7	5	7			MAN04
2001 05 22.42		B	5.1	TJ	5.0	B		7	7	6/			MAT08
2001 05 22.94		B	5.3	TJ	5.0	B		7	7	7			MAN04
2001 05 22.94		B	5.3	YG	8.0	B		20	8	6/	0.13	140	AM001
2001 05 23.68		M	5.1	AA	5.0	B		7	7	6	1.2	145	BEG01
2001 05 23.68		M	5.2	AA	5.0	B		10		7			PRI04
2001 05 23.70		M	5.2	AA	10.6	L	10	26		7			PRI04
2001 05 23.89		B	5.4	YG	5.0	B		7	9	6/			AM001
2001 05 23.91		S	5.3	YG	5.0	B		10		6			MEN04
2001 05 23.96		B	5.1	TJ	5.0	B		7	7	6			MAN04
2001 05 24.69		M	4.6	AA	5.0	B		7	8	8	2.0	145	BEG01
2001 05 24.69		M	4.9	AA	10.6	L	10	25		6			PRI04
2001 05 24.70		B	4.8	AA	20.0	L	8	82	4.5	4/			C0002
2001 05 24.70		M	4.9	AA	5.0	B		10		6	2.0		PRI04
2001 05 24.70		S	4.7	AA	5.0	B		10		6			C0002
2001 05 24.89		B	5.2	YG	5.0	B		7	9	6/			AM001
2001 05 24.89	x	S	5.3	YG	8.0	B		11	15	6			DES01
2001 05 24.90		S	5.0	YG	5.0	B		7					HOD02
2001 05 24.91		S	5.2	YG	5.0	B		10	15	6			MEN04
2001 05 24.93		B	5.0	TJ	5.0	B		7	8	6			MAN04
2001 05 24.97		B	5.2	TT	5.0	B		12	8				SAL02
2001 05 25.68		S	5.0	AA	5.0	B		10		6	0.3	147	C0002
2001 05 25.69		M	4.7	AA	5.0	B		7	7	7	1.5	147	BEG01
2001 05 25.69		M	5.0	AA	3.5	B		7		7			PRI04
2001 05 25.70		B	5.2	AA	20.0	L	8	82	5	5	0.5	147	C0002
2001 05 25.89	x	S	5.1	YG	8.0	B		11	15	6/			DES01
2001 05 25.90		S	5.1	YG	5.0	B		10		7			MEN04
2001 05 25.97		B	5.2	TT	5.0	B		12	8				SAL02
2001 05 26.38		B	5.2	TJ	5.0	B		7	5	7			MAT08
2001 05 26.68		M	5.0	AA	3.5	B		7		6			PRI04
2001 05 26.69		M	5.1	AA	5.0	B		7	7	6	1.0	147	BEG01
2001 05 27.68		M	5.1	AA	3.5	B		7		6			PRI04
2001 05 27.68		S	5.2	AA	5.0	B		10		6			C0002
2001 05 27.69		M	5.2	AA	5.0	B		7	7	6	20 m	150	BEG01
2001 05 27.90		S	5.1	YG	5.0	B		10		7			MEN04

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DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 27.98		S	4.5	YF	20	L	6	50	7	8	0.32	170	BAR11
2001 05 28.89		B	5.3	YG	5.0	B		12	5	5			YUM
2001 05 28.90		B	5.2	YG	5.0	B		12	5	5			YUM
2001 05 28.90		S	5.1	YG	5.0	B		10	18	5			MEN04
2001 05 28.92		S	5.3	TT	5.0	B		7	7.5				BAL07
2001 05 28.93		B	5.1	TJ	5.0	B		7	9	6			MAN04
2001 05 28.93		B	5.2	TJ	5.0	B		7	10	6			SAN13
2001 05 29.36		S	4.5	AA	6.5	B		20					SEA
2001 05 29.68		S	5.2	AA	5.0	B		10		6			C0002
2001 05 30.35		S	4.4	AA	0.0	E		1					SEA
2001 05 30.90		S	5.1	YG	5.0	B		10	18	5			MEN04
2001 05 31.90		S	5.2	YG	5.0	B		10	15	5			MEN04
2001 06 02.34		M	4.4	AA	5.0	B		10					SEA
2001 06 02.89		B	4.8	YG	5.0	B		7	5	5/			AM001
2001 06 03.38		B	4.6	TJ	5.0	B		7	8	6/			MAT08
2001 06 03.83	!	B	4.3	TJ	5.0	B		7	10	7			MAT08
2001 06 03.89		B	4.8	YG	5.0	B		7	5	6			AM001
2001 06 04.14		M	4.4	TJ	5.0	B		7	12	7	2.6	198	BOU
2001 06 04.15		S	4.9	TJ	5.0	B		7	&10	7			COM
2001 06 04.34		S	4.5	AA	5.0	B		10					SEA
2001 06 04.36		B	4.7	YG	5.0	B		7	9	6			AM001
2001 06 04.37	x	S	5.0	YG	8.0	B		11					DES01
2001 06 04.89		B	4.8:	YG	5.0	B		7	8	4/			AM001
2001 06 05.37		B	5.0	YG	5.0	B		7	10	6			AM001
2001 06 05.37	x	S	5.0	YG	8.0	B		11	12				DES01
2001 06 05.91		B	4.7	TJ	5.0	B		7	10	6			MAN04
2001 06 06.91		B	4.7	TJ	5.0	B		7	9	6			SAN13
2001 06 06.92		B	4.7	TJ	5.0	B		7	9	6			MAN04
2001 06 07.40		B	4.2	TJ	5.0	B		7	13	7	1.1	185	BUS02
2001 06 07.40		B	4.3	TJ	5.0	B		7	12	6	1.0	185	MAN04
2001 06 10.41		B	4.3	TJ	5.0	B		7	12	6	1.0	185	MAN04
2001 06 11.17		S	4.2	TJ	5.0	B		7	14	7			BOU
2001 06 12.82	!	B	3.3	TJ	0.0	E		1	12	7			MAT08
2001 06 13.17		B	3.3	TJ	0.0	E		1					BOU
2001 06 13.17		S	3.5	TJ	0.0	E		1	15	8	>7		COM
2001 06 13.34		S	2.8	TK	5.0	B		10	25	6			MEN04
2001 06 13.35		B	3.4	YG	0.0	E		1	40	7			AM001
2001 06 13.35		S	3.4	YG	5.0	B		12	15	6			YUM
2001 06 13.36		B	3.5	YG	5.0	B		7	20	6	1	205	AM001
2001 06 13.39		B	3.9	TJ	5.0	B		7	14	7			MAN04
2001 06 13.76		S	3.1	AA	0.0	E		1					SEA
2001 06 13.83		B	3.4:	TJ	0.0	E		1	10	7			MAT08
2001 06 14.15		M	3.6	TJ	5.0	B		7	15	7	6.3	207	BOU
2001 06 14.19		S	3.9	TJ	5.0	B		7	&15	9	&5		COM
2001 06 14.34		B	3.4	AA	8.0	B		20	15	7			LOU
2001 06 14.35		S	3.0	TK	5.0	B		10	32	6			MEN04
2001 06 14.36		B	3.5	YG	0.0	E		1	30	7			AM001
2001 06 14.36		B	3.5	YG	5.0	B		7	20	6			AM001
2001 06 14.78		B	3.2	AA	3.0	R		1					SEA
2001 06 15.16		M	3.6	TJ	5.0	B		7	15	7	6.7	210	BOU
2001 06 15.30		S	3.7	TK	3.0	B		8	20	7	4.5	225	HOD02
2001 06 15.32		S	3.4	YG	8.0	B		11	15	7	4.0	220	SOU01
2001 06 15.33		S	3.0	TK	5.0	B		10	35	6	0.96	210	MEN04
2001 06 15.33	x	S	3.5	YG	4.0	B		8	15	5	4.32	200	DES01
2001 06 15.33	x	S	3.5	YG	4.0	B		8	15	5	4.32	200	DES01
2001 06 15.34		S	3.2	AT	0.0	E		1			0.96		DES01
2001 06 15.35		B	3.6	YG	0.0	E		1	20	7			AM001
2001 06 15.35		S	3.6	YG	8.0	B		20	15	6	1	210	AM001
2001 06 15.78		B	3.6	AA	3.0	R		1					SEA
2001 06 16.14		B	3.9	AA	0.0	E		1		7			C0002
2001 06 16.14		M	3.7	TJ	5.0	B		7	14	7	5.7	213	BOU
2001 06 16.15		B	3.7	AA	5.0	B		10		5	1.2	210	C0002
2001 06 16.41		B	3.4	TJ	5.0	B		7	13	7	1.2	215	MAN04
2001 06 16.41		B	3.5	TJ	5.0	B		10	12	7	1.0	215	BUS02
2001 06 17.32		S	3.9	YG	0.0	E		1			0.96	225	DES01

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DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 17.34		B	4.0	YG	5.0	B		10	20	7	0.8	240	COE
2001 06 17.35		B	3.8	YG	8.0	B		11	20	6	2.4	235	COE
2001 06 17.75		B	4.2	TJ	0.0	E		1	15	6			MAT08
2001 06 17.76		S	3.7	AA	0.0	E		1					SEA
2001 06 17.80		B	3.7	TJ	5.0	B		7	8	6	1.5	215	FAR01
2001 06 18.12		M	3.8	AA	5.0	B		7	15	8	2.5	240	BEG01
2001 06 18.12		M	4.0	AA	0.0	E		1		8	30 m	240	BEG01
2001 06 18.13		M	4.0	TJ	5.0	B		7	14	6/			BOU
2001 06 18.13		S	3.8	TJ	5.0	B		7	&15	7			COM
2001 06 18.13	x	M	3.5	HV	0.0	E		1					TSU02
2001 06 18.33		S	3.9	YG	0.0	E		1			0.96	235	DES01
2001 06 18.76		S	4.0	AA	0.0	E		1					SEA
2001 06 18.79		B	4.3	TJ	0.0	E		1	15	6			MAT08
2001 06 19.12		M	3.6	AA	5.0	B		7	24	7	4.5	260	BEG01
2001 06 19.12		M	3.8	AA	5.0	B		7	16	7	1.5	240	BEG01
2001 06 19.12		M	4.3	TJ	5.0	B		7	14	6			BOU
2001 06 19.12		S	4.6	TJ	5.0	B		7	&12	7			COM
2001 06 19.13		S	3.9	S	4.2	B		10	16	5/	>4	225	BUS01
2001 06 19.14	x	M	3.5	HV	0.0	E		1					TSU02
2001 06 19.15		B	3.8	AA	5.0	B		10	15	6	1.3	222	COO02
2001 06 19.77		B	4.2	TJ	0.0	E		1	15	6			MAT08
2001 06 20.09		B	4.2	HV	0.0	E		1	10	8			BIV
2001 06 20.12		M	4.3	TJ	5.0	B		7	16	6			BOU
2001 06 20.13		I	4.2	TK	0.0	E		1					LIN04
2001 06 20.13	x	M	3.7	HV	0.0	E		1					TSU02
2001 06 20.36		B	3.9	YG	0.0	E		1	20	7			AMO01
2001 06 20.36		S	3.9	YG	8.0	B		20	15	5	0.5	250	AMO01
2001 06 20.38		B	4.8	TJ	5.0	B		7	12	7			MAN04
2001 06 21.07		B	4.0	HV	0.0	E		1	15	7			BIV
2001 06 21.09		B	4.0	TK	5.0	B		10	18	5	4.0	210	LIN04
2001 06 21.11		B	4.1	HV	0.0	E		1	15	7	2.0	225	BIV
2001 06 21.11		S	4.3	TJ	5.0	B		10	20	5	1.5	208	LUE
2001 06 21.13		M	4.3	HV	10.0	B		14	16	7	3.5	225	BIV
2001 06 21.13	x	M	3.7	HV	0.0	E		1					TSU02
2001 06 21.15		M	4.0	AA	3.5	B		7		7			PRI04
2001 06 21.34					8.0	B		11	15	5/	0.96	235	DES01
2001 06 21.34		S	4.0	YG	0.0	E		1					DES01
2001 06 21.35		B	4.3	YG	0.0	E		1	20	7			AMO01
2001 06 21.35		S	4.2	YG	8.0	B		20	15	5	0.50	250	AMO01
2001 06 21.37		B	4.7	TJ	5.0	B		7	10	6			SAN13
2001 06 21.37		B	4.8	TJ	5.0	B		7	12	7			MAN04
2001 06 21.39		S	4.1	TT	5.0	B		7	35				BAL07
2001 06 22.12		M	3.9	AA	3.5	B		7		7			PRI04
2001 06 22.12		M	4.3	TJ	5.0	B		7	20	5/	3.8	227	BOU
2001 06 22.12		S	4.5	TJ	5.0	B		7	&15	6/			COM
2001 06 22.14		B	3.8	AA	5.0	B		10		6	1.2	225	COO02
2001 06 22.14		M	4.0	AA	0.0	E		1		7			PRI04
2001 06 22.34					8.0	B		11	15	5/	1.30	240	DES01
2001 06 22.34		S	4.1	YG	0.0	E		1					DES01
2001 06 23.34		B	4.1	YG	0.0	E		1	20	7			AMO01
2001 06 23.34		S	4.2	YG	8.0	B		20	13	5	0.5	250	AMO01
2001 06 23.36		S	3.8	TK	5.0	B		10	35	6			MEN04
2001 06 23.77		B	4.0	TJ	0.0	E		1	20	5/			MAT08
2001 06 24.11		M	4.1	AA	0.0	E		1	20	8	1.0	255	BEG01
2001 06 24.12		M	4.0	AA	5.0	B		7	20	7	2.6	252	BEG01
2001 06 24.12		M	4.0	TJ	5.0	B		7	20	5/			BOU
2001 06 24.12		S	4.4	TJ	5.0	B		7	15	6/			COM
2001 06 24.36		B	4.1	YG	0.0	E		1	20	7			AMO01
2001 06 24.36		S	4.2	YG	8.0	B		20	14	5	0.5	250	AMO01
2001 06 24.75		S	3.8	AA	0.0	E		1					SEA
2001 06 25.13		M	4.0	AA	3.5	B		7		7			PRI04
2001 06 25.13		M	4.0	AA	5.0	B		7	20	7	1.8	255	BEG01
2001 06 25.78		B	4.6	S	3.5	B		7	20	5			OHM
2001 06 26.10		M	4.1	AA	0.0	E		1	20	8			BEG01
2001 06 26.11		M	4.1	AA	5.0	B		7	20	7	40 m	255	BEG01

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 26.13		M	4.1	AA	3.5	B		7	15	7			PRI04
2001 06 26.39		B	4.2	TJ	5.0	B		7	20	7			MAN04
2001 06 26.75	xs	S	4.2	TJ	0.0	E		1		8/			NAG08
2001 06 26.75	xs	S	4.3	TJ	3.5	B		7	15	7	&1	250	NAG08
2001 06 26.76		C	6.0	TJ	18.0	L	6	a320	10				KAD02
2001 06 27.11		M	4.2	AA	0.0	E		1	15	8			BEG01
2001 06 27.11		M	4.5	AA	5.0	B		7	20	7	2.0	257	BEG01
2001 06 27.14		M	4.2	AA	3.5	B		7	20	6			PRI04
2001 06 27.30		S	4.3	TK	5.0	B		10	30	5			MEN04
2001 06 27.38		B	4.1	TJ	5.0	B		7	30	7			MAN04
2001 06 27.75	xs	S	4.2	TJ	3.5	B		7	&20	6			NAG08
2001 06 27.76		C	5.8	TJ	18.0	L	6	a480	16				KAD02
2001 06 28.05		M	4.3:	TT	8.0	B		10	13	3			HOR02
2001 06 28.13		S	4.2	S	3.0	B		8	&25	5			BUS01
2001 06 28.35		B	4.6	YG	0.0	E		1	20	7			AMO01
2001 06 28.35		S	4.6	YG	8.0	B		20	20	5			AMO01
2001 06 28.38		B	4.1	TJ	5.0	B		7	30	7			MAN04
2001 06 28.65		S	4.0	AA	0.0	E		1					SEA
2001 06 29.06	a	S	4.4	HV	6.3	B		9	16	4			KAM01
2001 06 29.07		S	4.5	HV	5.0	B		7	15	6			BIV
2001 06 29.08		B	4.3	HV	5.0	B		7	20	6	1.7	240	BIV
2001 06 29.08		B	4.4	HV	0.0	E		1	15	7			BIV
2001 06 29.15		B	4.5	AA	5.0	B		10	12	5/	0.7	260	COO02
2001 06 29.34		B	4.6	YG	0.0	E		1	20	7			AMO01
2001 06 29.34		S	4.6	YG	8.0	B		20	20	5	0.40	260	AMO01
2001 06 29.38		B	4.2	TJ	5.0	B		7	30	6			MAN04
2001 06 29.69		B	4.3	TJ	0.0	E		1	20	5/			MAT08
2001 06 30.04		M	4.2	TT	8.0	B		10	17	3			HOR02
2001 06 30.14	!	C	6.8:	HI	40	L	5	a 30	> 3.8	D5			ROD01
2001 06 30.35		B	4.3	TJ	5.0	B		7	25	5/			MAN04
2001 06 30.76		M	4.6	AA	3.5	B		7	18	5			MIT
2001 07 01.05		S	5.5	TJ	10	B		14	7	6			SHA02
2001 07 01.06		S	5.3	TJ	5.0	B		7	11	5			SHA02
2001 07 01.07		B	4.4	HV	0.0	E		1	15	7			BIV
2001 07 01.07		B	4.5	HV	5.0	B		7	20	7	1.5	235	BIV
2001 07 01.08		S	4.4	TJ	7.0	B		16	14	5			GIA01
2001 07 01.08		S	4.8	HV	25.6	L	5	42	15	6	0.8	240	BIV
2001 07 01.09		B	4.5	HV	0.0	E		1	15	6			BIV
2001 07 01.13	!	C	7.0:	HI	40	L	5	a 60	>15.6	D5	>40.0m	248	ROD01
2001 07 01.31		S	4.6	YG	0.0	E		1					DES01
2001 07 01.33		S	4.6	TJ	5.0	B		10	30	5			MEN04
2001 07 01.34		B	5.0	YG	0.0	E		1	20	6			AMO01
2001 07 01.34		S	5.0	YG	8.0	B		20	15	5	0.20	260	AMO01
2001 07 01.69		S	4.4	TJ	5	R		8	30	5			YOS04
2001 07 01.70	x	S	5.5	TJ	3.0	B		10	15	4			MIY01
2001 07 01.71		S	4.5	TJ	2.4	B		10	16	5			YOS04
2001 07 01.74	x	S	4.7	TJ	3.5	B		7	22	6			NAG08
2001 07 01.83		B	4.5	TT	0.0	E		1	20	5			MAT08
2001 07 02.04		M	4.7	TT	8.0	B		10	22	4			HOR02
2001 07 02.06		S	5.0:	AA	8.0	B		15	&18	6			SCH04
2001 07 02.32		S	4.8	TJ	5.0	B		10	25	5			MEN04
2001 07 02.45		B	4.6	TJ	5.0	B		7	20	5/			MAN04
2001 07 02.69		B	4.7	TT	5.0	B		7	10	5			MAT08
2001 07 02.72	s	S	4.5	HD	0.0	E		1		7/			END
2001 07 02.73		S	4.5	HS	4.2	B		7	30	5			OOT
2001 07 02.74	s	S	4.6	HD	7.0	B		10	15	7	&1	240	END
2001 07 02.74	x	S	4.7	TJ	3.5	B		7	25	6/			NAG08
2001 07 02.75	x	S	4.4	TJ	0.0	E		1	40	7			NAG08
2001 07 02.95	s	S	4.3	S	5.0	B		7	10				FED03
2001 07 02.96	s	S	4.4	S	8	R	10	40	15	1/	&0.75		SVE01
2001 07 03.04		M	5.0	TJ	10.0	B		20	11	5/			MEY
2001 07 03.05		S	4.4	AA	5.0	B		20					DIE02
2001 07 03.05	a	S	4.8	HV	6.3	B		9	19	5			KAM01
2001 07 03.06		B	4.7	TT	5.0	B		10	17	4			HAS02
2001 07 03.08		S	5.0	TJ	7.0	B		16	18	5			GIA01

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DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 03.12	!	C	7.2	HI	40	L	5 a	4	>14	D5	>36.0m	243	ROD01
2001 07 03.69		B	4.7	TT	5.0	B		7	9	5			MAT08
2001 07 03.75	s	S	4.8:	HD	7.0	B		10	30	8			END
2001 07 03.95	s	S	4.5	S	5.0	B		7	12				FED03
2001 07 03.96	s	S	4.4	S	8.0	B		10	18	1/	&0.65		SVE01
2001 07 03.97	s	S	4.6	S	8.0	B		10	10				KAY
2001 07 03.99	a	S	4.9	HV	6.3	B		9	18	5			KAM01
2001 07 04.04		M	5.1	TJ	10.0	B		20	13	D6/			MEY
2001 07 04.04		S	4.2	AA	5.0	B		10	19	1			ZAN01
2001 07 04.04		S	4.7	AA	4.0	B		8	16	7			SCH04
2001 07 04.06		M	5.0	HS	5.0	B		10	14	5			HOE
2001 07 04.41		M	4.9	HV	5.0	B		10	30				WEL01
2001 07 04.71		S	4.6	TJ	5	R		8	30	3/			YOS04
2001 07 04.73	s	S	4.7	HD	7.0	B		10	&20	7			END
2001 07 04.74	s	S	4.7	HD	10.0	R		20	25	7			END
2001 07 04.75	x	S	4.8	TJ	5.0	B		12	20	5			NAG08
2001 07 05.01		M	4.8	TT	8.0	B		10	19	3/			HOR02
2001 07 05.02		B	5.1	HV	5.0	B		7	15	6			BIV
2001 07 05.04		M	5.4	HS	5.0	B		10	15	5			HOE
2001 07 05.04		S	4.2	AA	5.0	B		10	19	1			ZAN01
2001 07 05.04		S	5.5	TJ	7.0	B		16	14	4			GIA01
2001 07 05.40		B	5.5	TJ	5.0	B		7	15	6			MAN04
2001 07 05.63		B	5.0	TT	5.0	B		7	10	5			MAT08
2001 07 05.95		B	5.1	TJ	5.0	B		7	10	3			CHE03
2001 07 05.99		S	4.6	TJ	5.0	B		7	10	6			DIJ
2001 07 06.01		M	4.8	TT	8.0	B		10	20	3/			HOR02
2001 07 06.02		B	4.8	TI	10	B		25	15	4/			KON06
2001 07 06.03		S	4.3	AA	5.0	B		10	19	1			ZAN01
2001 07 06.05		M	5.0	TI	5.0	B		7	17	4			KYS
2001 07 06.91		B	5.2	TJ	5.0	B		7	13	4			CHE03
2001 07 06.94		S	4.5	AA	6.0	B		20	13	4			CSU
2001 07 06.98		M	5.7:	TI	8.0	B		12	&10	4			BAR06
2001 07 07.03		B	4.8	TI	10	B		25	15	5			KON06
2001 07 07.04		S	6.3	NP	25	L	5	30	8	5			SEG
2001 07 07.94		B	5.4	TJ	5.0	B		7	13	4			CHE03
2001 07 07.94		S	4.5	AA	6.0	B		20	13	4			CSU
2001 07 07.96		M	5.6:	TI	8.0	B		12	& 9	3			BAR06
2001 07 08.03		S	4.8	TI	7.0	B		11	16	4			CRE02
2001 07 08.99		S	4.5	AA	6.0	B		20	13	5	1.80	274	CSU
2001 07 09.04		S	5.6	TJ	7.0	B		16	11	4			GIA01
2001 07 09.74	x	S	4.5	TJ	5.0	B		7	16	3			WAT01
2001 07 09.87		M	5.2	TI	8.0	B		12	18	3			BAR06
2001 07 09.88	s	S	5.4	S	8	R	10	12	16	2			SVE01
2001 07 09.92	a	S	5.4	HV	6.3	B		9	17	3			KAM01
2001 07 09.96		S	6.1	HS	25.4	T	6	64	6	4			HOE
2001 07 09.97		M	5.5	TJ	10.0	B		20	12	5/			MEY
2001 07 09.98		S	5.3:	HV	5.0	B		7	15	5			BIV
2001 07 09.99		S	5.2	AA	5.0	B		10	13	3			ZAN01
2001 07 10.67	x	S	5.2	TT	3.5	B		7	&18	3			YOS02
2001 07 10.89		M	5.1	TT	8.0	B		10	17	3/	0.7	230	HOR02
2001 07 10.95		S	5.3	HV	5.0	B		7	18	4			BIV
2001 07 11.00		S	5.1	TI	7.0	B		11	14	3			CRE02
2001 07 11.01	!	C	7.2	HI	40	L	5 a	2	> 6.2	D5	>21.5m	230	ROD01
2001 07 11.04		S	4.5	AA	6.0	B		20	13	5	1.36	280	CSU
2001 07 11.58	xs	S	5.6	TJ	3.5	B		7	22	4			NAG08
2001 07 11.69		B	5.6	TT	5.0	B		7	7	4/			MAT08
2001 07 11.91		M	6.0	HS	25.4	T	6	64	16	4			HOE
2001 07 11.93	a	S	5.5	HV	6.3	B		9	14	4			KAM01
2001 07 11.95		S	5.4	TJ	6.0	B		20	30	4			LUE
2001 07 11.96		S	5.9	TJ	8.0	B		20	9.1	4			SHA02
2001 07 12.02		S	4.5	AA	6.0	B		20	13	5	1.27	302	CSU
2001 07 12.04		S	6.0	TJ	7.0	B		16	16	4			GIA01
2001 07 12.07		S	5.4	TI	7.0	B		11	16	4			CRE02
2001 07 12.55	xs	S	5.4	TJ	5.0	B		12	18	5			NAG08
2001 07 12.56		B	5.3	TT	5.0	B		7	8	7			MAT08

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DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 12.58	s	S	5.3	HD	7.0	B		10	20	5			END
2001 07 12.58	x	S	5.0	TJ	3.0	B		10	16	5			MIY01
2001 07 12.60		S	4.9	TJ	5	R		8	20	7			YOS04
2001 07 12.64	x	S	4.7	TT	3.5	B		7	18	4			YOS02
2001 07 12.65		B	5.1	TT	5.0	B		7	7	7			MAT08
2001 07 12.69		S	4.9	TJ	2.4	B		10	16	6			YOS04
2001 07 12.71		B	5.0	TT	5.0	B		7	7	7			MAT08
2001 07 12.91		E	4.9	AA	6	L	7	33	12	s7			ROM
2001 07 12.92		M	5.0	TT	8.0	B		10	18	5/	1.5	225	HOR02
2001 07 12.92		S	4.2	AA	6.0	B		20	13	5	1.18	315	CSU
2001 07 12.93		B	4.8	TJ	5.0	B		7	15	5	1.0	230	CHE03
2001 07 12.93		M	4.7	TT	5	N		1	20	7			HOR02
2001 07 12.93		S	5.7	TT	6	R	7	10	8	3			TAY
2001 07 12.94		B	5.5:	TK	5	R	10	20	&12	5/			VAZ
2001 07 12.94		M	4.9	TJ	5.0	B		7	14	7			BOU
2001 07 12.94		S	5.1	AA	5.0	B		10	15	6			ZAN01
2001 07 12.97		B	4.8	HV	0.0	E		1	15	6			BIV
2001 07 12.97		S	5.0	HV	5.0	B		7	18	7	1.0	220	BIV
2001 07 12.99		S	5.0	HV	20.3	L	6	48	14	6	0.6	220	BIV
2001 07 12.99		S	5.2	YG	7.0	R	7	24	10	4			GRA04
2001 07 13.04		S	4.9	TJ	7.0	B		16	14	6			GIA01
2001 07 13.20		M	4.9	AA	0.0	E		1	20	4			CRE01
2001 07 13.39		S	5.6	TK	25	L	4	50	13	7	0.5	250	LIN04
2001 07 13.60	x	I	4.9	TJ	0.0	E		1		8			NAG08
2001 07 13.60	x	S	5.0	TJ	5.0	B		12	25	5			NAG08
2001 07 13.77	s	H	6.5	LA	50.0	C	12	a030	15.5	3	> 9.2m	230	FUK02
2001 07 13.87	s	S	5.4	S	3	R	2	7	16	2			SVE01
2001 07 13.89		B	5.5:	TK	5	R	10	20	&17	5/			VAZ
2001 07 13.89		M	4.9	TT	8.0	B		10	20	4/	0.8	225	HOR02
2001 07 13.89	s	S	5.2	S	11	L	7	32	15				TIT
2001 07 13.89	s	S	5.4	S	5.0	B		7	15	2/			FED03
2001 07 13.90		E	4.9	AA	6	L	7	33	12	s7			ROM
2001 07 13.91		M	5.1	AA	5	R	5	17	13.4	0			SAL01
2001 07 13.92		B	5.0	TT	5.0	B		10	21.5	3	1.4	225	HAS02
2001 07 13.92		I	5.0	TT	0.8	E		1					HAS02
2001 07 13.92		M	5.0	AA	6	M		20	8.6	6			SHU
2001 07 13.99		S	4.9	TI	7.0	B		11	16	5			CRE02
2001 07 13.99		S	5.2	NP	25	L	5	30	12	6			SEG
2001 07 14.01		S	4.9	TJ	5.0	B		7	13	6			DIJ
2001 07 14.02		J	8.3	HI	31	T	3	a 60	+ 1.8				SOS
2001 07 14.02		J	10.8	HI	31	T	3	a 60	+ 0.2				SOS
2001 07 14.03		k	8.4	HI	31	T	3	a 60	+ 1.8				SOS
2001 07 14.03		k	10.7	HI	31	T	3	a 60	+ 0.2				SOS
2001 07 14.05		H	8.2	HI	31	T	3	a 60	+ 0.2				SOS
2001 07 14.05		H	10.5	HI	31	T	3	a 60	+ 1.8				SOS
2001 07 14.06		S	4.6	YG	0.0	E		1					DES01
2001 07 14.06		S	4.7	YG	23.0	L	5	45	25	2/	2.88	230	DES01
2001 07 14.06	!	C	6.2	HI	40	L	5	a 10	>13.2	D5	>40.0m	230	ROD01
2001 07 14.07		S	4.6	TK	0.0	E		1					YUM
2001 07 14.10		M	6.0	S	7	R	7	12	10	5			SAN04
2001 07 14.22		M	4.7	AA	0.0	E		1	25	6			CRE01
2001 07 14.25		B	5.4	S	3.5	B		7					GRE
2001 07 14.25	%	B	5.3	HV	3.5	B		7	&23	4			GRE
2001 07 14.25	%	B	5.4	TT	3.5	B		7					GRE
2001 07 14.27		S	5.2:	S	3.5	B		7					GRE
2001 07 14.27	%	S	4.9:	HV	3.5	B		7	&23	4			GRE
2001 07 14.27	%	S	5.1:	TT	3.5	B		7					GRE
2001 07 14.27	%	S	5.1:	Y	3.5	B		7	&23	4			GRE
2001 07 14.34		B	4.6	TJ	5.0	B		7	13	6			MAN04
2001 07 14.56		B	5.5	TJ	5.0	B		7	21	5			WAT01
2001 07 14.62	s	S	4.8	HD	7.0	B		10	22	7			END
2001 07 14.63	s	S	4.8:	HD	15.0	B		25	23	7			END
2001 07 14.63	x	M	5.1	HV	3.5	B		7					TSU02
2001 07 14.64		I	5.0:	HD	0.0	E		1		8			END
2001 07 14.67	x	S	5.0	TJ	3.5	B		7	25	5			NAG08

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DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 14.68	x	M	5.2	TT	3.5	B		7	19	5			YOS02
2001 07 14.87		M	5.0	AA	6	M		20	11	5/			SHU
2001 07 14.87	s	S	5.2	S	3	R	2	7	15	2/			SVE01
2001 07 14.88		B	5.5	TK	5	R	10	20	&16	5			VAZ
2001 07 14.88	s	S	5.1	S	11	L	7	30	20	2/	0.83	100	SVE01
2001 07 14.89	s	S	5.3	S	5	R	9	14	18	4	&0.12		FED03
2001 07 14.89	s	S	5.4	S	5.0	B		7	16	3/			FED03
2001 07 14.89	s	S	5.4	S	11	L	7	32	15				TIT
2001 07 14.90		M	5.1	AA	5	R	5	17	10.9	1			SAL01
2001 07 14.90		S	5.3	AA	5.0	B		10	22	s4	1.0	70	SAJ
2001 07 14.91			5.0	AA	0.0	E		1	16	3			SHU
2001 07 14.91		M	5.3	TI	8.0	B		20	20	3			BAR06
2001 07 14.91		M	5.5	TI	5.0	B		7	18	4			KYS
2001 07 14.92		S	5.0	AA	6.0	B		20	13	4	1.55	312	CSU
2001 07 14.93		M	5.2	TT	8.0	B		10	19	4/	1.7	230	HOR02
2001 07 14.97		M	5.0	TT	5	N		1	30	4			HOR02
2001 07 14.97		S	5.1	AA	5.0	B		10	15	5			ZAN01
2001 07 14.98		S	4.9	TI	7.0	B		11	17	5			CRE02
2001 07 15.01		I	5.1	TJ	0.0	E		1	&15	5/			PER01
2001 07 15.01		S	5.2	TJ	3.4	B		9	&16	4	>0.5	220	PER01
2001 07 15.02		B	4.9	HV	0.0	E		1	15	6			BIV
2001 07 15.02		S	4.9	HV	5.0	B		7	20	5	1.3	225	BIV
2001 07 15.03	s	S	5.2	S	11	L	7	30	16	2	0.5	120	TER02
2001 07 15.17		B	5.0	AA	5.0	B		7	26	6			LOU
2001 07 15.22		M	4.8	AA	0.0	E		1	25	7			CRE01
2001 07 15.26		B	5.8	HV	3.5	B		7	&20	5			GRE
2001 07 15.28		S	5.3:	HV	3.5	B		7	&20	5			GRE
2001 07 15.32		S	5.0	AA	5.0	B		7	20	4/			SPR
2001 07 15.41		S	5.3	TK	5.0	B		10	15	7			LIN04
2001 07 15.42		B	5.7	TK	25	L	4	50	11	7	0.8	230	LIN04
2001 07 15.58	s	S	5.0	HD	7.0	B		10	25	7			END
2001 07 15.58	x	S	5.0	TJ	3.5	B		7	23	4			NAG08
2001 07 15.59		B	5.6	TT	5.0	B		7	12	5			MAT08
2001 07 15.60	s	S	5.0	HD	10.0	R		16	24	7			END
2001 07 15.61	x	S	5.2	TJ	3.0	B		10	18	4/			MIY01
2001 07 15.72	s	H	6.9	LA	50.0	C	12	a030	13.9	3	> 7.0m	228	FUK02
2001 07 15.74	s	V	6.2	LA	50.0	C	12	a030	13.9	3	> 7.0m	228	FUK02
2001 07 15.84	s	S	5.6:	S	5.0	B		7	13	3			FED03
2001 07 15.85	s	S	5.5:	S	5	R	9	14	15	2/			FED03
2001 07 15.86		B	5.6:	TK	5	R	10	20	&26	5/			VAZ
2001 07 15.91		S	6.1	AA	5.0	B		10	18	5		80	SAJ
2001 07 15.92		B	5.4	AC	5.0	B		10	13	5			MOE
2001 07 15.93		M	5.3	AA	5	R	5	17	8	0			SAL01
2001 07 15.94		B	5.8	TJ	5.0	B		7	10	4			CHE03
2001 07 15.94		M	5.4	TI	8.0	B		20	19	3	0.7		BAR06
2001 07 15.94		S	5.4	AA	5.0	B		10	15	6			ZAN01
2001 07 15.94		S	6.8	TT	6	R	7	10	7	3			TAY
2001 07 15.95		S	5.3	AA	6.0	B		20	13	5	1.36	301	CSU
2001 07 15.96		S	4.8	TJ	5.0	B		7	14	6			DIJ
2001 07 15.97		M	5.1:	AA	6	M		20	10	5			SHU
2001 07 15.97		M	5.6	TT	8.0	B		10	18	3/	0.7	230	HOR02
2001 07 15.99		S	5.8	YG	7.0	R	7	24	8	3			GRA04
2001 07 16.03		S	5.6:	HV	5.0	B		7	20	4			BIV
2001 07 16.07		S	5.5	HV	5.0	B		7	16	5	0.8	225	BIV
2001 07 16.07		S	5.9:	HV	20.3	L	6	48	10	5	0.4	225	BIV
2001 07 16.19		S	5.2	HV	5.0	B		12	&18	3			GRE
2001 07 16.20		M	5.0	AA	0.0	E		1	25	6			CRE01
2001 07 16.59	s	H	6.9	LA	50.0	C	12	a120	12.1	3	> 8.9m	224	FUK02
2001 07 16.62	x	S	5.9	TJ	3.0	B		10	20	4/			MIY01
2001 07 16.65	x	S	5.3	TJ	3.5	B		7	20	5			NAG08
2001 07 16.66	s	V	6.5	LA	50.0	C	12	a120	12.1	3	> 8.9m	224	FUK02
2001 07 16.70	x	M	6.0	TT	3.5	B		7	19	3			YOS02
2001 07 16.88		B	5.7:	TK	5.0	B		5	&26	4/	1.10	268	VAZ
2001 07 16.88		M	5.4	AA	7	R	4	12	8	4/			SHU
2001 07 16.89	s	S	5.6	S	11	L	7	32	13	2/			SVE01

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 16.90		M	5.3	AA	5	R	5	17	7.1	2			SAL01
2001 07 16.90		S	6.4	AA	11	B		20	12	4	0.7	235	NEV
2001 07 16.92	s	S	5.5	S	20	R	15	30	17	3			SVE01
2001 07 16.94		M	5.1	TJ	5.0	B		7	14	5/			BOU
2001 07 16.94		S	5.6	AA	5.0	B		10	15	6			ZAN01
2001 07 16.95		S	5.7	TT	4.0	B		8	15	5/			SCH04
2001 07 16.96		S	5.8	HV	5.0	B		7	13	3	0.4	215	BIV
2001 07 16.97		S	6.1	HV	20.3	L	6	48	8.5	4	0.5	220	BIV
2001 07 16.98		M	5.3	HS	25.4	T	6	64	15	3			HOE
2001 07 16.99		S	5.1	TJ	5.0	B		10	&15	6			COM
2001 07 17.04		I	5.3	TJ	0.0	E		1	&16	5/			PER01
2001 07 17.04		S	5.5	TJ	3.4	B		9	&16	4/	>0.8	220	PER01
2001 07 17.13		M	5.8	S	6.0	B	10	12	8	4			SAN04
2001 07 17.42		S	6.1	HK	8.0	B		11	&12	d4			LE001
2001 07 17.57		M	5.9	AA	5.0	B		10					SEA
2001 07 17.64		B	5.6	TJ	5.0	B		7	16	5			WAT01
2001 07 17.66	s	S	6.0	HD	7.0	B		10	25	4			END
2001 07 17.68	s	S	6.1	HD	10.0	R		16	25	5			END
2001 07 17.83		B	6.0:	AA	11	L	7	32	13	4	1	185	KOS04
2001 07 17.86	s	S	5.4	S	8.0	B		10	15	3			SVE01
2001 07 17.88		M	5.5	AA	7	R	4	12	7	5			SHU
2001 07 17.88		M	6.0	AA	5	R	5	17	9.7	0			SAL01
2001 07 17.89		B	5.4	TT	5.0	B		10	15.5	4			HAS02
2001 07 17.89		B	5.7:	TK	5.0	B		5	&21	5/			VAZ
2001 07 17.90		E	5.6	AA	6	L	7	33	10	d6			ROM
2001 07 17.92		k	9.0	HI	31	T	3	a 60	+ 1.6				SOS
2001 07 17.92		k	11.5	HI	31	T	3	a 60	+ 0.2				SOS
2001 07 17.93		J	9.0	HI	31	T	3	a 60	+ 1.6				SOS
2001 07 17.93		J	11.7	HI	31	T	3	a 60	+ 0.2				SOS
2001 07 17.94		L	9.9	HI	31	T	3	a180	+ 1.6				SOS
2001 07 17.94		L	12.6	HI	31	T	3	a180	+ 0.2				SOS
2001 07 17.94		S	5.7	TT	20.3	T	6	48	15	4			KOP
2001 07 17.95		H	8.6	HI	31	T	3	a 60	+ 1.6				SOS
2001 07 17.95		H	10.7	HI	31	T	3	a 60	+ 0.2				SOS
2001 07 17.98		S	5.7	TI	7.0	B		11	12	7	0.75	220	CRE02
2001 07 18.04		I	5.6	TJ	0.0	E		1		5			PER01
2001 07 18.04		S	5.8	TJ	3.4	B		9	&18	3/			PER01
2001 07 18.06		M	5.8	S	7	R	7	12	4	4			SAN04
2001 07 18.19		S	5.8	HV	5.0	B		12	&15	2			GRE
2001 07 18.58	x	M	6.2	TT	3.5	B		7	15	2/			YOS02
2001 07 18.84		B	6.2	AA	11	L	7	32	14	4	1	185	KOS04
2001 07 18.88	s	S	5.7	S	5	R	9	14	14	4			FED03
2001 07 18.88	s	S	5.7	S	5.0	B		7	13	3			FED03
2001 07 18.89		B	5.8:	TK	5.0	B		7	&18	5			VAZ
2001 07 18.90		E	5.9	AA	6	L	7	33	8	6			ROM
2001 07 18.90		S	6.1	AA	5.0	B		10	15	4			SAJ
2001 07 18.92		S	5.9	TT	20.3	T	6	48	14	3/			KOP
2001 07 18.93		S	5.9	AA	6.0	B		20	13	5	1.16	303	CSU
2001 07 18.94		M	5.7	TI	8.0	B		20	18	3			BAR06
2001 07 18.94		S	5.8	AA	5.0	B		10	13	6			ZAN01
2001 07 18.96		M	6.2	HS	25.4	T	6	64	16	3			HOE
2001 07 18.97		S	6.1	HV	5.0	B		7	15	4			BIV
2001 07 19.11		I	5.7:	TJ	0.0	E		1		5			PER01
2001 07 19.11		S	6.0	TJ	3.4	B		9	&17	4	0.3	220	PER01
2001 07 19.18		S	6.3	HV	8.0	B		20	& 8	2			GRE
2001 07 19.19		S	6.1	HV	5.0	B		12	&15	1/			GRE
2001 07 19.54	x	S	6.0	TJ	3.5	B		7	16	5			NAG08
2001 07 19.56		M	6.1	AA	5.0	B		10	10	4			SEA
2001 07 19.85		M	6.7	HS	25.4	T	6	64	12	2			HOE
2001 07 19.87		M	6.0	AA	7	R	4	12	7	4/			SHU
2001 07 19.88		B	5.9	TK	5.0	B		7	&13	4/			VAZ
2001 07 19.88		M	6.1	AA	5	R	5	17	5.7	0			SAL01
2001 07 19.88		S	6.2	AA	5.0	B		10	15	3			SAJ
2001 07 19.88	s	S	5.8	S	5.0	B		7	12	3			FED03
2001 07 19.89		S	6.0	AA	11	B		20	11	3	0.7	217	NEV

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 19.90		S	6.2	TJ	6.0	B		20	13	3			LUE
2001 07 19.91		E	5.9	AA	6	L	7	33	9	d5			ROM
2001 07 19.91		S	5.8	AA	5.0	B		10	13	6			ZAN01
2001 07 19.91		S	6.0	HV	6.3	B		9	14	4	0.4	230	KAM01
2001 07 19.92		S	5.9	TT	4.0	B		8	15	6/			SCH04
2001 07 19.94		B	6.1	AC	5.0	B		10	12	4			MOE
2001 07 19.94		B	6.2	HJ	5.0	B		7	&15	5	&0.5	220	SER02
2001 07 19.94		S	6.6	TT	7.0	B		16	10	2		320	TAY
2001 07 19.95		S	6.0	AA	5.0	B		20	10	7			DIE02
2001 07 19.96		S	6.2	HV	5.0	B		7	15	4	0.7	210	BIV
2001 07 19.98		S	6.7	S	5.0	B		10	&15	3/	&1		COR01
2001 07 19.99		S	6.9	S	5.0	B		10	&15	3	&1		RIB
2001 07 20.02		S	6.7	S	5.0	B		7	15		0.33		MAR25
2001 07 20.03		S	5.9	AA	6.0	B		20	13	5	1.27	323	CSU
2001 07 20.04		S	6.3	TJ	5.0	B		7	12	4/			DIJ
2001 07 20.08		S	6.3	TT	20.3	T	6	48	13	3			KOP
2001 07 20.11		M	5.6	S	7	R	7	12	2	4			SAN04
2001 07 20.15		S	6.2	TJ	3.4	B		9	&18	s3/	0.8	55	PER01
2001 07 20.16		S	6.3	HV	8.0	B		20	& 8	3/			GRE
2001 07 20.17		B	6.4	HV	5.0	B		12					GRE
2001 07 20.17		S	6.0	HV	5.0	B		12	&12	1/			GRE
2001 07 20.49		S	6.2	HK	8.0	B		11	&20	d4			LEO01
2001 07 20.56	s	S	6.3	HD	7.0	B		10	13	4			END
2001 07 20.59	x	M	6.2	HV	3.5	B		7					TSU02
2001 07 20.60	x	S	6.2	TJ	8.0	B		11	15	4			NAG08
2001 07 20.62		S	6.0	HS	10.0	B		20	10	4			OOT
2001 07 20.63		S	6.3	TJ	5	R		8	26	2			YOS04
2001 07 20.69	s	H	7.2	LA	50.0	C	12	a240	12.3	4	> 6.8m	215	FUK02
2001 07 20.72	s	V	7.1	LA	50.0	C	12	a240	12.3	4	> 6.8m	215	FUK02
2001 07 20.84		B	6.2	AA	11	L	7	32	14	4	1	180	KOS04
2001 07 20.87		M	5.9	AA	7	R	4	12	6	4/			SHU
2001 07 20.88	s	S	6.4:	S	11	L	7	32	10				TIT
2001 07 20.92		S	6.2:	HV	5.0	B		7	12	4			BIV
2001 07 20.94		M	6.2	TJ	5.0	B		7	13	4			BOU
2001 07 20.95		S	6.1	TT	4.0	B		8	15	6			SCH04
2001 07 20.95		S	6.2	TJ	6.0	B		20	13	3			LUE
2001 07 20.97		S	6.1	AA	5.0	B		20	11	6			DIE02
2001 07 20.97		S	6.3	TJ	5.0	B		10	&12	5			COM
2001 07 20.98		S	6.2	TJ	7.0	R	7	24	10	4			GRA04
2001 07 21.01		S	6.8	NP	25	L	5	30	10	4			SEG
2001 07 21.02		S	6.1	TI	7.0	B		11	13	6	0.67	220	CRE02
2001 07 21.03		S	6.4	TJ	3.4	B		9	&16	s4	0.4	215	PER01
2001 07 21.12		M	5.5	S	7	R	7	12	4	5	10 m	170	SAN04
2001 07 21.18		S	5.9	HV	5.0	B		12	&15	2/			GRE
2001 07 21.18		S	6.2	HV	8.0	B		20	&10	3			GRE
2001 07 21.19		B	6.7	HV	8.0	B		20					GRE
2001 07 21.19		B	6.9	HV	5.0	B		12					GRE
2001 07 21.56		B	6.4	TT	5.0	B		7	9	5			MAT08
2001 07 21.60	s	S	6.6	HD	7.0	B		10	17	5	&0.5	250	END
2001 07 21.61	x	S	6.4	TJ	5.0	B		12	13	4			NAG08
2001 07 21.76	x	S	6.4	TJ	3.0	B		10	14	4			MIY01
2001 07 21.76	x	S	6.9	TJ	12.0	B		20	10	3/			MIY01
2001 07 21.85		M	5.9	AA	7	R	4	12	7	5			SHU
2001 07 21.85		k	9.8	HI	31	T	3	a180	+ 1.5				SOS
2001 07 21.85		k	11.5	HI	31	T	3	a180	+ 0.2				SOS
2001 07 21.86	s	S	6.0	S	5.0	B		7	11	2			FED03
2001 07 21.87		B	6.4	AA	11	L	7	32	12	4			KOS04
2001 07 21.88		M	5.8	TI	5.0	B		7	10	4			KYS
2001 07 21.89		H	9.4	HI	31	T	3	a180	+ 1.5				SOS
2001 07 21.89		H	11.2	HI	31	T	3	a180	+ 0.2				SOS
2001 07 21.90		B	6.0	TT	5.0	B		10	12	4	0.93	226	HAS02
2001 07 21.90		I	5.9	TT	0.8	E		1					HAS02
2001 07 21.92		J	10.1	HI	31	T	3	a180	+ 1.5				SOS
2001 07 21.92		J	11.8	HI	31	T	3	a180	+ 0.2				SOS
2001 07 21.92		S	6.2	AA	5.0	B		10	13	3			ZAN01

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 21.92		S	6.4	HV	6.3	B		9	14	3			KAM01
2001 07 21.93		S	6.8	TT	20.3	T	6	48	11	3			KOP
2001 07 21.98		S	6.6	TJ	7.0	R	7	24	8	4			GRA04
2001 07 21.99		B	6.3	HJ	5.0	B		7	&15	5	0.8	230	SER02
2001 07 22.01		B	6.2	HV	0.0	E		1	10	5			BIV
2001 07 22.01		M	6.3	S	10	R	5	25	7	5			MAR02
2001 07 22.01		S	6.1	TJ	5.0	B		7	12	4			GON05
2001 07 22.01		S	6.2	HV	5.0	B		7	12	4	1.1	215	BIV
2001 07 22.02		S	6.2	TI	7.0	B		11	14	6	0.67	215	CRE02
2001 07 22.05		S	6.4	HV	25.6	L	5	42	9	4	0.7	220	BIV
2001 07 22.23		B	7.1	HV	5.0	B		12					GRE
2001 07 22.23		S	6.2	HV	5.0	B		12	&15	1/			GRE
2001 07 22.38		B	6.3	TK	5.0	B		10	12	5	0.7	220	LIN04
2001 07 22.39		B	6.5	TK	25	L	4	50	9	5	0.8	220	LIN04
2001 07 22.40		S	6.3	HK	8.0	B		11	11	d4			LEO01
2001 07 22.58	x	S	6.5	TJ	5.0	B		12	13	3/			NAG08
2001 07 22.65		B	6.5	TT	5.0	B		7	9	5			MAT08
2001 07 22.83		B	6.4	AA	6.0	B		20	10	3			KOS04
2001 07 22.86	s	S	6.0	S	5	R	4	20	16	2/	&0.4	210	SVE01
2001 07 22.88		S	6.2	TI	7.0	B		11	14	6	0.75	215	CRE02
2001 07 22.89		B	5.9:	TK	5.0	B		7	&10	4/			VAZ
2001 07 22.89		E	6.3	AA	6	L	7	33	8	5			ROM
2001 07 22.91		S	6.5	HV	6.3	B		9	14	4		225	KAM01
2001 07 22.93		M	6.1	TI	8.0	B		20	18	3			BAR06
2001 07 22.93		S	6.4	TJ	5.0	B		7	12	3/			BOU
2001 07 22.93		S	6.4	TJ	5.0	B		10	&10	5			COM
2001 07 22.94		S	6.4	AA	5.0	B		10	14	3			ZAN01
2001 07 22.95		B	6.3	TT	5.0	B		10	16.1	4	0.6	217	HAS02
2001 07 22.95		I	6.3	TT	0.8	E		1					HAS02
2001 07 22.97		S	6.5	TJ	5.0	B		7	11	4			DIJ
2001 07 22.99		S	6.6	HV	7.0	B		10	13	3			KOP
2001 07 23.49		M	6.5	AA	5.0	B		10					SEA
2001 07 23.56		S	6.7	HS	10.0	B		20	10	3			OOT
2001 07 23.60		B	6.7	TT	5.0	B		7	8	5			MAT08
2001 07 23.63	x	S	6.6	TJ	5.0	B		12	15	3			NAG08
2001 07 23.85		M	6.4	S	6	R		20	8	4			SHU
2001 07 23.88		B	6.9:	TK	5.0	B		7	&17	4			VAZ
2001 07 23.88		S	6.5	AA	5.0	B		10	14	2			ZAN01
2001 07 23.90		S	6.6	AC	5.0	B		10	11	3			MOE
2001 07 23.92		S	6.3	TI	7.0	B		11	10	4			CRE02
2001 07 24.01		S	6.8	HV	7.0	B		10	12	3			KOP
2001 07 24.14		S	6.2	HV	8.0	B		20	& 7	1			GRE
2001 07 24.16		B	6.4	TT	5.0	B		12	4				SAL02
2001 07 24.59	x	S	6.7	TJ	8.0	B		11	13	3			NAG08
2001 07 24.66	x	M	7.3	TT	3.5	B		7	13	2/			YOS02
2001 07 24.87		E	6.5	AA	6	L	7	33	7	5			ROM
2001 07 24.89		B	7.1	TK	5.0	B		7	&15	4			VAZ
2001 07 24.90		S	6.8	AA	5.0	B		10	14	2			ZAN01
2001 07 24.91		M	6.3	TI	8.0	B		12	20	3			BAR06
2001 07 24.91		S	6.4	AA	11	B		20	12	3			NEV
2001 07 24.92		S	6.6	TT	4.0	B		8	12	7			SCH04
2001 07 24.93		S	6.5	HV	5.0	B		7	12	2			BIV
2001 07 24.93		S	6.7	TJ	7.0	B		16	18	5			GIA01
2001 07 24.94		B	6.9	HJ	5.0	B		7	13	4			SER02
2001 07 24.94		M	6.6	TJ	5.0	B		7	12	4			BOU
2001 07 24.94		S	6.7	HV	20.3	L	6	48	8	2	0.4	215	BIV
2001 07 24.94		S	6.7	TJ	5.0	B		7	10	4			DIJ
2001 07 24.97		S	6.4	AA	5.0	B		20	10	4			DIE02
2001 07 24.97		S	6.7	TJ	5.0	B		10	&10	4/			COM
2001 07 25.02		S	6.9	HV	7.0	B		10	12	3			KOP
2001 07 25.07	!	C	8.3	HI	40	L	5 a	3	> 5.3	D5	>24.0m	214	ROD01
2001 07 25.12		B	6.5	TT	5.0	B		12	4				SAL02
2001 07 25.84		M	7.1	S	6	R		20	8	4			SHU
2001 07 25.90		S	6.3	AA	6.0	B		20	13	4/	1.09	328	CSU
2001 07 25.90		S	6.9	AA	5.0	B		10	11	2			ZAN01

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 25.91		M	6.8	TI	8.0	B		20	17	3			BAR06
2001 07 25.93		S	6.9	HV	6.3	B		9	14	3			KAM01
2001 07 25.95		S	6.5	S	5.0	B		10	10	3			COR01
2001 07 25.96		S	6.6	S	5.0	B		7	11	3			RIB
2001 07 25.97		S	6.7	TJ	5.0	B		7	10	3			DIJ
2001 07 25.98		S	6.6	TJ	5.0	B		7	12	4			BOU
2001 07 25.98		S	6.7	AC	5.0	B		10	11	2			MOE
2001 07 26.83		E	6.8	AA	6	L	7	33	5	4			ROM
2001 07 26.84		B	6.5	AA	6.0	B		20	10	3			KOS04
2001 07 26.85		S	6.3	AA	6.0	B		20	13	4/	0.82	305	CSU
2001 07 26.87		S	6.6	TI	7.0	B		11	13	3			CRE02
2001 07 26.89		S	6.9	AC	5.0	B		10	11	2			MOE
2001 07 26.90		S	7.0	AA	5.0	B		10	11	2			ZAN01
2001 07 26.97		M	6.7	TJ	5.0	B		7	12	3/			BOU
2001 07 26.97		S	6.7	HV	7.0	B		10	11	s2/			KOP
2001 07 26.98		S	6.9	TJ	7.0	R	7	24	9	4			GRA04
2001 07 27.18		S	6.5	HV	5.0	B		12	&14	1/			GRE
2001 07 27.19		B	7.4	HV	8.0	B		20					GRE
2001 07 27.19		S	6.8	HV	8.0	B		20	&10	1/			GRE
2001 07 27.20		S	6.5	HV	3.5	B		7	&15	1/			GRE
2001 07 27.29		S	6.7	AA	5.0	B		7	12	5			SPR
2001 07 27.83		S	6.9	TI	8.0	B		12	&17	3/			BAR06
2001 07 27.89	s	S	7.3:	S	11	L	7	32	& 7	1/			TIT
2001 07 27.90		S	6.9	AC	5.0	B		10	10	2			MOE
2001 07 27.90		S	7.2	AA	5.0	B		10	11	2			ZAN01
2001 07 27.94		S	6.8	AA	5.0	B		20	10	3			DIE02
2001 07 28.01		S	7.1	HV	7.0	B		10	10	s2/			KOP
2001 07 28.14		S	6.8	TJ	5.0	B		7	8	2			MAN04
2001 07 28.19		S	6.5	HV	5.0	B		12	&16	1/			GRE
2001 07 28.86		S	7.1	AA	6.0	B		20	13	4	0.59	320	CSU
2001 07 28.88		M	7.3	TI	5.0	B		7	11	4			KYS
2001 07 28.88		S	7.0	TI	7.0	B		11	13	3			CRE02
2001 07 28.91	K	S	6.9	TI	8.0	B		12	17	3/			BAR06
2001 07 28.92		S	7.0	TI	20	L	5	50	17	2/			BAR06
2001 07 28.92		S	7.2	TJ	5.0	B		7	15	3			DIJ
2001 07 28.95		S	7.0	AC	5.0	B		10	10	2			MOE
2001 07 29.02		S	7.2	HV	7.0	B		10	10	s2			KOP
2001 07 29.03		S	7.0:	HV	5.0	B		7	10	3			BIV
2001 07 29.06		S	8.2	NP	25	L	5	30	4	2			SEG
2001 07 29.09		S	6.9	HV	5.0	B		7	12	3			BIV
2001 07 29.10		S	7.3	HV	25.6	L	5	42	11	3	0.5	215	BIV
2001 07 29.34		B	8.2	TK	25	L	4	50	4	4	10.0m	195	LIN04
2001 07 29.84		B	7.0:	AA	6.0	B		20	10	3			KOS04
2001 07 29.86		S	7.1	AA	6.0	B		20	13	3	0.64	323	CSU
2001 07 29.87		S	7.0	TI	7.0	B		11	13	3			CRE02
2001 07 29.91		M	6.9	AA	11	B		20	8	4			NEV
2001 07 29.91		S	7.6	AA	5.0	B		10	15	3	0.3	70	SAJ
2001 07 29.96		E	6.9	AA	6	R	10	16	10	5			ROM
2001 07 29.99		S	6.8	HS	20.3	L	4	61	5	2			MOR09
2001 07 30.01		S	7.3	HV	7.0	B		10	9	2			KOP
2001 07 30.07		S	7.1	HV	5.0	B		7	15	2			BIV
2001 07 30.07		S	7.2	HV	20.3	L	6	48	8	2	0.4	210	BIV
2001 07 30.14		S	6.9	HV	8.0	B		20	& 7	1			GRE
2001 07 30.15		S	7.0	TJ	3.4	B		9	&10	4			PER01
2001 07 30.28		S	7.3	AA	5.0	B		7	7	3			SPR
2001 07 30.39		S	8.0	TK	25	L	4	50	5	3			LIN04
2001 07 30.84		M	6.6	S	6	R		20	5.1	2/			SHU
2001 07 30.87		S	7.1	AA	6.0	B		20	13	3			CSU
2001 07 30.90		J	10.6	HI	31	T	3	a300	+ 1.1				SOS
2001 07 30.90		J	12.4	HI	31	T	3	a300	+ 0.2				SOS
2001 07 30.92		S	7.1	TI	7.0	B		11	11	2			CRE02
2001 07 30.93		k	10.7	HI	31	T	3	a300	+ 1.1				SOS
2001 07 30.93		k	12.8	HI	31	T	3	a300	+ 0.2				SOS
2001 07 30.94		H	10.2	HI	31	T	3	a300	+ 1.1				SOS
2001 07 30.94		H	12.7	HI	31	T	3	a300	+ 0.2				SOS

Comet C/2001 A2 (LINEAR) [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 30.94		S	7.0:	TI	12	R	7	45	15	2			BAR06
2001 07 30.95		B	8.8	S	15.0	M	10	27	5	4			SER02
2001 07 30.98		S	7.0	TJ	7.0	R	7	15	13	3			GRA04
2001 07 31.14		S	7.2	HV	8.0	B		20	& 6	1			GRE
2001 07 31.15		S	7.5	TJ	3.4	B		9	& 9	4			PER01
2001 07 31.83		S	7.5:	AA	5.0	B		10	10	2			SAJ
2001 07 31.94		S	7.1:	TI	12	R	7	45	14	2			BAR06
2001 07 31.97		S	7.1	TJ	7.0	R	7	15	13	3			GRA04
2001 07 31.98		S	7.1	TJ	5.0	B		7	12	2			GRA04
2001 07 31.99		E	7.4	AA	8	R	10	28	9	5			ROM
2001 08 01.03		C	9.8	HS	10.5	R	5	a120	2	2	13	m 204	MOR09
2001 08 01.06		S	7.4	HV	5.0	B		7	13	2			BIV
2001 08 01.07		S	7.6	HV	20.3	L	6	48	6	2	0.3	200	BIV

Comet C/2001 B2 (NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 01 27.06	&	C	15.2	UO	57.0	P	5	a 30					TIC
2001 03 31.89		C	15.1	UO	57.0	P	5	a 90					TIC
2001 04 01.88		C	15.2	UO	57.0	P	5	a 90					TIC
2001 04 24.84		C	15.4	UO	57.0	P	5	a 60					TIC
2001 04 24.96	d	k	15.3	LB	35	L	5	a360	0.65				HOR02
2001 04 27.93	d	k	15.2	LB	35	L	5	a600	0.7				HOR02
2001 04 29.92	d	k	15.5	LB	35	L	5	a540	0.5				HOR02
2001 05 09.86	d	k	15.6	LB	35	L	5	a600	0.45				HOR02
2001 05 10.84	d	k	15.5	LB	35	L	5	a600	0.5				HOR02
2001 05 12.50	x	C	15.8	TT	35.0	C	14	A080	0.5	3			TSU02
2001 05 12.51		C	16.2	TJ	18.0	L	6	a180	0.35				KAD02
2001 05 14.87	d	k	15.5	LB	35	L	5	a540	0.55				HOR02
2001 05 16.50		C	16.0	GA	60.0	Y	6	a120	0.65				NAK01
2001 05 20.86	d	k	15.2	LB	35	L	5	a540	0.5				HOR02
2001 05 23.87	d	k	15.3	LB	35	L	5	a630	0.45				HOR02
2001 05 24.87	d	k	15.5	LB	35	L	5	a270	0.45				HOR02
2001 05 25.87		C	15.5	UO	57.0	P	5	a 60					TIC
2001 05 25.87	d	k	15.5	LB	35	L	5	a630	0.45				HOR02
2001 06 11.48	x	C	16.2	HV	35.0	C	14	A680	0.3	4			TSU02
2001 06 11.49	x	C	16.1:	HV	60.0	Y	6	a120	0.65				NAK01

Comet C/2001 C1 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 02 25.13		C	16.5	UO	57.0	P	5	a 90					TIC
2001 05 12.57	a	C	16.6	GA	60.0	Y	6	a120	0.45		1.6m	11	NAK01
2001 05 12.63	x	C	16.4	TT	35.0	C	14	a840	0.4	3			TSU02

Comet C/2001 G1 (LONEOS)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 10.46		C	17.5	GA	40.0	L	6	a180	0.25				AKA
2001 05 16.51		C	17.9	GA	60.0	Y	6	a240	0.25				NAK01

Comet C/2001 HT_50 (LINEAR-NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 16.52		C	18.7	GA	60.0	Y	6	a240	0.25				NAK01
2001 05 17.50		C	17.8	GA	40.0	L	6	a240	0.15				AKA

Comet C/2001 K3 (Skiff)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 31.73		C	16.0	TJ	18.0	L	6	a180	0.35				KAD02
2001 06 26.92		C	15.9	UO	57.0	P	5	a 60					TIC
2001 06 27.25	!	J	14.6	SC	25.4	T	5	a100	0.36	s3	?		ROQ
2001 07 03.74		C	16.0	GA	60.0	Y	6	a120	0.45		0.7m	206	NAK01
2001 07 24.62		C	15.6	GA	60.0	Y	6	a120	0.45		1.0m	214	NAK01

Comet C/2001 K5 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 29.92	d	k	16.1	LB	65	P	4	a180			10 s	223	HOR02
2001 06 02.60		C	15.7:	TJ	18.0	L	6	a180	0.2				KAD02
2001 06 11.60	x	C	16.5:	TJ	60.0	Y	6	a120	0.25	8		190	NAK01
2001 07 22.51	a	C	16.8	GA	60.0	Y	6	a120	0.3	8			NAK01

Comet C/2001 M10 (NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 15.04		C	18.0	UO	57.0	P	5	a 60					TIC
2001 07 22.63		C	17.7	GA	60.0	Y	6	a240	0.3		0.6m	228	NAK01

Comet C/2001 N2 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 24.70		C	17.4	GA	60.0	Y	6	a240	0.35				NAK01
2010 07 15.02		C	17.5	UO	57.0	P	5	a 60					TIC

Comet 2P/Encke

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 08 05.14		S	11.0	NP	25	L	5	60	3	3			SEG
2000 08 09.14		S	11.0	NP	25	L	5	96	3	3			SEG
2001 07 24.69		C	19.5	GA	60.0	Y	6	a240	0.2				NAK01

Comet 16P/Brooks

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 12.72		C	16.1	TJ	18.0	L	6	a120	0.25				KAD02

Comet 19P/Borrelly

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 19.84		S	13.2:	NO	20	L	7	160	1.0	2			MAT08
2001 06 21.36		S	12.0:	TK	14.3	L	6	80		0/			AMO01
2001 07 01.84		S	12.9:	NO	20	L	7	160	1.0	3			MAT08
2001 07 12.77		C	13.0	TJ	18.0	L	6	a 60	0.6		0.8m	240	KAD02
2001 07 22.83		S	11.4	TJ	20	L	7	45	1.5	5			MAT08
2001 07 24.78	xs	S	11.9	HS	25.4	L	4	113	0.8	4			YOS02

Comet 24P/Schaumasse

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 02 21.91		C	15.2:	UO	25.4	L	6		0.4				GRA04
2001 04 11.89		S	11.7	HS	25.6	L	5	84	2	3			BIV
2001 04 12.89		C	12.5	HS	25.4	L	6		1.7				GRA04
2001 04 13.79		S	9.5	AC	6.3	R	13	52	5	0			KOS
2001 04 13.88		S	11.8	HS	25.6	L	5	42	2.3	3			BIV
2001 04 18.78		S	9.4	AC	6.3	R	13	52	5	1			KOS
2001 04 24.86	d	k	12.5:	LB	35	L	5	a450	1.6				HOR02
2001 04 26.82		S	9.8	TT	35	L	5	68	3.0	1			HOR02
2001 04 29.82		S	10.5	TT	35	L	5	68	2.7	1/			HOR02
2001 05 01.82		C	12.2	HS	20	T	6	120	3.0				GIA01
2001 05 10.47	x	C	12.7	HS	35.0	C	14	a720	0.5	4			TSU02
2001 05 10.47	x	S	10.8	TJ	32.0	L	5	91	2.9	3			NAG08
2001 05 11.91		S	10.6	TJ	31.0	J	6	72	3.0	2			BOU
2001 05 11.91		S	10.8	TJ	31.0	J	6	72	2	1/			DIJ
2001 05 11.91		S	11.1	VB	20	R	14	140	1.7	2			SHA02
2001 05 11.91		S	11.5	TK	25.6	L	5	42	2.3	2			BIV
2001 05 11.91		S	11.6	TK	25.6	L	5	84	2	2			BIV
2001 05 12.47		S	10.3	TJ	25.4	T	6	62	2.3	2			YOS04
2001 05 12.48		C	13.1	TJ	18.0	L	6	a 90	1.0				KAD02
2001 05 12.48	x	C	13.7	TT	35.0	C	14	a660	0.6	4			TSU02
2001 05 12.91		S	10.7	TJ	31.0	J	6	72	2.5	2			BOU
2001 05 13.88	x	S	10.8	TT	30	L	4	96	2.5	2			GRA09
2001 05 14.84		S	10.4	TT	35	L	5	68	2.5	2			HOR02

Comet 24P/Schaumasse [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 14.85		S	10.9:	HS	20	L	5	70	2	3			BAR06
2001 05 15.18		J	12.3	SC	25.4	T	5	a100	1.98	s5/	1.7m	90	ROQ
2001 05 15.85		S	11.1	HS	20	L	5	70	1.8	2			BAR06
2001 05 16.47	a	C	12.1	GA	60.0	Y	6	a 60	2.7				NAK01
2001 05 18.93		S	10.7	TJ	25.4	J	6	58	3.0	1/			BOU
2001 05 19.49	x	C	12.5	HS	35.0	C	14	a360	0.8	4			TSU02
2001 05 19.51	x	S	10.8	HS	25.4	L	4	46	2.3	2			YOS02
2001 05 19.88		S	12.6	HS	25.0	C	10	125	1.0	4			HAS02
2001 05 19.93		S	11.7	TK	20.3	L	6	40	1.5	2			BIV
2001 05 20.31		S	11.1	TK	25	L	4	100	1.7	2			LIN04
2001 05 20.86		S	11.0	TK	35	L	5	68	2.5	2			HOR02
2001 05 20.90		S	11.5	TK	20.3	L	6	40	1.8	2			BIV
2001 05 20.90		S	11.5	TK	20.3	L	6	79	1.8	2			BIV
2001 05 20.90	x	S	10.6	TT	23	L	6	76	3	2			DES01
2001 05 22.86		S	10.7	TK	35	L	5	68	2.4	2			HOR02
2001 05 22.93		S	11.0	TJ	31.0	J	6	89	2.0	1/			BOU
2001 05 24.86		S	10.7	TK	35	L	5	68	2.3	2			HOR02
2001 05 24.94		S	11.0	TJ	31.0	J	6	89	2.0	2			BOU
2001 05 25.86		S	10.8	TK	35	L	5	68	2.3	2			HOR02
2001 05 25.94		S	11.0	TJ	31.0	J	6	89	2.2	2			BOU
2001 05 27.89	&	C	13.3	HS	10.5	R	5	a120	1.1	2			MOR09
2001 06 02.48		C	14.0	TJ	18.0	L	6	a 90	0.8				KAD02
2001 06 08.71		S	11.1	TJ	40.6	L	4	70	1.8	2			BOU
2001 06 09.70		S	11.2	TJ	40.6	L	4	70	2.3	2			BOU
2001 06 10.73	w	S	11.4	AC	40.6	L	4	70	2.2	1/			BOU
2001 06 11.47	a	C	13.3:	GA	60.0	Y	6	a 60	1.4				NAK01
2001 06 11.50	x	C	13.9	HV	35.0	C	14	a600	0.8	3			TSU02
2001 06 11.70	w	S	11.4	AC	40.6	L	4	70	2.0	2			BOU
2001 06 12.71	w	S	11.5	AC	40.6	L	4	70	2.2	2			BOU
2001 06 13.71	w	S	11.5	AC	40.6	L	4	70	2.4	2			BOU
2001 06 14.76	w	S	11.6	AC	40.6	L	4	70	2.0	1/			BOU
2001 07 10.48	x	C	15.9	TT	35.0	C	14	a600	0.3	3			TSU02
2001 07 23.47	a	C	14.9:	GA	60.0	Y	6	a120	1.0				NAK01

Comet 29P/Schwassmann-Wachmann

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 17.69		C	13.2	TJ	18.0	L	6	a180	0.8				KAD02
2001 05 18.71		C	13.4	TJ	18.0	L	6	a180	0.7				KAD02
2001 05 19.73	x	S	12.0	HS	25.4	L	4	113	0.8	4			YOS02
2001 05 20.67		C	13.8:	TJ	18.0	L	6	a180	0.6				KAD02
2001 05 27.77	x	C	13.5:	TJ	60.0	Y	6	a120	1.2	s1/			NAK01
2001 05 27.77	x	c	16.0:	TJ	60.0	Y	6	a120					NAK01
2001 06 02.65		C	15.6:	TJ	18.0	L	6	a180	0.35				KAD02
2001 06 12.50		S	14.0:	HS	20	L	7	160	0.5	4			MAT08
2001 06 12.61	x	C	13.7	TT	35.0	C	14	a600	0.3	7			TSU02
2001 06 14.54		S	14.0:	HS	20	L	7	160	0.5	4			MAT08
2001 06 14.81		M	13.4	HS	40.6	L	4	122	0.4	6			BOU
2001 06 15.12		S	13.0:	TJ	25.4	L	10	96					SOU01
2001 06 15.12	x	S	13.3:	GA	25.4	T	10	96	1	2			DES01
2001 06 17.49			[14.0	HS	20	L	7	160					MAT08
2001 06 26.58	x	C	14.7	TT	35.0	C	14	A080	1.0	3			TSU02
2001 07 14.56	x	C	14.0	HV	35.0	C	14	a840	0.2	8			TSU02
2001 07 15.66		S	13.0:	HS	20	L	7	160	0.5	7			MAT08
2001 07 22.59	a	C	13.5:	GA	60.0	Y	6	a120	0.9				NAK01
2001 07 22.59	a	c	15.6	GA	60.0	Y	6	a120					NAK01
2001 07 22.64		S	14.0:	HS	20	L	7	160	0.5	4			MAT08
2001 07 24.58	x	C	13.9	HV	60.0	Y	6	a120	0.8				NAK01
2001 07 24.58	x	c	15.8	HV	60.0	Y	6	a120					NAK01

Comet 33P/Daniel

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 16.55		C	18.7:	GA	60.0	Y	6	a120	0.35	0			NAK01

Comet 41P/Tuttle-Giacobini-Kresák

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2000 12 22.85		B	8.8	S	30.4	L	5	50	2.3	5/	15 m	290	NAG04

Comet 45P/Honda-Mrkos-Pajdušáková

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 04 13.85		C	10.2	HS	25.4	L	6		1.0		0.05	30	GRA04
2001 04 26.80		S	11.5	HS	35	L	5	158	2	3			HOR02
2001 05 06.45		C	13.4:	TJ	18.0	L	6	a120	0.8				KAD02
2001 05 10.45	x	C	13.8	HS	35.0	C	14	a600	0.8	1			TSU02
2001 05 10.90		S	11.8	GA	31.0	J	6	109	1.1	1/			BOU
2001 05 10.91		S	12.0	GA	31.0	J	6	109	1.2	1/			DIJ
2001 05 11.90		S	11.8	GA	31.0	J	6	109	1.0	1			BOU
2001 05 11.90		S	12.0	GA	31.0	J	6	109	1.3	1/			DIJ
2001 05 11.90		S	12.2	HS	25.6	L	5	84	1.7	2			BIV
2001 05 11.90		S	12.4	HS	25.6	L	5	169	1.5	3			BIV
2001 05 12.46		S	11.0	TJ	25.4	T	6	116	1.6	3			YOS04
2001 05 12.46	x	C	12.9	TJ	35.0	C	14	a480	1.2	3			TSU02
2001 05 12.48		C	13.3	TJ	18.0	L	6	a 90	0.9				KAD02
2001 05 12.90		S	11.9	GA	31.0	J	6	109	1.1	1			BOU
2001 05 15.84		S[	11.6	HS	20	L	5	70	! 1				BAR06
2001 05 16.47	a	C	12.8:	GA	60.0	Y	6	a120	2.0				NAK01
2001 05 19.48	x	C	14.8	HV	35.0	C	14	A620	0.8	1			TSU02
2001 05 19.87		S	11.7	HS	25.0	C	10	125	1.9	3			HAS02

Comet 51P/Harrington

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 01.74		C	15.1	TJ	18.0	L	6	a120	0.4		2.0m	250	KAD02
2001 07 04.77		C	14.9	TJ	18.0	L	6	a120	0.35		1.0m	249	KAD02

Comet 55P/Tempel-Tuttle

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 12 27.78		B	12.4	HS	30.4	L	5	61	2.3	1			NAG04
1997 12 31.74		S	11.5	HS	30.4	L	5	50	2.9	1			NAG04
1998 01 02.81		B	10.6	HS	25	H	3	45	2.7	1			NAG04
1998 01 09.82		B	9.0	S	25	H	3	45	5.5	2/	1.1	280	NAG04
1998 01 19.46		B	8.5	S	10.0	B		26	5.4	2			NAG04
1998 01 25.51		B	8.9	AA	30.4	L	5	50	5.6	3	30 m	65	NAG04

Comet 70P/Kojima

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 16.56		C	17.7	GA	60.0	Y	6	a240	0.45				NAK01

Comet 74P/Smirnova-Chernykh

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 03 16.89	*	S	14.5:	HS	44.5	T	4	146	0.8	3			SAR02
2001 04 25.03	d	k	15.4	LB	35	L	5	a720	0.5				HOR02
2001 04 27.97	d	k	15.3	LB	35	L	5	a630	0.5				HOR02
2001 04 29.94	d	k	15.1	LB	35	L	5	a480	0.45				HOR02
2001 05 09.89	d	k	15.6	LB	35	L	5	a810	0.6				HOR02
2001 05 10.88	d	k	15.0	LB	35	L	5	a450	0.55				HOR02
2001 05 11.93	d	k	15.4	LB	35	L	5	a540	0.55				HOR02
2001 05 12.53	x	C	15.4	HV	35.0	C	14	a720	0.4	4			TSU02
2001 05 13.90	d	k	15.2	LB	35	L	5	a810	0.75				HOR02
2001 05 14.87	d	k	15.3	LB	35	L	5	a540	0.6				HOR02
2001 05 20.88	d	k	15.2	LB	35	L	5	a540	0.75				HOR02
2001 05 21.17		J	14.6	SC	25.4	T	5	a100	0.96	s5			ROQ
2001 05 23.90	d	k	15.2	LB	35	L	5	a630	0.7				HOR02
2001 05 24.89	d	k	15.2	LB	35	L	5	a540	0.65				HOR02
2001 05 25.89	d	k	15.2	LB	35	L	5	a630	0.6				HOR02
2001 05 26.13		J	14.0	SC	25.4	T	5	a100	0.96	s5			ROQ
2001 06 13.87	d	k	15.5	LB	35	L	5	a630	0.65				HOR02

Comet 74P/Smirnova-Chernykh [cont.]

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 15.86	d	k	15.9	LB	35	L	5	a630	0.65				HOR02
2001 06 20.90	d	k	15.7:	LB	35	L	5	a540	0.65				HOR02
2001 06 24.86	d	k	15.8	FD	35	L	5	a660	0.5				HOR02

Comet 86P/Wild

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 17.67	!	k	17.6	LA	103.0	C	4	a240	0.2				ORI
2001 05 18.69	!	k	17.6	LA	103.0	C	4	a240	0.2				ORI

Comet 95P/Chiron

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 14.52	xs	C	16.1	HV	35.0	C	14	a720	< 0.2	9			TSU02

Comet 103P/Hartley

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
1997 12 18.47		B	8.8	S	15.0	B		25	3.2	2			NAG04
1997 12 25.47		B	8.7	S	15.0	B		25	3.4	2	10 m	55	NAG04
1997 12 27.44		B	8.5	S	30.4	L	5	50	4.4	3	1.0	70	NAG04
1997 12 31.53		B	8.7	S	10.0	B		26	3.6	3	50 m	50	NAG04
1998 01 02.51		B	8.7	S	15.0	B		25	3.2	3			NAG04
1998 01 19.43		B	8.5	S	10.0	B		26	4.2	4			NAG04
1998 01 25.53		B	8.8	S	30.4	L	5	50	4.4	4			NAG04

Comet 110P/Hartley

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 04 12.91		C	15.7	HS	25.4	L	6		0.4				GRA04
2001 04 24.82	d	k	15.7	LB	35	L	5	a900	0.3				HOR02

Comet 143P/Kowal-Mrkos

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 22.60		C	18.8	GA	60.0	Y	6	a240	0.25				NAK01

Comet 149P/Mueller

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 12.74	x	C	18.3	HS	35.0	C	14	A880	0.2	3			TSU02
2001 05 16.61		C	18.2	GA	60.0	Y	6	a240	0.3				NAK01

Comet 151P/Helin

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 24.72		C	19.2	GA	60.0	Y	6	a240	0.2				NAK01

Comet P/1999 WJ_7 (Korlević)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 13.49	x	C	15.8	HV	35.0	C	14	A920	0.3	3			TSU02

Comet P/2001 BB_50 (LINEAR-NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 04 02.02	&	C	16.9	UO	57.0	P	5	a 90					TIC
2001 04 24.00	&	C	16.8	UO	57.0	P	5	a 90					TIC
2001 04 29.94	&	C	16.5	UO	57.0	P	5	a 60					TIC
2001 05 12.55	x	C	17.0	TJ	60.0	Y	6	a240	0.45				NAK01
2001 05 12.61	x	C	17.6	TT	35.0	C	14	a600	0.3	3			TSU02

Comet P/2001 CV_8 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 16.54		C	19.3	GA	60.0	Y	6	a240	0.2				NAK01

Comet P/2001 F1 (NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 04 02.01		C	17.8	UO	57.0	P	5	a 90					TIC
2001 05 12.56		C	18.6	GA	60.0	Y	6	a240	0.25			280	NAK01
2001 06 11.54		C	18.9:	GA	60.0	Y	6	a240	0.25				NAK01
2001 07 23.51	a	C	19.0	GA	60.0	Y	6	a240	0.25				NAK01

Comet P/2001 H5 (NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 12.60	x	C	17.6:	TJ	60.0	Y	6	a240	0.3				NAK01
2001 05 19.62	a	C	17.9:	GA	60.0	Y	6	a240	0.25				NAK01

Comet P/2001 J1 (NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 05 16.49		C	17.6:	GA	60.0	Y	6	a240	0.5			130	NAK01
2001 05 17.47	!	k	17.7	LA	103.0	C	4	a120	0.25				ORI
2001 05 19.47		C	17.7:	GA	60.0	Y	6	a240	0.4				NAK01

Comet P/2001 K1 (NEAT)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 06 11.58		C	18.5:	GA	60.0	Y	6	a240	0.25				NAK01
2001 07 22.53	a	C	19.5:	GA	60.0	Y	6	a240	0.2				NAK01

Comet P/2001 MD_7 (LINEAR)

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2001 07 14.84		C	16.0	UO	57.0	P	5	a 60					TIC
2001 07 22.58		C	15.5	GA	60.0	Y	6	a120	0.4				NAK01

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HELP FOR COMET OBSERVERS: The GlareBuster

Bob Crelin — an amateur astronomer from Branford, Connecticut, who is one of the best-known light-pollution activists in the United States — has introduced a new, inexpensive, shielded outdoor-lighting fixture for residential and small-business use. The *GlareBuster GB-1000* fixture accepts a variety of standard light bulbs (including compact fluorescent, incandescent, and halogen) and is easily installed on any outdoor wall. The full-cutoff fixture has die-cast aluminium construction and will throw light only downwards, not outwards an upwards (if mounted properly!).

Many comet observers have difficulty observing due to nearby outdoor lighting fixtures that have little or no shielding, and there has been a dearth of good, available, inexpensive outdoor lighting fixtures — until now. All *ICQ* readers are strongly urged to support this new venture by purchasing one or more *GlareBuster* fixtures. Light pollution is making it more difficult each year for most observers to properly observe comets, and many fewer observations are made due to this worsening situation — definitely hurting science and hurting the goal of the *ICQ* in archiving good photometric data on comets.

Numerous lighting outlets around the United States are already carrying the *GlareBuster*. Check to see if your local lighting store (or home-improvement store) has the *GlareBuster*, and if not, ask them to stock it. The *GlareBuster* website is located at `http://www.theglarebuster.com`.

DESIGNATIONS OF RECENT COMETS

Listed on this page and the next, for handy reference, are the last 35 comets to have been given designations in the new system. The name, preceded by a star ($\star$) if the comet was a new discovery (compared to a recovery from predictions of a previously-known short-period comet) or a # if a re-discovery of a 'lost' 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 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 [see the list and references in the October 2000 issue (p. 149)]; recent such SOHO discoveries were reported on *IAUC* 7667, 7689, and 7718 and include comets C/1996 A2; 2001 M11, O1, P1, P2, Q2, R2, R3, R4, and R5. SOHO comets C/2001 N1 (*IAUC* 7667), C/2001 Q3 (*IAUC* 7694), and C/2001 Q7 (*IAUC* 7718) do not appear to be of the Kreutz sungrazing type.

[This list updates that in the April 2001 issue, p. 82. For explanation regarding new usage of 'C/' instead of 'P/' for intermediate-period comets, see editorial note on page 2 of the January 2000 issue.]

	New-Style Designation	*P*	*T*	*q*	*IAUC*
$\star$	C/2000 Y1 (Tubbiolo)		2/2/01	8.0	7544
$\star$	C/2000 WM_1 (LINEAR)		1/22/02	0.56	7546
$\star$	C/2000 Y2 (Skiff)		3/21/01	2.77	7549
$\star$	P/2000 Y3 (Scotti)	11.4	11/1/00	4.05	7552
$\star$	C/2001 A1 (LINEAR)		9/17/00	2.41	7561
$\star$	C/2001 A2 (LINEAR)		5/24/01	0.78	7564
$\star$	C/2001 B1 (LINEAR)		9/19/00	2.93	7570
$\star$	C/2001 B2 (NEAT)		9/1/00	5.3	7572
	149P/2000 Y10 (Mueller)	9.0	2/7/01	2.65	7577
$\star$	C/2001 C1 (LINEAR)		3/28/02	5.1	7578
$\star$	P/2001 CV_8 (LINEAR)	7.64	2/12/01	2.15	7581
$\star$	150P/2000 WT_{168} (LONEOS)	7.66	3/23/01	1.76	7584
$\star$	P/2001 BB_{50} (LINEAR-NEAT)	13.5	1/30/01	2.35	7601
$\star$	P/2001 F1 (NEAT)	16.4	11/21/00	4.15	7604
$\star$	C/2001 G1 (LONEOS)		10/2/01	8.2	7606
$\star$	P/2001 H5 (NEAT)	14.7	1/28/01	2.40	7613
$\star$	P/2001 J1 (NEAT)	7.64	3/14/01	0.94	7623
$\star$	C/2001 HT_{50} (LINEAR-NEAT)		7/8/03	2.80	7624
$\star$	P/2001 K1 (NEAT)	7.54	11/6/00	2.47	7629
$\star$	C/2001 K3 (Skiff)		4/22/01	3.06	7631
$\star$	C/2001 K5 (LINEAR)		10/12/02	5.18	7634
	151P/2001 M1 (Helin)	14.1	9/23/01	2.53	7648
$\star$	C/2001 M10 (NEAT)	138	6/20/01	5.29	7654
$\star$	P/2001 MD_7 (LINEAR)	7.91	11/30/01	1.25	7660
$\star$	C/2001 N2 (LINEAR)		8/19/02	2.67	7661
$\star$	C/2001 O2 (NEAT)		10/18/99	4.8	7673
$\star$	C/2001 Q1 (NEAT)		9/21/01	5.8	7685
$\star$	P/2001 Q2 (Petriew)	5.50	9/1/01	0.95	7686
	39P/2001 P3 (Oterma)	19.5	12/22/02	5.47	7689
$\star$	C/2001 Q4 (NEAT)		5/25/04	1.00	7695
$\star$	C/2001 Q5 (LINEAR-NEAT)		6/11/01	2.04	7697
$\star$	P/2001 Q6 (NEAT)	23.0	11/9/01	1.41	7698
$\star$	P/2001 R1 (LONEOS)	6.5	2/17/02	1.36	7713
$\star$	P/2001 R6 (LINEAR-Skiff)	8.34	10/26/01	2.12	7723
$\star$	C/2001 S1 (Skiff)		5/22/01	3.73	7725