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

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Manuscripts will be reviewed/refereed for possible publication; authors should first obtain a copy of "Information and Guidelines for Authors" from the *ICQ* website or from the Editor. Cometary observations should be sent to the Editor in Cambridge; again, see the *ICQ* website or contact the Editor for the proper format. Those who can send observational data (or manuscripts) in machine-readable form are encouraged to do so [especially through e-mail via the Internet (ICQ@CFA.HARVARD.EDU)]. 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://www.cfa.harvard.edu/icq/icq.html). The *ICQ* published a 225-page *Guide to Observing Comets* in early 1997 that is now out of print; a revised edition is in 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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ICQ COMET HANDBOOK 2008

The *ICQ*'s annual *Comet Handbook* for 2008 is still in preparation and should be mailed sometime in February. We thank AstroArts, Inc., of Japan (website `http://www.astroarts.co.jp/index.shtml`) for a generous donation toward the publication of the *2008 Comet Handbook*.

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CORRIGENDUM. In the July 2007 issue, page 104, C/2007 K6, the last two lines were inadvertently deleted; *they should read as follows*: (ref: UCAC-2 catalogue); astrometry reported to Minor Planet Center [R. H. McNaught, Siding Spring Observatory, Coonabarabran, NSW, Australia].

Forward-Scattering Enhancement of Comet Brightness. II. The Light Curve of C/2006 P1 (McNaught)

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Abstract. Like the great daylight comet C/1927 X1, comet C/2006 P1 (McNaught) underwent a remarkable brightness surge at small scattering angles (θ), becoming widely visible near the sun in broad daylight during the interval 2007 Jan. 12-15 UT, when it was as bright as total visual magnitude $m_1 \approx -6$. The enhancement, which had been forecasted (Marcus 2007b, 2007c), was due to forward-scattering of sunlight by the comet's dust grains. To characterize the surge, I first establish the comet's "baseline" brightness in the standard power-law formula $m_1 = m_0 + 5 \log \Delta + 2.5n \log r$ (Δ = geocentric distance and r = heliocentric distance), using binocular and naked-eye m_1 observations as tabulated in the *ICQ* that were made when the comet was *not* in forward-scattering geometry ($\theta > 90°$). I find that the solutions $m_0 = 5.71$ and $n = 4.59$ for pre-perihelion, and $m_0 = 3.83$ and $n = 3.61$ for post-perihelion, fit the observations well and provide continuity at perihelion ($q = 0.171$ AU) on Jan. 12.80 TT. Next, I apply the novel compound Henyey-Greenstein comet-dust light-scattering model developed in Paper I (Marcus 2007a) to analyze the excursion of the brightness from this baseline, as interpolated into the period Jan. 10.0-21.7 UT, when the comet was in forward-scattering geometry ($\theta \leq 90°$). I show that the model successfully accounts for the comet's brightness surge in the timing of the peak ($\approx$ Jan. 14.3 UT at $\theta_{\rm min} = 31°.1$), its maximum amplitude (-2.1 ± 0.8 magnitudes, near the forecast of -2.4 magnitudes), and its shape — both for the data in aggregate and, in particular, for series by individual observers. I conclude that this model can be used to accurately predict and analyze the brightness of a comet in forward-scattering geometry.

1. Introduction

Comet C/2006 P1 (McNaught) was a "great" comet in nearly every sense (Bortle 1997). Although it did not come very close to the earth ($\Delta_{\rm min} = 0.817$ AU on 2007 Jan. 15.5 UT) and suffered from poor solar elongation during its northern-hemisphere apparition, the comet did venture close to the sun ($q = 0.171$ AU on 2007 Jan. 12.80 TT), where it could become bright. Moreover, it was *intrinsically* bright, as measured by its "absolute magnitude" (defined below). After passing perihelion, it dazzled southern-hemisphere observers in later January with its mammoth dust tail — resplendently bright, long, broad, and replete with seemingly innumerable striae, which were widely photographed. But C/2006 P1 fulfilled another criterion of "greatness" that has been widely overlooked (Marcus 1997): it passed in a direction between the earth and the sun. In this special geometry, forward-scattering of sunlight by its dust grains enhanced its brightness by a *further* two magnitudes, as I shall document here. That remarkable surge catapulted the comet into visibility throughout the world in broad daylight (Fig. 1) as close as 5°.5 from the sun, even by naked eye if the sun were suitably shielded by the hand or a building.

In the first paper, I reviewed forward-scattering in comets and developed a model to forecast and analyze it, based upon five comets that have been well-characterized photometrically in forward-scattering geometry (Marcus 2007a). The model, utilizing a compound Henyey-Greenstein function for dust scattering, derives from equations 8, 14, and 15 of Paper I. In full form it is given by

$$\Phi(\theta) = \frac{\delta_{90}}{1+\delta_{90}}\left[k\left(\frac{1+g_f^2}{1+g_f^2-2g_f\cos\theta}\right)^{3/2} + (1-k)\left(\frac{1+g_b^2}{1+g_b^2-2g_b\cos\theta}\right)^{3/2} + \frac{1}{\delta_{90}}\right], \quad (1)$$

where $\Phi(\theta)$ is the scattering (or "phase") function of comet brightness, θ (= 180° − phase angle) is the scattering angle, $0 \leq g_f < 1$ and $-1 < g_b \leq 0$ are the forward-scattering and back-scattering asymmetry factors, $0 \leq k \leq 1$ is the partitioning coefficient between forward and backward scattering, and δ_{90} is the dust-to-gas light ratio in the coma as viewed at $\theta = 90°$. The model is applicable for all θ ($0° \leq \theta \leq 180°$) and is "normalized" — that is, $\Phi(\theta) = 1$, at 90°. In Paper I, I presented the light curves of five comets for which there are good photometric data in forward-scattering geometry. I found that the data for these five comets are well fit by parameter values $g_f = 0.9$, $g_b = -0.6$, $k = 0.95$, and $\delta_{90} = 1$ for a "usual" comet or $\delta_{90} = 10$ for a "dusty" one. I shall apply these values here in the study of comet C/2006 P1. The *magnitude* of $\Phi(\theta)$,

$$m_{\Phi(\theta)} = -2.5 \log \Phi(\theta), \quad (2)$$

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Figure 1. Comet C/2006 P1 (McNaught) in broad daylight on 2007 Jan. 13.66 UT, when the scattering angle, θ, was 34°.7 (1/250-sec exposure by Mauro Zorzenon from Monte Matajur, Italy, with a Canon 300D camera and zoom lens set at 112 mm. Copyright ©2007 by Mauro Zorzenon and Cristina Scauri, and reproduced here with permission). Minimum scattering angle was reached 16 hours later on Jan. 14.27 ($\theta_{\rm min}$ = 31°.1). The comet, at the upper left, is visible because its brightness has been boosted some two magnitudes due to forward-scattering of sunlight by its dust grains. In a like manner, water droplets along the edges of the cloud deck beneath the setting sun are forward-scattering sunlight toward the observer.

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appears as a term in the standard power law for cometary brightness,

$$m_1 = m_0 + 5\log\Delta + 2.5n\log r + m_{\Phi(\theta)}, \tag{3}$$

where m_1 is the total visual magnitude of the coma (but see Section 5.3.1), Δ and r are the comet-earth and comet-sun

Table 1. Comet C/2006 P1 (McNaught) Ephemeris and Predicted Brightness Enhancement in Forward-Scattering Geometry§

Date (2006-7 UT)	Δ (AU)	r (AU)	ε (°)	ρ (°)	θ (°)	$m_{\Phi(\theta)}$¶
Aug. 03.0	2.468	3.119	121.4	101.3	163.9	−0.1
Aug. 23.0	2.523	2.845	98.0	105.7	159.4	0.0
Sep. 12.0	2.589	2.559	77.1	107.2	157.5	0.0
Oct. 02.0	2.614	2.256	58.4	105.4	157.8	0.0
Oct. 22.0	2.560	1.934	41.8	99.2	160.0	0.0
Nov. 11.0	2.399	1.586	27.3	85.7	163.3	−0.1
Dec. 01.0	2.110	1.199	16.6	56.7	163.4	−0.1
Dec. 21.0	1.666	0.751	14.1	10.4	161.4	−0.1
Jan. 02.0	1.293	0.431	15.3	357.2	143.0	0.2
Jan. 04.0	1.218	0.373	15.2	357.5	136.2	0.2
Jan. 06.0	1.138	0.314	14.9	359.1	126.7	0.2
Jan. 08.0	1.053	0.257	14.0	2.6	112.5	0.2
Jan. 10.0	0.963	0.206	12.1	9.5	90.5	0.0
Jan. 11.0	0.920	0.186	10.6	15.7	75.4	−0.2
Jan. 12.0	0.881	0.174	8.6	25.9	58.2	−0.7
Jan. 12.5	0.863	0.171	7.6	33.7	49.4	−1.1
Jan. 13.0	0.849	0.171	6.6	44.5	41.4	−1.6
Jan. 13.5	0.837	0.173	5.8	59.4	35.1	−2.0
Jan. 14.0	0.828	0.178	5.4	78.0	31.6	−2.3
Jan. 14.5	0.821	0.185	5.6	97.7	31.5	−2.3
Jan. 15.0	0.818	0.193	6.4	114.7	34.3	−2.1
Jan. 15.5	0.817	0.203	7.4	127.4	38.8	−1.7
Jan. 16.0	0.818	0.215	8.7	136.6	44.1	−1.4
Jan. 16.5	0.821	0.227	10.1	143.2	49.5	−1.1
Jan. 17.0	0.826	0.240	11.5	148.2	54.9	−0.9
Jan. 18.0	0.839	0.268	14.2	155.1	64.6	−0.5
Jan. 19.0	0.856	0.296	16.7	159.5	73.0	−0.3
Jan. 20.0	0.875	0.326	19.0	162.7	80.2	−0.1
Jan. 22.0	0.917	0.384	23.0	167.1	91.7	0.0
Jan. 24.0	0.962	0.442	26.2	169.9	100.3	0.1
Jan. 26.0	1.008	0.499	29.0	172.0	107.1	0.2
Jan. 28.0	1.052	0.554	31.3	173.6	112.4	0.2
Jan. 30.0	1.096	0.608	33.4	174.9	116.8	0.2
Feb. 09.0	1.290	0.857	41.6	179.3	130.1	0.2
Mar. 01.0	1.572	1.288	54.8	183.7	141.0	0.2
Mar. 21.0	1.755	1.665	68.1	185.3	146.3	0.1
Apr. 10.0	1.886	2.007	89.1	184.9	150.4	0.1
Apr. 30.0	2.011	2.324	94.9	182.3	154.4	0.1
May 20.0	2.170	2.623	105.1	177.2	158.1	0.0
Jun. 09.0	2.395	2.906	110.2	170.3	160.9	0.0
Jun. 29.0	2.697	3.177	109.0	163.7	162.4	−0.1
Jul. 19.0	3.069	3.438	102.6	159.7	163.2	−0.1

§See text (Sec. 2) for explanation of the columns.
¶Computed with the compound Henyey-Greenstein scattering model as given in Equations 1 and 2, using parameter values $g_f = 0.9$, $g_b = -0.6$, $k = 0.95$, and $\Box_{90} = 1$.

[text continued from bottom of page 120]

distances, m_0 is the "absolute magnitude" of the comet as it would be seen at $\Delta = 1$ AU $= r$, and n is the power-law index by which m_1 varies with log r. Normally the $m_{\Phi(\theta)}$ term can be safely ignored in brightness analyses. However, in forward-scattering geometry, $m_{\Phi(\theta)}$ becomes extremely important and can overwhelm the other terms, approaching a value of -8 (!) as θ approaches 0° (see Fig. 15 of Paper I). Comet C/2006 P1 did not reach such extremely small scattering angles ($\theta_{\rm min}$ was 31°.1 on Jan. 14.3 UT), and so its magnitude surge — although considerable — was very much less than this.

While Paper I was under editorial review and revision, comet C/2006 P1 was discovered on 2006 Aug. 7 by Robert H. McNaught at Siding Spring, Australia (Green 2006). During the remainder of 2006 and the first days of 2007, it brightened briskly on its way to perihelion. Recognizing that the comet would reach small scattering angles, I applied the model as given in equation 3 to forecast the $\approx$ 2-magnitude surge noted above (Marcus 2007b). A detailed version of this forecast was posted on the Internet (Marcus 2007c) and is shown in Table 1 as $m_{\Phi(\theta)}$. In this paper, I formally analyze the brightness estimates of C/2006 P1 and demonstrate that the surge closely followed this forecast model.

2. The Apparition

Table 1 illustrates the geometric circumstances of the apparition, with 0.5-day spacing when the comet was at $\theta \leq 60°$. The ephemeris is based on orbital elements from *MPC* 59042. The columns provide the decimal date, Δ, r, elongation (ϵ), heliocentric position angle (ρ) measured counterclockwise from north on the sky, and scattering angle (θ). As paired coordinates, ϵ and ρ give a more direct sense of the apparition's geometry than do conventional right ascensions and declinations. Note, after 2006 October, the poor elongations throughout the comet's entire northern-hemisphere apparition, when $270° \leq \rho \leq 360°$ and $0° \leq \rho \leq 90°$.

I restrict this brief summary of the apparition to the comet's visual magnitudes, m_1, as currently tabulated in the *ICQ*. Coma and tail observations generally are not a focus of this study. The first estimate was on 2006 Aug. 25.48 UT (Seargent, $m_1 = 13.9$, 25.4-cm reflector, 114×). Observers put the comet at 14th to 13th magnitude in September, and 12th to 11th magnitude in October, as viewed in telescopes. The first binocular sighting was by Seargent on Oct. 11.41 UT (25×, 10-cm objectives, $m_1 = 11.1$). In mid-November the comet was 9th magnitude. After Nov. 18, there was a six-week hiatus of observations, as the elongation sank from 23° then to 14°-17° throughout December (Table 1). C/2006 P1 was next estimated on Dec. 29.28 UT, when Granslo (in Sweden) gave $m_1 = 3.9$ in a 25-cm reflector. Despite elongations in January that decreased from 15° to 7° at perihelion, the comet was brilliant enough to be viewed in bright twilight, particularly from high northern latitudes, at very low altitude, often at just 1° or 2°, as its heliocentric distance decreased and its magnitude brightened from $m_1 \approx 2$ at the beginning of January to ≈ -2 to -3 by Jan. 10. The extreme circumstances necessitated large corrections for atmospheric extinction, which likely led to uncertainties of $\pm$ 0.5 to $\pm$ 1 magnitude in the m_1 estimates in this period (see Sec. 5.3).

The comet was first estimated in broad daylight as having $m_1 = -2.5$ on Jan. 10.83 UT (R. Keen, Mt. Thorodin, CO, USA, 7.6-cm reflector). As the comet surged in brightness, most estimates during Jan. 12-15 UT were in daylight by naked eye or binoculars, with six observers putting the comet as bright as -6 between Jan. 13.56 and 15.17, and one observer giving $m_1 = -7$ on Jan. 14.82. This extreme brightness — no comet since C/1965 S1 (Ikeya-Seki) had been so bright (Green 2007) — should have led to an independent uncertainty in m_1 estimations of $\pm$ 0.5 to 1 (or greater) magnitude, owing to the lack of comparably bright comparison objects (Sec. 5.3); Venus, the brightest, was $\approx$ 2 magnitudes fainter at the time, at $m_V = -3.9$. As we shall see in Sec. 3.3.1, the daylight observations center upon the time of minimum scattering angle on Jan. 14.3 UT, rather than upon the time of perihelion on Jan. 12.8, as would be more conventionally expected.

After the comet passed south of the sun ($90° \leq \rho \leq 270°$) on Jan. 14 UT and attained comparatively greater elongations in later January (Table 1), the head could only be viewed from the southern hemisphere, although the tail was so long and arched that some of its striae were visible from mid-northern latitudes (see, *e.g.*, photos on pp. 71 and 73 of the April *ICQ*). The greater elongations meant that — in principle, at least — uncertainties in the m_1 estimates from extinction corrections would be smaller. The comet declined from 0th to 2nd magnitude in late January, from 3rd to 5th magnitude through February, from 5th to 8th magnitude in March, 8th to 9th magnitude in April, and 9th to 10th magnitude in May. Seargent continued to dominate the threshold observations (that is, the first or last to be made in a given instrument size), with the last naked-eye sighting on Mar. 9.42 UT ($m_1 = 6.4$) and the last binocular one on June 12.42 ($m_1 = 10.3$, 25×, 10-cm objectives). The last tabulated telescopic sighting was by Robledo on July 6.98 ($m_1 = 12.6$, 25-cm reflector).

3. Analysis

Our strategy is to first establish the *baseline* brightness of C/2006 P1, when the comet was *not* in forward-scattering geometry, taken here as $\theta > 90°$. Next I interpolate the solution into the forward-scattering interval ($\theta \leq 90°$). Any departure of the observations from the interpolated baseline should then represent the effect of forward-scattering.

3.1. The Observations

Total visual magnitude (m_1) estimates were taken from tabulations in the *ICQ* from 2007 and late 2006 (**28**, 168;

29, 32-33, 82-87, and 109). Because our intention is to construct a purely visual light curve, CCD observations (which are tabulated separately in the *ICQ*) were not utilized, although two are selectively examined in Section 4 for the purpose of correlation. In all, 425 visual m_1 estimates by 60 observers were available for analysis. Of these, 55 were near-simultaneous duplicates or triplicates by the same observer spanning a 0.01-day or, in three instances, a 0.02-day interval. In order not to give undue weight to these observers, only the observation made in the smallest instrument or by naked eye was retained, leaving a total of 370 m_1 estimates for consideration. Most estimates made in January and February were at low altitude and were corrected by the observer for extinction, generally with the *ICQ* extinction tables (Green 1992). No attempt was made to correct for magnification artifact, or "aperture effect" (Morris 1973), in which the contrast gradient of the outer coma, attenuated by magnification, falls below visual contrast threshold, effectively "shrinking" the visible coma, and leading to an underestimation of its brightness. This potential artifact should not be a significant problem in the C/2006 P1 light curve, for the far majority (84%) of the 370 m_1 estimates were at low magnifications in binoculars ($N = 183$) or by naked eye ($N = 126$), and the coma was condensed for observations at all but the largest heliocentric distances.

3.2. The Baseline Photometric Solutions

Figure 2 plots the observations as heliocentric magnitude ($H_1 = m_1 - 5 \log \Delta$), which is the comet's magnitude as seen at 1 AU from the earth, *vs.* the logarithm of the heliocentric distance. We see that H_1 is roughly linear with $\log r$ during both pre-perihelion (open symbols) and post-perihelion (closed symbols), with the exception of a spike just after perihelion at $\theta_{\rm min}$ ($\log r \approx -0.75$). This spike is the forward-scattering event. We also see that the post-perihelion brightness is systematically greater than the pre-perihelion brightness.

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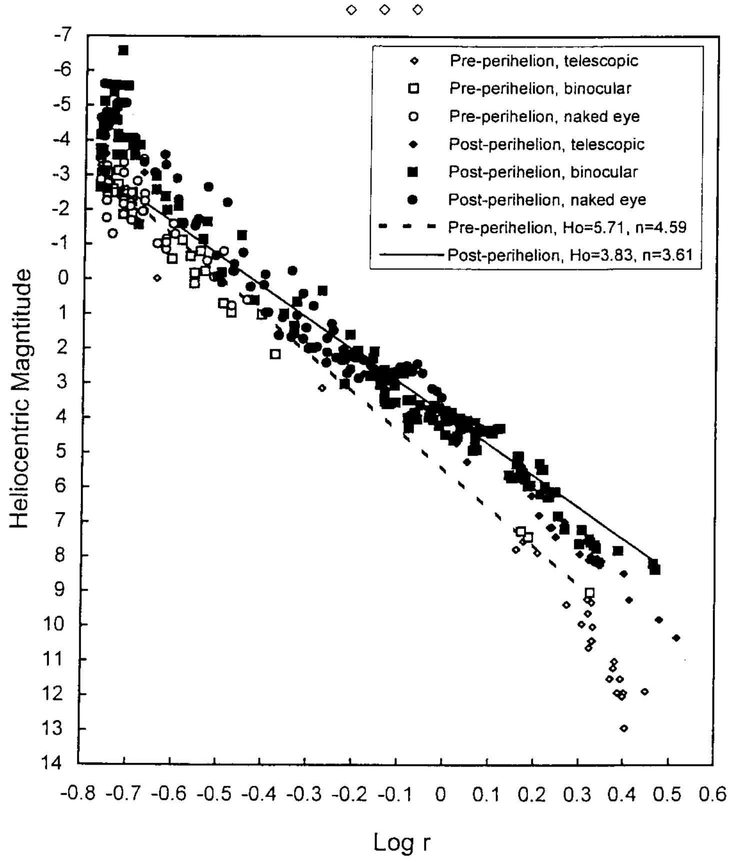

Figure 2. The heliocentric magnitude, $H_1 = m_1 - 5 \log \Delta$, of C/2006 P1 plotted against the logarithm of its heliocentric distance, r (AU). Perihelion (q = 0.171 AU) was on 2007 Jan. 12.80 TT. The lines, joined at perihelion ($\log q = -0.767$), represent the "baseline" brightness solution based on naked-eye and binocular m_1 estimates made at $\theta > 90°$ (see text). The brightness excess at $\log r < -0.5$ post-perihelion is due to forward-scattering of sunlight by the comet's dust grains.

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To obtain the baseline photometric parameters, I excluded observations made in forward-scattering geometry, which I operationally define here as $\theta \leq 90°$, corresponding to the interval 2007 Jan. 10.0-21.7 UT (see Table 1). I then applied a correction for the scattering function to the observations *not* made in forward-scattering geometry, using equations 2 and 3 with $\delta_{90} = 1$. This correction is small, just a few tenths of a magnitude or less (Table 1), and has little effect on the analysis. It is applied for the sake of consistency so that scattering effects will have been modeled for the *entire* data span, not just the forward-scattering portion. In order to minimize any underestimation of m_1 due to magnification artifact (see above), only binocular and naked-eye observations were used for the analysis. Least-squares linear regression on equation 3 then yields the following photometric solution for the "baseline" brightness: pre-perihelion, $0.324 \geq \log r \geq -0.686$, $m_0 = 5.53 \pm 0.20$, $n = 4.52 \pm 0.14$, $\sigma = \pm 0.50$, $N = 33$; post-perihelion, $-0.423 \leq \log r \leq 0.47$, $m_0 = 3.87 \pm 0.04$, $n = 3.61 \pm 0.07$, $\sigma = \pm 0.48$, $N = 83$. The error limits on m_0 and n are standard deviations; σ is the standard deviation of the observations about the regression line, a measure of the dispersion in the data set; and N is the number of observations utilized in the regression. Gratifyingly, pre- and post-perihelion solutions are nearly convergent at perihelion ($q = 0.171$ AU), yielding heliocentric magnitude values of $H_1(q) = -3.16$ and -3.06, respectively. On the assumption that this very slight discontinuity is not real, we "tweak" the parameters, within their standard-deviation error limits, to produce an intermediate common value $H_1(q) = -3.10$ at perihelion, by setting $m_0 = 5.71$ and $n = 4.59$ pre-perihelion, and $m_0 = 3.83$ post-perihelion (with $n = 3.61$ remaining the same). I adopt these adjusted photometric parameters as my "baseline" brightness solutions, which are shown respectively as the dashed and solid lines in Fig. 2. Joined at perihelion ($\log q = -0.767$), they provide the requisite continuous baseline during the forward-scattering interval.

3.3. The Forward-Scattering Brightness Surge

Figure 3 plots the observations against the time from perihelion, $t - T$. The "baseline"-brightness solution, $H_1 = m_0 + 2.5 \log r$ (dotted line), has been interpolated into the interval of forward-scattering geometry ($\theta \leq 90°$, -2.8 days $\leq t - T \leq 8.9$ days). Also shown is the compound Henyey-Greenstein forward-scattering model, $H_1(\theta) = H_1 + m_{\Phi(\theta)}$, for two dust-to-gas ratios, $\delta_{90} = 1$ (heavy solid line) and $\delta_{90} = 10$ (thin solid line). Note that the brightness does not peak at perihelion, as one would expect in the ordinary baseline model. Instead, there is a significant brightness excursion peaking near the time of the minimum scattering angle. The observations appear to follow the forward-scattering model curves better than the baseline brightness curve.

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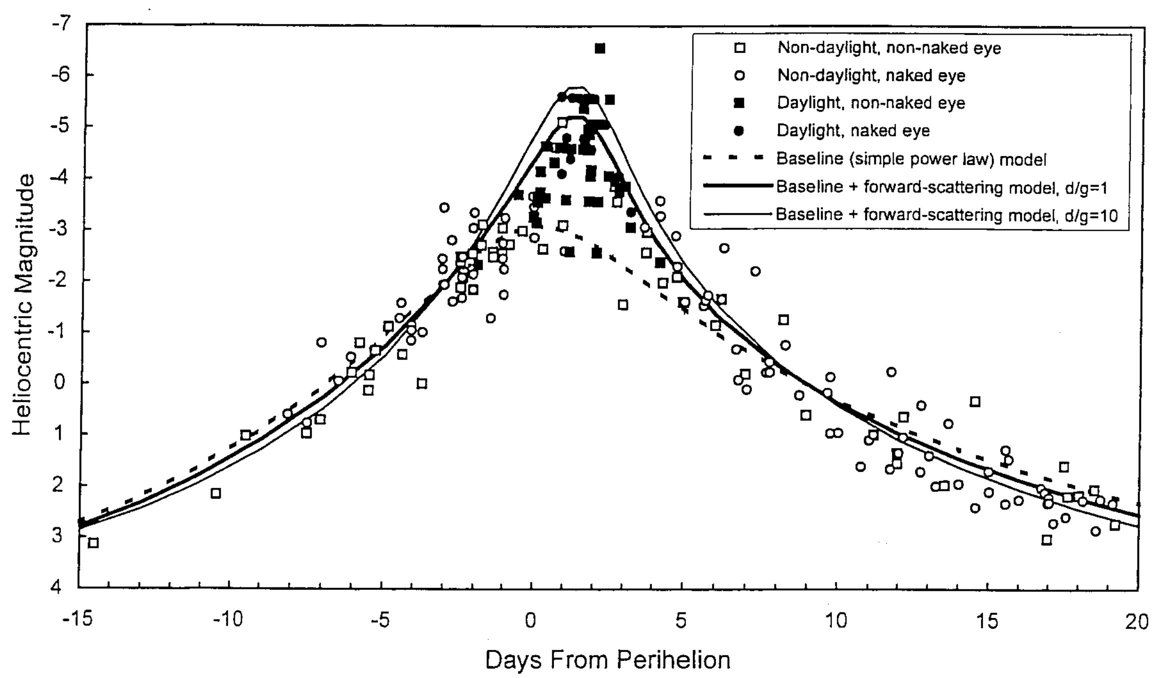

Figure 3. Heliocentric magnitude of C/2006 P1 plotted against the time from perihelion (T = 2007 Jan. 12.80 TT). The dashed line is the baseline power-law brightness solution. The solid lines show the compound-Henyey-Greenstein-function dust-scattering-model solutions for two dust-to-gas ratios, $\delta_{90} = 1$ and $\delta_{90} = 10$. Daylight visibility (closed symbols) occurred in forward-scattering geometry and centers on the time of minimum scattering angle at $t - T = 1.5$ days (see text). The brightness surge closely follows the compound HG dust-scattering models.

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3.3.1. The Timing of the Surge with Respect to the Daylight Observations

Qualitatively, the peak in heliocentric brightness appears to coincide with the time of minimum scattering angle in Figures 3 and 4. We can also get a semi-quantitative idea of the time of the maximum brightness by considering the daylight observations as a proxy for the period of maximum brightness of the comet. These are shown as filled symbols in

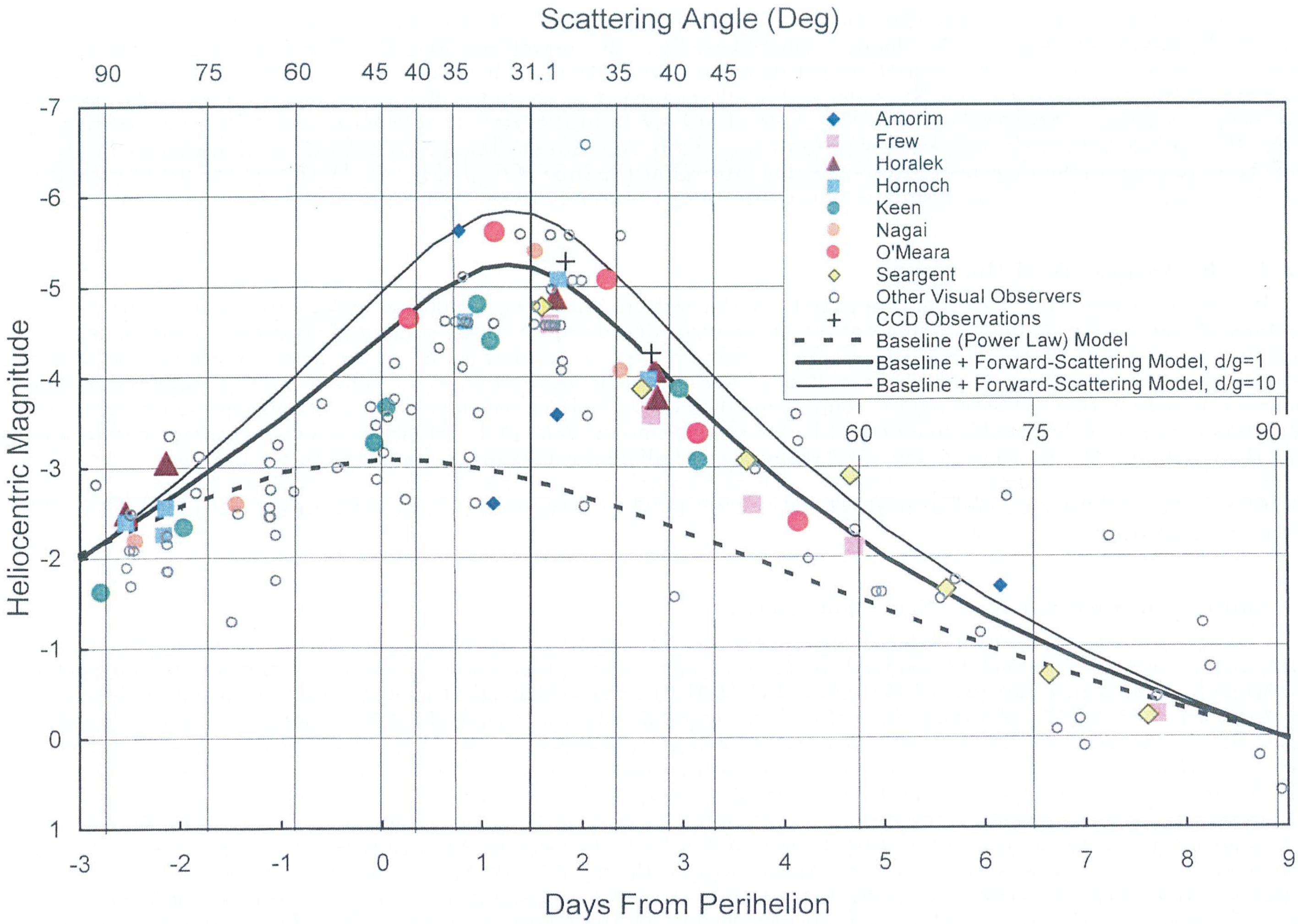

Figure 4. A closer view of the heliocentric magnitude of C/2006 P1 in forward-scattering geometry plotted against $t - T$ and the scattering angle. The minimum scattering angle is 31°.1. Observers with four or more estimates, at least one of which falls within moderate forward-scattering geometry ($\theta \leq 40°$), are represented by separate symbols. With so many observations, there is inevitable overlap of some symbols on the plot (estimates by Horalek and Hornoch at $t - T = -2.5$ days; Frew, Horalek, Hornoch, and Seargent at 1.5 to 1.7 days; Frew, Horalek, Hornoch, and Seargent at +2.6 to 2.7 days; and Frew and Seargent at 7.6 to 7.7 days). Note how closely seven of these eight observers follow the scattering models.

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[text continued from page 124]

Fig. 3. In all, fifty-six m_1 estimates were made in broad daylight between Jan. 10.83 and 16.94 UT: ten with telescopes, thirty with binoculars, and sixteen by naked eye. At peak brightness, six observers put the comet as bright as $m_1 = -6$, and one other gave $m_1 = -7$ (these correspond to heliocentric magnitudes $H_1 = -5.6$ and -6.6 in Figs. 3 and 4). Fifty-three of the 56 daylight estimates were made between Jan. 12.71 ($\theta = 46°.8$) and 15.94 ($\theta = 43°.4$), representing 80% of the 66 observations in that interval. The mean time of binocular and naked-eye daylight observations was Jan. 14.24, very close to the time of $\theta_{\rm min}$ on Jan. 14.27. This near-coincidence demonstrates the remarkably tight correlation of daylight visibility to the scattering angle.

3.3.2. The Shape of the Surge

The observations in aggregate seem to follow the shapes of the Henyey-Greenstein cometary scattering models in Figures 3 and 4. We can better see this effect if we consider series by the most prolific individual observers — specifically, those who had four or more observations in the forward-scattering interval, with at least one made at $\theta \leq 40°$. Eight observers fulfill these criteria: Alexandre Amorim, Brazil; David J. Frew, Perth, Australia; Petr Horalek, Czech Republic; Kamil Hornoch, Czech Republic and Austria; Richard A. Keen, Mt. Thorodin, Colorado, U.S.A.; Yoshimi Nagai, Gunma, Japan; Stephen J. O'Meara, Hawaii; and David A. J. Seargent, Cowra, New South Wales, Australia. Their observations are plotted separately in Figure 4. Note that the series by all-but-one of the observers follow the slopes of the HG scattering models closely. In particular, those of Hornoch, Keen, and O'Meara, which span across the time of $\theta_{\rm min}$, individually follow the shape of the "hump" centered on $\theta_{\rm min}$. In comparison with the "baseline" model, Keen's and Hornoch's follow the pre-$\theta_{\rm min}$ HG models' steeper upslopes, and O'Meara's follow their steeper post-$\theta_{\rm min}$ downslopes. The estimates of Horalek, Hornoch, and Nagai are within 0.5 magnitude or less of the HG model curves on the early upslopes and early downslopes. Seargent's and Frew's observations are in near-perfect concordance, and follow the downslopes of the HG models exquisitely well, beginning from $\theta_{\rm min}$. Only Amorim's estimates are difficult to characterize owing to their large (3-magnitude) dispersion over a one-day interval at the time of $\theta_{\rm min}$ (Fig. 4). With this one series excepted, the close adherences of the series estimates of the other seven observers to the scattering model shapes are remarkable.

3.3.3. The Amplitude of the Surge

We can determine the maximum amplitude of the forward-scattering brightness enhancement from the $O - C$ ("observed" minus "computed") residuals of the m_1 estimates with respect to the computed "baseline" solution near the time of $\theta_{\rm min}$ on Jan. 14.3 (Figures 3 and 4). To do this, we form a "normal point" of the 24 observations that span a one-day interval centered on Jan. 14.3. From these, I derive a mean value of $O - C = -2.0 \pm 0.8$ (σ) magnitudes. This excursion is close to that predicted by the compound-HG model (Table 1), which gives -2.3 magnitudes as averaged over the interval Jan. 13.8-14.8 and a maximum of -2.4 magnitudes on Jan. 14.3. From these considerations, we can infer that the maximum $O - C$ value on Jan. 14.3 would also be about 0.1 magnitude greater than the average — *i.e.*, -2.1 ± 0.8 (σ) magnitudes. In this same interval, a "normal point" formed of the eight observations by the seven selected observers in Sec. 3.3.2 gives a similar mean $O - C = -2.1 \pm 0.4$ (σ) magnitudes, or an inferred maximum $O - C = -2.2 \pm 0.4$ (σ) magnitudes.

4. Comparison with Selected CCD Photometry

CCD photometry can deliver high-precision estimates of cometary magnitudes, but the methods of reducing and analyzing the observations must be specified carefully in order for comparison with visual m_1 estimates to be meaningful. In this section, we look at the two CCD studies of C/2006 P1 in broad daylight that have reached formal publication.

Hornoch *et al.* (2007), observing from the Czech Republic, used a 6.3-cm Maksutov-Cassegrain telescope and an SBIG ST-7 CCD camera with no bandpass filter to obtain magnitudes on 2007 Jan. 15.479 with a variety of circular apertures, ranging from $0'.5$ to $6'$, centered on the central condensation of the coma (tabulated in 2007 in *ICQ* **29**, 88). Their assumed magnitude of -3.9 for the comparison object, Venus, was a visual magnitude. At the time of their measurement, Hornoch visually estimated the coma diameter as $3'$ in 8-cm binoculars at 10× (see *ICQ* **29**, 33). For this diameter, the authors obtained unfiltered mag -4.6 ± 0.15. To compare this unfiltered magnitude with visual m_1 estimates, it is necessary to apply color corrections, because the ST-7 CCD chip is red-sensitive (see spectral response at `http://www.sbig.com/sbwhtmls/ST7ME.htm`). I make the following assumptions for the photometry of dusty comets with this particular chip: (1) $V - R = +0.4$ (Sostero 2007a); (2) the R band and this unfiltered passband are photometrically are nearly equivalent (Sostero 2007b); and (3) the V band and human photopic passbands are nearly equivalent (see, *e.g.*, Cox 2000, Tables 5.22 and 7.5). For Venus, I adopt $V - R = +0.5$ (Mallama *et al.* 2006). Because the spectra of Venus and dusty comets each are approximately solar, I assume that for Venus, the R band and the unfiltered passbands are likewise nearly photometrically equivalent (Sostero 2007b). With the foregoing considerations, the equivalent visual magnitude of the comet is then $m_1 = -4.6 - 0.5 + 0.4 = -4.7$.

Miles (2007), observing from Dorset, England, used a 6-cm refractor and a Starlight Xpress SXV-H9 CCD camera with a standard V-band filter to obtain $m_V = -5.01 \pm 0.15$ on Jan. 14.624 for a $1'.5$-aperture diaphragm, the largest of several that he employed (tabulated in *ICQ* **29**, 88). Miles does not report a visual coma diameter, but near that time, on Jan. 14.54, Hornoch had estimated it in daylight as $3'$ in 8-cm binoculars at 10× (*ICQ* **29**, 33). To convert this magnitude to the equivalent for a $3'$-aperture diaphragm, I assume that the coma signal is mostly sunlight scattered by dust, and that the dust is under uniform steady-state outflow from the nucleus. Under these circumstances, the coma brightness should scale directly with the diaphragm size (Gehrz and Ney 1992). This would produce a theoretical correction of $\Delta m_V = -2.5 \log (3'/1'.5) = -0.75$ magnitude, which is encouragingly close to the measured -0.6-magnitude difference that Hornoch *et al.* (2007) obtained between $3'$- and $1'.5$-diaphragm sizes in their own study. Accordingly, I apply a -0.7-magnitude correction to the Miles (2007) datum to obtain an equivalent visual $m_1 = m_V = -5.01 - 0.7 = -5.71$.

Converting to heliocentric magnitudes (see Sec. 3), the Miles (2007) and Hornoch *et al.* (2007) data respectively yield $H_1 = -5.28$ at $t - T = +1.8$ days (when $\theta = 31^\circ.9$), and $H_1 = -4.26$ at $t - T = +2.7$ days (when $\theta = 38^\circ.6$). These two CCD data points are plotted in Fig. 4 as crosses. Note that they are congruent with the visual m_1 estimates, and fall quite close to the scattering-model curves.

5. Discussion

5.1. The Baseline Brightness

At $m_0 = 5.53$ and $n = 4.52$ pre-perihelion, and $m_0 = 3.87$ and $n = 3.61$ post-perihelion, comet C/2006 P1 was an intrinsically bright comet, intermediate to C/1975 V1 (West) post-perihelion ($m_0 = 4.6$, $n = 3.6$; Meisel and Morris 1982), and 1P/Halley post-perihelion ($m_0 = 3.4$, $n = 3.0$) at its most recent return (Green and Morris 1987). The C/2006 P1 light curve is reasonably linear over a wide range of log r, although beyond log $r \gtrsim 0.2$, there is an apparent steepening of the slopes for both pre- and post-perihelion (Fig. 1). These latter m_1 estimates, however, were made in telescopes at higher magnifications, and could be prone to underestimation due to "magnification artifact", or "aperture effect" (Morris 1973). Although I made no attempt to "correct" these higher magnification estimates (Sec. 3.1), had they been adjusted by, say, the formula $-1.25 \log (M/10)$ that was used in the analysis of the light curve of 96P/Machholz in Paper I (M = magnification, $M \geq 10$; Marcus 2007a), then these telescopic estimates of C/2006 P1 would have fallen closer to the regression lines in Fig. 1. Because the far majority of the m_1 observations of C/2006 P1 were by naked eye or binoculars at low magnification, and *only* these observations were used in the regression analysis, we can be assured that the photometric solutions derived in Sec. 3 are not significantly affected by magnification artifact. The solutions presented here for the baseline brightness by naked eye and binoculars therefore can be regarded as definitive for $\log r \lesssim 0.2$. For $\log r \gtrsim 0.2$, the comet's photometric behavior perhaps would be better characterized by (yet-unpublished) CCD studies.

Like comets C/1975 V1 and 1P, comet C/2006 P1 was slightly brighter after perihelion than before (Fig. 1). Such asymmetry often leads to a mathematical discontinuity in brightness when the separate pre- and post-perihelion solutions are projected to perihelion. Fortunately, the pre- and post-perihelion solutions for C/2006 P1 give heliocentric magnitudes at perihelion that differ by only 0.1 magnitude. It took very little adjustment of the photometric parameters in Sec. 3.2 to bring the solutions to exact convergence at perihelion on Jan. 12.80 TT. This made it possible to interpolate a continuous baseline light curve into the forward-scattering interval of Jan. 10.0-21.7, when $\theta \leq 90°$. This is important, for a continuous baseline is required to realistically analyze excursions due to forward-scattering.

5.2. The Forward-Scattering Brightness Surge

Using the interpolated baseline brightness power law as a reference, I next characterized the brightness behavior of C/2006 P1 in forward-scattering geometry. I demonstrated that the comet underwent a significant, broad-based brightness surge. Because the surge correlated so exquisitely to the scattering angle, θ, we can conclude with good confidence that it was the result of forward-scattering of sunlight by the fine dust particles in the comet's coma. In its amplitude (-2.1 magnitudes), time of peak ($\approx$ Jan. 14.3 UT), and shape, the brightness enhancement closely followed the prediction (Marcus 2007b, 2007c; Table 1) based upon the compound Henyey-Greenstein cometary light-scattering model introduced in Paper I (Marcus 2007a). Comet C/2006 P1's brightness behavior therefore can be considered to be a validation of this model.

C/2006 P1 owed its widespread naked-eye visibility in broad daylight to the forward-scattering enhancement of its brightness. Without this boost, the comet would have remained at a baseline m_1 of "only" mag -3 to -3.5, and would not have shone at the mag -5 to -6 reported near the time of minimum scattering angle on Jan. 14. At just 6° off the limb of the sun, without forward-scattering enhancement of its brightness, the comet might have been barely visible in daylight in telescopes, but not by naked eye.

The brightness surge is the most problematic portion of the C/2006 P1 light curve. Had we not accounted for it with a proper model, we would have obtained anomalous photometric parameters that would have overestimated n in equation 3 for post-perihelion. Any light curve that is intended to be a proxy for the true activity of the comet, rather than just a superficial phenomenological description of the brightness, *must* be corrected for the effect of forward-scattering in some way. Our model provides a proper correction for scattering effects in the m_1 estimates as $m_{\Phi(\theta)}$ in Table 1.

5.3. Precision and Accuracy of the Visual m_1 Estimates

5.3.1. The Extenuating Viewing Circumstances and Errors in the Estimates

The magnitudes of C/2006 P1 were estimated in difficult circumstances of low altitude and/or bright twilight or daylight. These extenuating conditions are reflected in the rather high standard deviations of $\pm$ 0.5 magnitude in the observations in the non-forward-scattering ($\theta > 90°$) portion of the light curve (Sec. 3.2), and $\pm$ 0.8 magnitude in the forward-scattering ($\theta \leq 90°$) portion (Sec. 3.3.3). Much of the $\pm$ 0.5-magnitude dispersion must be due to uncertainty in extinction corrections used for the estimates made at very low altitudes. The higher $\pm$ 0.8-magnitude dispersion likely reflects the relatively greater importance of the lack of a comparably bright comparison object when the comet was at its brightest at $m_1 \approx -6$ (the next brightest comparison object, Venus, was then at $m_V = -3.9$), as well as potential difficulties in observing in daylight circumstances near the glare of the sun. On the other hand, the comet was generally at higher altitude during the daylight observations, comparable with Mercury and Venus, so that uncertainty from atmospheric extinction was effectively negligible then. A third source of potential error was any truncation of the fainter outer coma by the very bright daylight sky background near the sun. This difference could lead to a *systematic* underestimation of m_1 for observations made in broad daylight and, to a lesser degree, in bright twilight. No such loss should occur for the sharply defined disks of Venus or Mercury. Indeed, coma diameters tabulated in the *ICQ* for the height of the comet's daylight visibility over Jan. 13-15 are very variable, ranging from 0'.5 to 5'. Some of this variance is no doubt due to the intrinsic imprecision expected with the small magnifications used via naked eye and low-power binoculars. However, to the extent that the smaller estimates are more severely truncated by increased sky-background brightness from haze (like comet dust, the haze particles also forward-scatter sunlight), then the m_1 brightnesses will also be underestimated. This would mean that the brighter daylight estimates plotted in Figures 3 and 4 are closer to the truth. Indeed, the somewhat-brighter CCD estimates (Fig. 4) seem to imply as much. A fourth source of potential error would be the inclusion of the bright proximal tail in the m_1 estimate, which ordinarily is regarded as pertaining only to the coma (for the less dusty and bright comets, at least). This would lead to a systematic overestimation of the coma brightness and of the scattering function, as was pointed out in Sec. 4.3 of Paper I (Marcus 2007a).

5.3.2. The Reality of the Surge

This statistical dispersion (or "noise") in the estimates, however, was not so high as to mask the significantly larger, systematic signal in the data set due to forward-scattering. At magnitude -2.1 ± 0.8 (σ), the amplitude of the surge was some 2.6 times (= 2.1/0.8) greater than the standard deviation of the observations taken in aggregate. If instead the -2.2 ± 0.4 standard-deviation value for the more prolific observers is considered (Secs. 3.3.2, 3.3.3), then the surge was some 5.5 times (=2.2/0.4) greater. The reality of the surge above the baseline brightness cannot seriously be doubted.

5.3.3. Correlation To CCD Magnitudes

Even if the surge confidently rises above the "noise level" of the baseline light curve, the precision and accuracy of the visual m_1 estimates still is a matter of legitimate concern. In this respect, the CCD photometric data in the two published studies analyzed in Sec. 4 are reassuring. When carefully reduced to correspond to the visually observed coma size and corrected for color differences, the CCD magnitudes are consonant with the visual m_1 magnitudes of the more prolific observers in Fig. 4, and conform remarkably well with the HG-scattering-model curves (Figures 3 and 4). Still, this concordance does not exclude the possibility of systematic bias in the visual m_1 data set. For example, the bright daylight sky might have truncated the coma size relative to what could have been perceived on a darker background, leading to a systematic underestimation of the magnitudes during daylight. This possibility could be assessed independently with photometry from satellite observations, which would essentially be unaffected by sky background. Grynko (2005) did this for comets 96P/Machholz and C/2004 F4 (Bradfield) when they were in forward-scattering geometry in the *SOHO* C3-coronograph field, but these data have their own potential problems (Marcus 2007a). At this writing, however, photometric data on C/2006 P1 from the *SOHO* (or from *SECCHI*) satellites have not been presented in the literature.

5.4. Limitations of the Method

Following equation 19 of Paper I (Marcus 2007a), I extracted the scattering function, $\Phi(\theta) = I(\theta, r, t)/I(90°, r_0, t_0)$, for C/2006 P1 solely from its visible light curve, $I(\theta, r, t)$, using heliocentric distance, r, and scattering angle, θ, but not time, t, as regression variables in equations 1-3 of this paper. An intrinsic limitation of this "visible light curve" method is that it does not easily deal with potential confounding brightness variations that depend on time, such as bursts in dust production, or with uncertainty in the secular variation of heliocentric magnitude with log r (the value of n in equation 3). Given its very tight correlation with the scattering angle (Figures 3 and 4), it is highly unlikely that that the brightness surge of C/2006 P1 could have been due in any significant way to a dust burst, but the possibility cannot be ultimately excluded using this method. Indeed, minor dust bursts — manifested as small spikes in the light curve and corresponding synchronic bands in the dust tail — complicated Grynko's (2005) photometric derivation of the forward-scattering behavior of C/2004 F4 (Bradfield) in the *SOHO*-satellite C3-coronograph field (Marcus 2007a). In the case of C/2006 P1, I defer assessment of the possibility of small outbursts to dust dynamicists who are more experienced at "reading" dust tail structures than am I.

In contrast to the "visible light curve" method, the "gold standard" method of simultaneous visible/infrared photometry for deriving $\Phi(\theta)$ does not suffer from dependence on t or r. The "visible/infrared method" utilizes two different measures of dust — the flux of sunlight that it scatters, $f_s(\theta)$, and the flux of sunlight that it absorbs and immediately re-radiates as heat, f_t (Gehrz 1997, Marcus 2007a). Because $f_s(\theta)$ is dependent upon the scattering angle, but f_t is not, their ratio, $R(\theta) = f_s(\theta)/f_t$, leads directly to the scattering function, $\Phi(\theta) = R(\theta)/R(90°)$ (equations 20 and 21 of Paper I). Because time-dependent dust bursts or r-dependent secular changes in dust production affect both $f_s(\theta)$ and f_t *in the same way*, their *ratio*, and the scattering function that derives from this ratio, are independent of r and t. Through this virtue, the "visible/infrared method" escapes the confounding vagaries and uncertainties to which the "visible light curve" method — which relies on scattered-sunlight measurements alone — is prone. The scattering functions for comets C/1927 X1, C/1975 V1, and C/1980 Y1 were obtained by the "visible/infrared method" (see Paper I). Unfortunately, I am currently unaware that any simultaneous visible/infrared photometry of C/2006 P1 was taken in daylight when this comet was in forward-scattering geometry.

5.5. Comparison of C/2006 P1 with the Great Daylight Comet C/1927 X1

In many respects, comet C/2006 P1 is remarkably similar to the great daylight comet C/1927 X1 (Skjellerup-Maristany), which also ventured into forward-scattering geometry and experienced pronounced brightness enhancement as a result (Marcus and Seargent 1986; Marcus 1997; Marcus 2007a). In orbital characteristics, the eccentricities of the two comets were each very close to 1, and their perihelion distances were nearly identical ($q = 0.176$ AU for C/1927 X1). Each was in forward-scattering geometry at perihelion and suffered poor elongation through much of its apparition. In physical characteristics, each sported a strong dust tail visible in daylight, and their absolute magnitudes were comparable, with $m_0 \approx 5.5$ for C/1927 X1 (Marcus 2007d). On 1927 Dec. 16.8 UT, the Slipher brothers at Lowell Observatory (Flagstaff, Arizona) observed C/1927 X1 at a scattering angle near $\theta = 30°$, comparable to $\theta_{\rm min} = 31°$ for C/2006 P1. They recorded that "the experienced observer saw it readily during the day by merely extending the hand to shadow the eyes from the sun, which was only about five degrees southwest of the comet" (Slipher and Slipher 1928). The comet was still visible to them in daylight by naked eye on the next day at $\theta \approx 45°$. The similarity of the daylight visibilities of comets C/2006 P1 and C/1927 X1 at comparable θ, ϵ, Δ, and r is qualitative evidence that the two comets were of comparable intrinsic brightness.

However, unlike C/2006 P1, comet C/1927 X1 ventured much more deeply into forward-scattering geometry, reaching $\theta_{min} = 6^\circ\!.5$ on 1927 Dec. 15.4 UT (Marcus 2007a). Twelve hours later, on Dec. 15.92, at $\theta = 11^\circ\!.7$, this comet blazed so brightly that it was *casually* discovered in daylight by a lady in a hiking party high in the clear air of the Sierra Madre mountains, with the sun shadowed by a peak (Goodhue 1928). Had C/2006 P1 reached this small scattering angle, the HG scattering model (Marcus 2007a) predicts a brightness enhancement of $m_{\Phi(\theta)} = -6.8$ due to forward-scattering. With a baseline brightness of $m_1 \approx -3.4$ at perihelion, C/2006 P1 would have become as bright as $m_1 \approx -3.4 - 6.8 = -10.2$! At this brightness, C/2006 P1, too, would have been casually discoverable by novices in broad daylight just several degrees off the limb of the sun.

6. Conclusions

From this study of the visual m_1 magnitude estimates published in the *ICQ*, I conclude:

1) C/2006 P1 (McNaught) was an intrisically bright comet, somewhat brighter after perihelion than before. For $\log r \lesssim 0.2$, the light curve is well fitted by the photometric parameters $m_0 = 5.71$, $n = 4.59$ for the pre-perihelion span, and $m_0 = 3.83$, $n = 3.61$ for the post-perihelion span.
2) The comet underwent a major surge in brightness due to forward-scattering of sunlight by small dust grains.
3) The comet's widespread visibility in broad daylight in binoculars and by naked eye was due to the forward-scattering enhancement of its brightness.
4) In its amplitude, timing, and shape, the surge closely followed the cometary scattering model presented in Paper I (Marcus 2007a). In particular, series of observations by individuals in the forward-scattering interval, as well as the two analyzed CCD magnitudes, follow the model shape very closely.
5) Closely following predictions (Marcus 2007b, 2007c), the light curve of C/2006 P1 validates my cometary light-scattering model. The model (Marcus 2007a) can be used to accurately analyze and predict the light curves of comets in forward-scattering geometry.

Acknowledgements. It is a privilege to have worked with the *ICQ* database of cometary photometric observations, and to acknowledge this invaluable resource in cometary astronomy. I am grateful to the many observers who made this study possible by contributing their observations of C/2006 P1 to this archive. Giovanni Sostero (Remanzacco, Udine, Italy) and Richard Miles (Dorset, U.K.) kindly read the manuscript and provided valuable guidance on the reduction of the CCD photometry. I also thank Brian G. Marsden (Smithsonian Astrophysical Observatory) for his comments on the manuscript. Above all, I thank the Editor for his many suggestions for improvement of not only this, Paper II, but also Paper I (*ICQ* **29**, 39) in this series on forward-scattering and comet brightness.

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Photometry of Deep-Sky Objects

All of the new data below are from Jose Carvajal Martinez (Madrid, Spain). The previous batch of photometry of *ICQ*-recommended deep-sky objects appeared in the April 2006 issue, pp. 45-47. We encourage other regular comet photometrists to contribute both visual and CCD magnitudes of the recommended deep-sky objects; additional information is given in *ICQ* **20**, 98; **16**, 129; and **26**, 3.

See also the *ICQ* website: `http://www.cfa.harvard.edu/icq/icqproject.html`.

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Visual Data

NGC 221

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 12 10.84		M	8.2	S	32	L	5	76	1.5	7/			MAR02

NGC 936

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 12 10.89		S	10.8	S	32	L	5	76	0.75	2/			MAR02

NGC 1068

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 12 10.89		M	9.2	S	32	L	5	76	1.5	5/			MAR02

NGC 1952

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 12 10.90		S	7.2	S	32	L	5	76	4	0			MAR02

NGC 2068

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 12 10.91		M	7.3	S	32	L	5	76	4	0			MAR02

NGC 6356

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 07 28.90		M	8.8	TI	10.5	M	14	57	2.5	4/			MAR02

NGC 6712

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 07 28.91		M	8.9	TI	10.5	M	14	57	3	3			MAR02
2006 10 14.82		M	8.9	TI	32	L	5	76	4	3/			MAR02

NGC 6760

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 07 28.91		M	8.9	TI	10.5	M	14	57	4	2/			MAR02
2006 10 14.84		M	9.0	TI	32	L	5	76	3	3			MAR02

NGC 6934

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 07 28.92		M	8.6	TI	10.5	M	14	57	2.5	5/			MAR02
2006 10 14.85		M	9.3	TI	32	L	5	76	1.5	5			MAR02

NGC 7078

DATE (UT)	N	MM	MAG.	RF	AP.	T	F/	PWR	COMA	DC	TAIL	PA	OBS.
2006 07 28.92		M	6.8	S	10.5	M	14	57	5	5			MAR02
2006 10 14.88		M	6.9	S	32	L	5	76	4.5	6			MAR02
2006 12 10.83		M	6.9	S	32	L	5	76	4	6			MAR02

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Tabulation of Comet Observations

New magnitude reference tabulation code: `UV` = USNO-A2.0 catalogue used to extract blue and red comparison-star magnitudes, then converted to "V" magnitudes through the following formula derived by T. Kato (Kyoto Univ.) by comparing two variable-star fields (SW UMa and IR Gem): $V = r + 0.375(b-r)$; information communicated by A. Nakamura.

New CCD camera tabulation codes: `AAL` = Artemis 285AL-a (see `http://www.artemisccd.co.uk/icx285.htm`); `CKD` = Canon Kiss Digital camera; `DSI` = Meade DSI Pro; `FLD` = Finger Lakes Instrumentation (FLI) Dream Machine; `FLI` = Finger Lakes Instrumentation (FLI) CM91E; `QHY` = QHY-6 (website `http://qhyccd.com/`); `ST3` = SBIG STL1301E.

New CCD-camera-chip tabulation codes: `CAC` = 22.7-mm × 15.1-mm (APS-C) CMOS for Canon Kiss Digital camera; `EXV` = Sony ExViewHAD tm; `ICX` = Sony ICX259AL; `KA2` = Kodak KAF-1301E; `SAL` = Sony 285AL; `TK2` = Tektronik TK-1024-AV.

New tabulation code for computer software used for the photometric reduction of CCD images: *SI0* = Stella Image (Japanese software programmed by K. Kadota and sold by Astro Art Co.).

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

See the July 2001 issue (page 98) for explanations of the abbreviations used in the descriptive information.

⋄ *Comet 2P/Encke* ⟹ 2007 Apr. 7.83: alt. 7°, twilight (solar alt. −12°; measurements from sixteen stacked, aligned 6-sec images [QVA]. Apr. 7.83 and 11.84: photometry tab. here is as reduced by B. Granslo, but Qvam's own reduction using *MaxIm DL/CCD* software agreed quite well w/ that of Granslo [QVA]. Apr. 11.84: tail faint and narrow; alt. 5°.5; solar alt. −13°; measurements from three stacked, aligned 10-sec images [QVA].

⋄ *Comet 8P/Tuttle* ⟹ 2007 Aug. 9.69: comp. star has $B-V = +0.48$ [TSU02]. Aug. 9.69, Sept. 10.68, and Oct. 16.62: `Guide 8.0` software used for comp.-star mags [TSU02]. Sept. 10.68: comp. star has $B-V = +0.72$ [TSU02]. Oct. 5.43 and 6.43: nearby 15th-mag stars identified, but comet not visible [YOS04]. Oct. 16.62: comp. star has $B-V = +0.96$ [TSU02]. Oct. 16.69 and 18.68: `Guide 8.0` software used for comp.-star mags [YOS02].

⋄ *Comet 17P/Holmes* ⟹ 2007 July 25.72, Oct. 24.81, 25.60, 26.85, 27.48, 27.51, 28.54, and 30.54: `Guide 8.0` software used for comp.-star mags [YOS02]. July 25.72: $B-V$ values of comp. stars were +0.77, +0.79, and +0.82 [YOS02]. Aug. 9.75: comp. star has $B-V = +0.85$ [TSU02]. Aug. 9.75 and Oct. 25.61: `Guide 8.0` software used for comp.-star mags [TSU02]. Oct. 24.136: comet had mag $R = 7.3$ in a 10″ square aperture, w/ a bright, inner coma that is almost stellar; comet some 9 mag brighter than two nights earlier in a 10″ aperture, and the comet is brightening by 0.5 mag/hr in a 10″ aperture over the course of 6 hr, according to CCD images by R. Naves, M. Campas, J. A. Henríquez, and G. Muler from Spain; Henríquez (Tenerife) may have been the first to have detected the outburst [report by Mark Kidger, Madrid, Spain]. Oct. 24.175-24.223: all-sky CCD images of the Spanish Meteor and Fireball Network, taken from the Montseny station in Barcelona (described by Trigo-Rodriguez *et al.* 2004, *Earth, Moon, and Planets* **95**, 553; limiting mag in unguided 30-sec exposures is 10 at zenith); photometry derived using USNO-catalogue comp. stars (by comparing the number of photons of the comet w/ counts of stars of similar brightness in several images), yielding (presumably total) magnitudes 7.0 on Oct. 24.175, 6.7 on Oct. 24.195, 6.5 on Oct. 24.208, and 6.2 on Oct. 24.223 for comet 17P (most from 90-sec exposures) [Josep M. Trigo-Rodriguez, Institute of Space Sciences, Consejo Superior de Investigaciones Cientificas and Institut Estudis Espacials de Catalunya]. Oct. 24.21: on unfiltered CCD images taken with 50-cm $f/3$ reflector, comet shows stellar appearance of red mag 7.4 (astrometry contributed to Minor Planet Center) [François Kugel and C. Rinner, Banon and Dauban, France]. Oct. 24.34: co-addition of ten 5-sec CCD images taken remotely with a 25-cm $f/3.4$ reflector (+ B filter) near Mayhill, NM, U.S.A., show the comet as a bright, featureless, star-like object of total mag ~ 4.6 (astrometry contributed to Minor Planet Center) [E. Guido and G. Sostero, Castellammare di Stabia, Italy]. Oct. 24.50: "easy naked-eye starlike object of total mag 4.0 this morning, possibly showing as a small disk at high power in the telescope, although hard to tell with the seeing" [A. Hale, Cloudcroft, NM, U.S.A.]. Oct. 24.52, 25.52, and 29.45: `Guide 8.0` software used for comp.-star mags [MIY01]. Oct. 24.55: visible w/ naked eye (at mag 3.5), even in the large city of Yokohama (Kanagawa, Japan), and 10×66 R (at mag 3.7) as a starlike object (DC = 9) [YOS04]. Oct. 24.60, 27.72, 28.72, 28.73, 29.49, 30.81, and 30.82: `The Sky (ver. 5)` software used for comp.-star mags [MIT]. Oct. 24.61: CCD images taken with a 25-cm $f/5$ reflector show the comet to be starlike (total mag 3.6, dia. 1'.7) with no tail (astrometry contributed to Minor Planet Center) [KAD02]. Oct. 24.63: comet has brightened notably w/in 2 hr; still looks completely stellar (DC = 9) [YOS04]. Oct. 24.80: outburst; coma dia. 0'.5 in 25×100 B [GON05]. Oct. 24.80, 25.08, 25.81, 27.81, and 31.81: mountain location, very clear sky [GON05]. Oct. 24.80, 25.08, 25.81, 27.17, and 27.81: moonlight [GON05]. Oct. 24.89: "in 10×50 B, the comet appeared as a very small disk and yellowish in color (slightly redder than nearby α Per); via naked eye, the object was easily seen as a stellar object, despite a nearly full moon and interference from cirrus clouds" [GRA04]. Oct. 24.93: "the comet was an easy naked-eye object as seen from central Marseille, despite moonlight and light pollution; comet appeared stellar to the naked eye, w/ a yellow-orange color; the non-stellar nature of this source was however revealed by the fact that it was seen to scintillate w/ a lower amplitude and longer typical time scale, compared to nearby stars of similar brightness" [DAH].

Oct. 25.15: cirrus clouds [CRE01]. Oct. 25.21: w/ 7×50 B, comet appears nearly stellar (very small coma); comp.-star mags from SIMBAD website (ϵ Per, V = 2.90; δ Per, V = 2.99; γ Per, V = 2.95); obs. made from Viladevacalls, a small town 25 km from Barcelona [FER04]. Oct. 25.33: obs. from Honolulu, Hawaii; bright moonlight [LIN04]. Oct. 25.42 and 28.43: `MegaStar (ver. 5.0)` software used for comp.-star mags [MUR02]. Oct. 25.6: obs. from Xiaoguwei Island, Guangzhou, China; light pollution and strong moonlight [YE]. Oct. 25.6 and 25.7: CCD images processed w/ Larson-Sekanina algorithm, revealing a strong jet ≈ 60″ long towards p.a. ≈ 145° and a second "tree-like" jet ≈ 35″-40″ long with four "branches" [YE]. Oct. 25.75: "in 10×50 B, the comet appeared considerably more extended than on Oct. 24.89 (it now showed an easily visible disk)" [GRA04]. Oct. 25.75: "the comet was easily seen w/ naked eye, and appeared yellowish in 7×50 B" [SKI]. Oct. 25.76: "w/ 7.0-cm R, the coma showed a small-but-nonstellar central cond. (size ≈ 15″) that was surrounded by a disk of almost uniform brightness; the yellow central cond. was slightly offset towards W, and the 'N' magnitude refers to this feature" [GRA04]. Oct. 25.81: "bright new 'star' in Perseus about 4°.5 E of α Per; to the naked eye, clearly yellowish; in 11×80 B, a very small, circular coma, but not diffuse; in 28-cm $f/10$ T (280×, 400×), a nearly round, disklike coma of homogeneous brightness and size 0'.6 × 0'.5; the disk had a well-defined, sharp edge; a small boomerang-shaped central cond. was slightly off-center in the coma and had a slightly brighter offset pseudo-nucleus; w/ Lumicon Deep Sky filter, an extremely faint outer coma was seen w/ dia. ≈ 4′; no tail seen" [WAR01]. Oct. 25.81 and 26.16: yellow color, stellar appearance to naked eye; hazy sky, humid; bright sky due to nearly full moon [WAR01]. Oct. 25.84: using a 32-cm L (100×), coma dia. 4′; appears like a "laterally illuminated pearl" that gave the impression of a 3-D view; "there was a more intense central cond. w/ a small 1′-long fan tail 30° wide in p.a. 210°; on the opposite side (around p.a. 80°), there is a curved, obscure shadow inside the coma" [MAR02].

Oct. 26.07, 27.07, 28.07, 30.04, 31.88: comp. stars α, γ, and δ Per [PER01]. Oct. 26.07, 27.07, 28.07, 30.04: near zenith [PER01]. Oct. 26.20: comet near zenith, w/ full moon ~ 30° from comet toward SW; partly cloudy (though at times clear overhead); w/ 25-cm $f/4$ L (~ 64×), "I have never seen a comet look like this one does — no noticeable tail w/ a fairly round brightish yellowish outer coma of dia. ≈ 2'.5 and a much brighter inner coma (or condensed area) of size ≈ 0'.5 that is perhaps slightly offset from the outer coma's center toward the SW and appears rather elongated also toward the SW; easily seen w/ naked eye despite full moon, though no perceptible size via naked eye"; obs. from suburban Boston, MA, U.S.A. [GRE]. Oct. 26.39: CCD images obtained w/ 61-cm $f/16$ C ranged from 0.1 to 240 sec, and "show an outer round coma shell of size 3'.5 (this outer shell is extremely bright, w/ a consistent brightness throughout, and it is centered exactly on the nuclear area); the core area is 6″ in dia. and round w/o any kind of additional or secondary 'hot' spots; however, there is an extension from the core to the SW (at p.a. 220°) for 20″ that has width ≈ 8″, has no mottling along its length, is very subtle, and is ever so slightly curved; the end of the extension terminates in a rounded 'bubble' appearance; very close inspection of this extension shows a thin line for the first half of its length, also with the same curvature; a subtle secondary round shell of 40″ is centered around the end of this extension, and is very noticeable in even the shortest exposures; no hint of any tail is seen extending from the outer shell, but with the full moon and some lingering smoke (local fires), any such tail might not be visible"; astrometry for Oct. 26.39-26.43 submitted to Minor Planet Center (total mag given as 2.4); "quite a sight with the unaided eye", total mag 2.5 [Jim Young, Table Mountain Observatory, southern California]. Oct. 26.39: w/ Canon 15×50 image-stabilized B, total mag 2.5 (brightness falling between that of α and δ Per; comet had a definite edge around a brighter central nuclear core [Karen Young, via her husband, Jim Young, Table Mtn. Obs.]. Oct. 26.39: bright sky due to full moon [WHE01]. Oct. 26.39, 27.20, 29.18, and 30.45: comp. stars α Per (mag 1.8) and δ Per (mag 3.0) [WHE01]. Oct. 26.5 and 26.8: CCD images processed as on Oct. 25.6 (see above) show that the two jets are strengthened, but only the "tree" jet is longer [YE]. Oct. 26.58: "despite very low alt. and bright moonlight, I managed to see this comet last night — an incredible object!; visible via naked eye despite full moonlight; strong yellow color in binoculars" [SEA]. Oct. 26.83: "the comet had a 'planetary' appearance to the naked eye, showing little scintillation compared to nearby stars; it appeared as a barely resolved object, slightly less sharp than nearby stars of similar brightness; obs. from central Marseille" [DAH]. Oct. 26.90: using a 32-cm L (100×), coma dia. 4'.5; "the pearl-like aspect still remains; the only remarkable change seen today was the coma, which is now clearly visible through an 8×50-mm finder, w/ DC = 7" [MAR02].

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CCD image of comet 17P/Holmes taken on 2007 Oct. 26.12 UT by Jack Newton (Portal, AZ, U.S.A.) with a Borg 101-mm f/4 telescope and a Canon 350D camera (exposure 10 sec; color image balanced with MaxIm DL software).

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Oct. 27.10: comet alt. 6°; w/ 18-cm L (40×), coma dia. 5′, DC = 7/ [AMO01]. Oct. 27.10 and 28.16: comp. stars have V = 1.79 (B–V = +0.48) and 3.01 (–0.13); moonlight and light-pollution interference [AMO01]. Oct. 27.12: comet alt. 9°; yellowish color; central cond. of size 1′ and outer coma of size 6′; elongated coma in p.a. 20° [AMO01]. Oct. 27.16: comp. stars have V = 1.79 (B–V = +0.48) and 3.01 (–0.13); moonlight interference [SOU01]. Oct. 27.48: B–V values of comp. stars were +0.60, +0.66, and +0.73 [YOS02]. Oct. 27.74: "still looks almost stellar w/ naked eyes, and is rather orange now; it appears brighter than on Oct. 24; w/ 10×66 R, DC = 2, and comet appears as a strange, round, ball-like object, like a planetary nebula or an out-of-focus star, but not sharp at all (although it was completely stellar and strongly sharp on Oct. 24); the color is similar to that of Jupiter or Saturn, but the 'rim' of the comet is much more blurred than those planets" [YOS04]. Oct. 27.74: also mag 2.1 w/ naked eye [FOG]. Oct. 27.8: CCD images processed as on Oct. 25.6 show that the first jet seen on Oct. 25.6 was greatly weakened, and the "tree" jet extends now to at least ≈ 2′ w/ at least four || "streaks" [YE]. Oct. 27.81: in 20-cm T (77×), faint outer coma dia. 11′ (w/o filter); inner disk of dia. 4'.0; starlike central cond. of mag 9.8; broad fan extends 0'.8 from center in p.a. 220°; outer coma is clearly enhanced with Swan-band filter [GON05]. Oct. 27.82: using a 32-cm L (100×), coma dia. 6′, DC = 5; "the complex structure remains; w/ an 8×50 finder, DC = 6, and coma seems like a planetary nebula with a bright central disk" [MAR02]. Oct. 27.91: clouds and moonlight; at 150×, stellar central cond. of mag 9.0 (ref = TT) [PAR03]. Oct. 27.92: "the comet was clearly non-stellar and appeared as a barely resolved object of high surface brightness, surrounded by a small diffuse envelope; for this and my following obs., the comet and comp. stars were defocused using eyeglasses held at some distance from my eyes; obs. from central Marseille" [DAH]. Oct. 27.92: w/ 8.0-cm R (60×), coma dia. 6′, DC = 5 [PIL01].

Oct. 28.10: "even with the bright moon (now pretty much in conjunction with the comet, albeit well to its S), you can tell with the unaided eye that the comet is diffuse/fuzzy as compared to α and δ Per; w/ 7×35 B, the beautiful lemon-yellow color of the comet is brought out, and it appears as a distinct circular patch; w/ a 10.1-inch Dobsonian L, closer inspection at 46× and 139× brought out the tiny star-like central cond., surrounded by a whitish oval glow roughly 2′ across (this feature is noticeably off-center from the stellar cond.); finally, there is the outermost section of the coma, an almost symmetrical, circular, yellowish-white patch of which I estimated/guesstimated was a 'solid' 3'.6 in dia. at 139×; the comet is very reminiscent of the 'Eskimo' (or 'Clown-face') nebula"; comp. stars α Per (mag 1.79) and δ Per (3.01); comp.-star mags from "Table of Brightest Stars" by R. F. Garrison and T. Karmo in the *2008 RASC Observer's Handbook*, p. 253 [RAO]. Oct. 28.14: yellowish color; strong central cond.; moonlight and light-pollution interference [DES01]. Oct. 28.16: comet alt. 11° [AMO01]. Oct. 28.23 and 29.04: moonlight [CRE01]. Oct. 28.46: while the comet "looked flat last night, it looks more cometary tonight — tiny dense spot is visible at the center, surrounded by a circular coma; w/ 10×66 R, DC = 6; it still looks stellar with naked eyes" [YOS04]. Oct. 28.48 and 31.60: `Guide 8.0` software used for comp.-star mags [NAG04]. Oct. 28.74: w/ 9×63 B, coma w/ very high surface brightness, only marginally brightening towards center; visible also w/ the unaided eye as a "soft" star; w/ 20-cm T (50×), bright coma of dia. 6'.5 w/ an extremely-well-defined border (resembling the Eskimo nebula), showing a stellar false nucleus of mag 8.5 in the center; SW of the false nucleus (with the false nucleus on the tip) was a significantly brighter region (dia. ≈ 1/5 of the coma dia.), which was slightly elliptical w/ the major axis pointing SW-NE [KAM01]. Oct. 28.75: "when compared to nearby stars of similar brightness, the comet was clearly seen as an extended source, and appeared as a very small object of high surface brightness, surrounded by a somewhat larger, diffuse envelope; obs. from the suburbs of Marseille" [DAH]. Oct. 28.79: using a 32-cm L (100×), coma dia. 8′, DC = 5; "although the false nucleus remains bright, total mag is clearly fainter, and the inner structure is not so complex, as compared with previous obs.; today I couldn't find the shadow seen in p.a. 80° on Oct. 25.84; surprisingly, using the Swan-band filter for the first time, I got coma dia. 16′, w/ an external dimmer envelope easily visible; w/ 8×50 finder, coma dia. 8′, DC = 6, and still similar to a planetary nebula with a bright central disk" [MAR02]. Oct. 28.79: w/ 32-cm $f/5$ L (96×), coma dia. 8′, DC = 6 [PIL01]. Oct. 28.81: moonlight [GON06].

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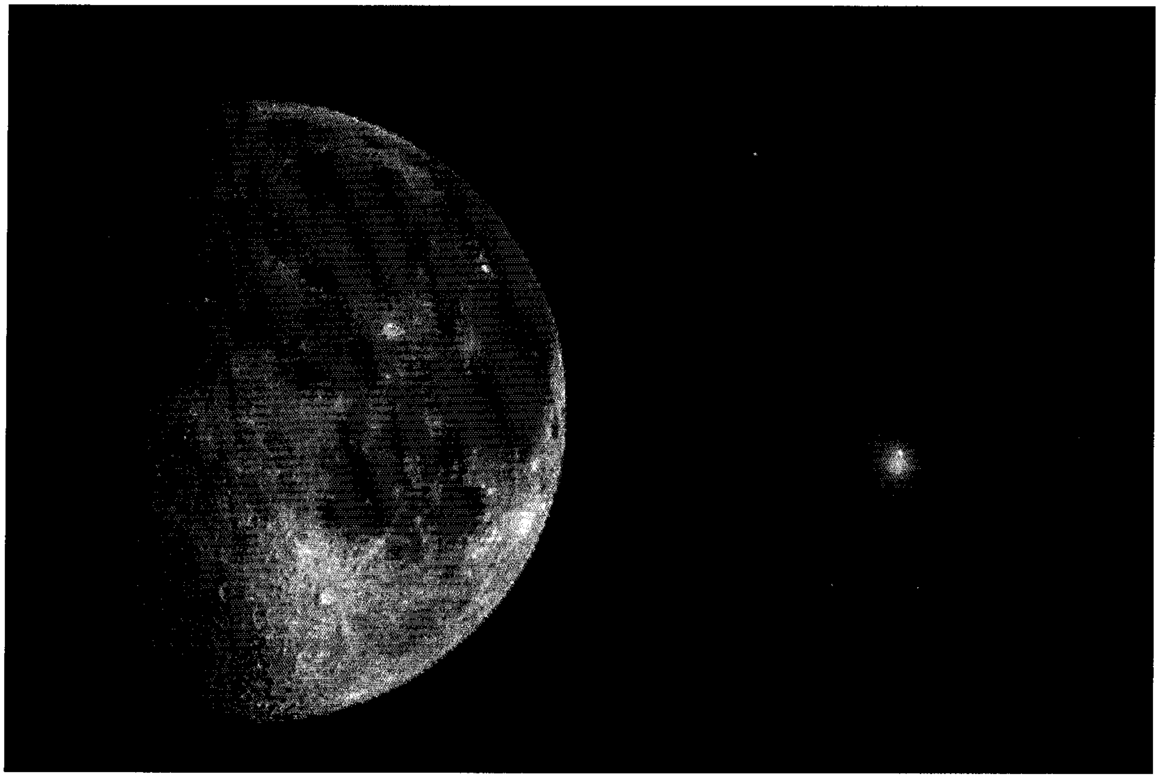

Images of the moon and comet 17P placed side-by-side to indicate scale; both images were taken with indentical instrumentation: a 10-inch LX-200 Meade reflector and a Nikon Coolpix 4500 camera, obtained via eyepiece projection (35-mm Panoptic eyepiece) by Mark van der Hum (Naarden, The Netherlands). The image of comet 17P/Holmes was obtained on 2007 Oct. 29.94 UT (exposure 8 sec at ISO 400). ©2008, Mark van der Hum.

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Oct. 29.12: α and δ Per again used as comp. stars; coma dia. in 7×35 B, 3.1-inch Jaegers R, and 10.1-inch Dobsonian L all seen to have increased (from 24 hr ago) to 4′; the 10.1-inch L at 139× shows "two background stars immersed in the coma (one of these was positioned well inside the brighter layer of the inner coma, and quite close to the sharp stellar cond./false nucleus); the overall concentric/symmetrical structure continues to impress!" [RAO]. Oct. 29.54: "comet bright, nearly equal to Algol; it looked almost stellar with naked eyes, but I could see the faint halo around the stellar nuclear cond., and the comet did not look disk-like w/ naked eyes; w/ 10×66 R, comet looked like an eye — w/ a tiny central bright core and an outer fainter round coma (like a typical planetary nebula)" [YOS04]. Oct. 29.87: using a 32-cm L (49×), coma dia. 8′, DC = 5; w/ 8×50 finder, coma dia. 8′, DC = 6 [MAR02]. Oct. 29.89: w/ 12.7-cm R (39×), stellar nucleus visible; dia. of dust coma ≈ 10′; a fountain visible in p.a. 220°, plus hints of an extended gas coma; w/ a Swan-band filter, coma dia. ≈ 22′; border of dust coma opposite the fountain is sharper than on the opposite side [GIL01]. Oct. 29.91: "w/ 12.0-cm R (111×), the comet showed a round halo w/ an apparently stellar point at the center, plus a brighter region that was located asymmetrically w/ respect to the false nucleus; I also suspected a circular and slightly darker structure in the outer part of the halo"; w/ 12-cm $f/8$ R (111×), coma dia. 7′ [SKI]. Oct. 29.99: "using 10×50 B, the comet appeared much more extended than on Oct. 25.75; its brightness was much higher than the central part of M31; clearly non-stellar w/ naked eye" [GRA04].

Oct. 30.03: "comet clearly non-stellar to naked eye, but strongly condensed w/ slightly yellowish color; amazing object in 7×50 B; the comet looked like a large planetary nebula w/ rather sharp edges, surrounded by some faint nebulosity (probably the faint outer halo, largely blotted out by moonlight); the disk appeared as a white color w/ a slightly greenish-yellow hue; the center looked a little brighter, but in this instrument, no further detail could be discerned"; comet at alt. $\sim$ 87° [BOU]. Oct. 30.05: in 30.5-cm T (117×), bright stellar cond. of mag $\approx$ 9.5 and broad, jetlike fan, surrounded by almost-circular coma; clearing up after a rain shower, w/ the moon still in the clouds [COM]. Oct. 30.05: "w/ 20.3-cm T (100×), the comet showed a round disk w/ a somewhat-diffuse edge (resembling a planetary nebula) that was centered around a stellar false nucleus (the 'N' magnitude refers to feature); in addition, there was a bright, diffuse, $\approx$ 2′-long tail-like fan that was apparently originating from the nucleus and directed towards p.a. 210°; my photographs taken shortly afterwards (Oct. 30.06) also showed these features — and, in addition, a faint and diffuse outer halo that appeared blue-green and 17′ in size" [GRA04]. Oct. 30.45: sky very hazy [YOS04]. Oct. 30.76: "while walking, I found an extra 'star' in Perseus — maybe the strangest comet I have seen; I made the mag est. w/o glasses, since I'm −2.5 diopters nearsighted; w/ 10×25 B, I saw a circular disk in the coma (or central cond.) that possessed a very high surface brightness and was only slightly diffuse at the periphery, and a little bit brighter in the center; comet seemed like a brighter variant of 47 Tuc as seen w/ naked eye — it was like an out-of-focus star"; w/ 10×25 B, coma dia. 12′, DC = 7 [KAR02]. Oct. 30.76: "comet brighter, bigger, and less starlike than the day before — probably due to the moon being below the horizon" [GIL01]. Oct. 30.77: w/ 7×50 B, bright inner disk of size $\approx$ 10′ w/ fairly distinct edge, surrounded by a faint, very diffuse outer halo of size $\approx$ 25′ [BOU]. Oct. 30.77-30.80: "coma dia. is mainly that of the dust component; w/ 15×60 B, the faint outer coma measured 24′; w/ 31-cm J (109×), the central cond. was estimated to be mag $\approx$ 10.6 (ref. TA); edge of dust coma sharp in the solar direction, and much more diffuse in the anti-solar direction" [DIJ]. Oct. 30.77: "w/ 10×50 B, comet looked like an unresolved globular cluster w/ a dirty-yellow shade" [GIL01]. Oct. 30.80: "in 31-cm J (72×, 109×), the bright inner disk was 9′ in dia. (it was rather fuzzy in the anti-solar direction, but fairly sharply defined in the solar direction); at 109×, the slightly fuzzy central cond. was est. at mag $\approx$ 10.5 (ref = TA), and a rather broad, nearly circular fan of diameter $\approx$ 1′.5-2′ was seen" in p.a. 225° [BOU]. Oct. 30.83: easy, slightly diffuse object w/ unaided eye; w/ 9×63 B, well-defined coma of high surface brightness w/ a significantly brighter central part measuring $\approx$ 1/3 of the coma dia.; this bright coma was surrounded by a faint outer halo of dia. 22′; w/ 20-cm T (50×), morphology very similar to Oct. 28, but coma larger with a slightly-more-diffuse border; false nucleus of mag 8.5 at the N-NE tip of the significantly brighter oval central region, which stretched to the S-SW with respect to the false nucleus; N part of coma better defined than S one [KAM01]. Oct. 30.85: w/ 8.0-cm R (60×), coma dia. 10′, DC = 6 [PIL01]. Oct. 30.86: in 30.5-cm T (117×, 150×), "dust coma more diffuse, w/ broader fan, and the brightness of the coma was varying (dust clouds?); the dust coma was more sharply defined to the S and more diffuse at the opposite side"; at 117×, the coma dia. $\approx$ 15′ [COM]. Oct. 30.90: "the comet appeared slightly blue-green w/ naked eye; using 12.0-cm *f*/8 R (111×), coma dia. 8′; the outermost halo appeared circular and showed a distinct and dark ring-shaped structure; the innermost point of light appeared brighter when compared to my previous obs." [SKI]. Oct. 30.91: "inner very bright coma formed a round, almost-circular disk 10′ in dia., whose W border was considerably more diffuse than toward the E, S, and N; a pseudo-nucleus was almost exactly centered in the coma and surrouunded by a bright patch of material that was offset to the W (this patch was elongated N-S, $\approx$ 3′ wide); the coma outside of this patch was very homogeneous in brightness throughout the whole disk; outside of the bright inner coma was a very faint outer coma that gradually became fainter and appeared circular in shape; the outer edge faded gradually into the sky $\approx$ 10′ from the pseudonucleus; the color of the inner coma was brownish-yellowish gray — very strange and unusual; overall, the comet looked very much like a planetary nebula; no tail could be seen"; alt. 70°; obs. from Uppsala, Sweden [WAR01].

Oct. 31.00: comet at zenith; "naked-eye estimate made by simply leaving off my glasses" [MEY]. Oct. 31.07-31.10: "using naked eye, 7×50 B, and 10.0-cm R (25×), the given diameters refer to the diffuse outer coma; the comet was obs. at alt. up to 80° and under a clear, transparent, and moonlit sky" [GRA04]. Oct. 31.08: "w/ 7×50 B, the estimated 'M' magnitude corresponds to the nearly circular golden-yellow disk of 10′ in size" [GRA04]. Oct. 31.10: "through 10.0-cm R (25×), the most prominent feature was the planetary-nebula-like disk (est. dia. 9′), its surface brightness being considerably higher than the brightest parts of M31 and M42 (its limb appeared somewhat diffuse in the sunward direction, but clearly more blurred on its anti-solar hemisphere); a stellar false nucleus was also well seen (its 'N' magnitude being tab.) and located near the center of the disk; a fan-shaped feature radiated from the nuclear cond. towards p.a. 220° — this fan being diffuse, 2′.5 long, spanning $\approx$ 60° of p.a., and of clearly higher surface brightness than the disk (evidently, total mag of the disk was $\sim$ 5.5, ref = TK); a diffuse halo surrounded the disk — this outer coma being quite faint but fairly easily seen and of a markedly higher surface brightness than M33" [GRA04]. Oct. 31.75: w/ 32-cm *f*/5 L (45×), coma dia. 23′, DC = 6 [PIL01]. Oct. 31.80: first obs. without moon; w/ unaided eye, comet was an easy, slightly diffuse object; w/ 9×63 B, coma still bright, but this night the borders looked more diffuse; brighter central region w/ dia. 1/5 to 1/4 of coma dia.; no tail; w/ 20-cm T (50×), coma boundary a bit more diffuse, with the N part less diffuse than the S one; false nucleus of mag 8.5 on the N tip of the bright central region; today the central region was centered on the coma, so that the false nucleus was displaced to the N [KAM01]. Oct. 31.81: bright inner disk of dia. 4′ [MEY]. Oct. 31.81: in 25×100 B, faint outer coma of dia. 28′ (w/o Swan-band filter); inner disk of dia. 9′; starlike central cond. of mag 9.5; broad fan extends 2′.3 from center in p.a. 220° [GON05]. Oct. 31.86: obs. from Constantine, Algeria [MOR09]. Oct. 31.90: using a 32-cm L (49×), coma dia. 11′, DC = 5; w/ 8×50 finder, coma dia. 11′, DC = 6 [MAR02].

◇ *Comet 29P/Schwassmann-Wachmann* ⟹ 2007 Oct. 5.77: small, faint object [YOS04].

◇ *Comet 44P/Reinmuth* ⟹ 2007 Aug. 9.57: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V$ = +0.94 [TSU02].

◇ *Comet 46P/Wirtanen* ⟹ 2007 Sept. 21.52, Oct. 5.53, and 16.56: CCD images w/ 0.5-m Uppsala D; images stacked w/ *Astrometrica 4.4.1.364* software; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Obs., Australia]. Sept. 21.52: 15″ coma; total mag 16.9 [R. H. McNaught, Siding Spring Obs., Australia]. Oct. 5.53: total mag 16.3 (UCAC-2 catalogue presumably used for comp.-star mags); 30″ coma; 40″ tail in p.a. 45° [R. H. McNaught, Siding Spring Obs., Australia]. Oct. 16.49: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.40$ [TSU02]. Oct. 16.56: total mag 15.9; 40″ coma w/ almost-asteroidal cond.; tail 1′.3 long in p.a. 65° [R. H. McNaught, Siding Spring Obs., Australia].

◇ *Comet 50P/Arend* ⟹ 2007 Aug. 9.73: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.48$ [TSU02]. Oct. 5.73 and 6.65: 15th-mag stars visible, but not the comet [YOS04]. Oct. 11.62: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.56$ [TSU02].

◇ *Comet 73P/Schwassmann-Wachmann [comp. C (stated or presumed)]* ⟹ 2006 Apr. 30.89: reference stars were Tycho 2581-2343-1 (mag 6.9), 2582-686-1 (7.1), and 2585-789-1 (7.9); comp.-star mags apparently taken from `Cartes du Ciel 2.76` software (see notes for C/2007 F1 on 2007 Oct. 9.69) [NOV01].

◇ *Comet 93P/Lovas* ⟹ 2007 July 14.96 and 15.96: w/ 30-cm *f*/5 L, CCD images show coma dia. 10″, w/ cond. and no tail; total mag 17.3 on July 15.96; astrometry published by Minor Planet Center [NEV]. Sept. 10.18: mountain location, very clear sky; nearby field stars checked via Digitized Sky Survey; comp.-star mags taken from Henden photometry near DZ Psc [GON05]. Sept. 16.00: starlike central cond. of mag 14.1 at 150× [PAR03]. Oct. 5.48 and 6.62: easy to see; moderately condensed and small [YOS04]. Oct. 11.40: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.47$ [TSU02].

◇ *Comet 96P/Machholz* ⟹ 2007 Apr. 5.08: not visible from Mauna Kea after sunset [MAC]. Apr. 13.52: obs. made with original discovery instrument [MAC]. Apr. 16.05: irregular-shaped coma; tails suspected [MAC]. Apr. 19.79: from CCD images with a Canon Kiss Digital camera (8-bit image has wide field of 1°.08 × 0°.72) attached to 25-cm *f*/4.8 L; aperture size not recorded, but probably ≈ 150″ in dia.; the astrometry that was reported to the Minor Planet Center records total mag 8.1-8.2 and "nuclear" mag 12.9 (from two or three pixels, translated to 5″-7″ on the sky) for Apr. 19.80 [NAK07]. Apr. 22.49: also 0°.05 tail in p.a. 196° [MAC]. May 1.49: in moonlight, 99% illuminated [MAC]. May 6.48: in moonlight, 85% illuminated [MAC]. May 7.48: not seen; moon 77% illuminated; high clouds [MAC]. May 8.48: not seen; moon 67% illuminated [MAC]. May 10.47: moon up 43% illuminated [MAC] May 12.49: comet appears larger under dark sky [MAC]. May 13.41: comet appears larger and more diffuse [MAC]. May 14.44: comet appears more diffuse and larger in dark sky [MAC]. May 15.43: some cirrus clouds in sky [MAC]. May 18.44: comet appears brighter [MAC]. May 21.45 and 24.44: comet diffuse [MAC]. May 22.44: comet appears larger [MAC]. May 28.43: comet near some stars, difficult to measure [MAC]. May 29.48: comet difficult, near some stars; moon (94% illuminated) setting [MAC]. May 30.48: comet not visible; bright moon (97% illuminated) [MAC]. June 8.32: "at times, comet seems larger than" tab. value [MAC]. June 13.42: very difficult to see [MAC]. June 18.29: not visible; some cirrus in sky [MAC]. June 21.25: recently cleaned main mirror of telescope [MAC]. July 3.25: "suspected as a streak between stars — SLOOH photos showed it as a streak during this time" (SLOOH evidently refers to the robotic observatory in the Canary Islands – Ed.) [MAC]. Aug. 9.50: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.54$ [TSU02].

◇ *Comet 125P/Spacewatch* ⟹ 2007 Aug. 9.47: comp. star has $B-V = +0.62$ [TSU02]. Aug. 9.47, 24.45, and Sept. 14.44: `Guide 8.0` software used for comp.-star mags [TSU02]. Aug. 24.45: comp. star has $B-V = +0.74$ [TSU02]. Sept. 14.44: comp. star has $B-V = +0.68$ [TSU02]. Sept. 21.41: CCD images w/ 0.5-m Uppsala D, stacked w/ *Astrometrica 4.4.1.364* software; total mag 16.0 (UCAC-2 catalogue presumably used for comp.-star mags); diffuse tail 15″ long in p.a. 100°; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Obs., Australia].

◇ *Comet 128P/Shoemaker-Holt* ⟹ 2007 Oct. 16.75: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.41$ [TSU02].

◇ *Comet 136P/Mueller* ⟹ 2007 Oct. 11.49: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.53$ [TSU02].

◇ *Comet 139P/Vaisala-Oterma* ⟹ 2007 Sept. 6.91-6.95: CCD images show the comet to be diffuse without cond.; recovery, w/ indicated correction to the ephemeris prediction being +0′.5 in α and +0′.2 in δ; astrometry contributed to Minor Planet Center [NEV]. Oct. 11.57: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.49$ [TSU02].

◇ *Comet 188P/2007 J7 (LINEAR-Mueller)* ⟹ 2007 Oct. 6.64: "unexpectedly seen (extremely faint and small, near limit), and I spent much time to confirm that it was really the comet; it was not visible on the previous night" [YOS04]. Oct. 11.44: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.66$ [TSU02]. Oct. 11.96: nearby field stars checked via Digitized Sky Survey; comp.-star mags taken from Henden photometry near EI Psc [GON05]. Oct. 14.86: very faint object; close to star of mag 15; field checked via Digitized Sky Survey [BOU].

◇ *Comet 189P/2007 N2 (NEAT)* ⟹ 2007 Aug. 9.63: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.54$ [TSU02]. Aug. 24.51: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.83$ [TSU02].

◇ *Comet 191P/2007 N1 (McNaught)* ⟹ 2007 Sept. 11.40: w/ 0.68-m D + CCD, four combined 30-sec images spanning Sept. 11.398-11.420 show mag 16.0-16.3; well-condensed coma ≈ 1′ in dia. and a tail 10′ long in p.a. ≈ 260°-265° [R. E. Hill, Catalina Mountain, Arizona]. Oct. 11.69: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V$ = +0.56 [TSU02].

◇ *Comet C/2005 EL_{173} (LONEOS)* ⟹ 2007 Oct. 19.66: CCD image w/ 0.5-m Uppsala D yields total mag 15.6 (UCAC-2 catalogue presumably used for comp.-star mags); images stacked w/ *Astrometrica 4.4.1.364* software; 40″ coma with no tail; strong central cond.; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Observatory, Australia].

◇ *Comet C/2005 L3 (McNaught)* ⟹ 2007 Aug. 5.88 and Sept. 13.83: search ephemeris from MPC website; checked with Digitized Sky survey; limiting stellar mag 15.5 [HAS02]. Aug. 9.59: comp. star has $B-V$ = +0.66 [TSU02]. Aug. 9.59, 24.58, Sept. 10.51, and Oct. 2.43: `Guide 8.0` software used for comp.-star mags. [TSU02]. Aug. 24.48, Sept. 10.51, and Oct. 2.43: comp. star has $B-V$ = +0.71 [TSU02]. Sept. 7.91: mountain location, very clear sky; nearby field stars checked via Digitized Sky Survey [GON05]. Oct. 5.40: very small, but strongly condensed and clearly visible [YOS04]. Oct. 6.41: poor sky conditions [YOS04].

◇ *Comet C/2005 S4 (McNaught)* ⟹ 2007 Sept. 10.55: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V$ = +0.71 [TSU02].

◇ *Comet C/2006 K1 (McNaught)* ⟹ 2007 Oct. 20.61: CCD image w/ 0.5-m Uppsala D yields total mag 16.1 and a 30″ coma; images stacked w/ *Astrometrica 4.4.1.364* software show a diffuse tail extending to 3′.6 in p.a. 215°; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Observatory, Australia].

◇ *Comet C/2006 K3 (McNaught)* ⟹ 2007 July 25.77: `Guide 8.0` software used for comp.-star mags; $B-V$ values of comp. stars were +0.62, +0.85, and +0.85 [YOS02].

◇ *Comet C/2006 OF_2 (Broughton)* ⟹ 2007 Aug. 10.12: mountain location, very clear sky; nearby field stars checked via Digitized Sky Survey [GON05]. Aug. 10.12, Sept. 7.87, 9.96, Oct. 11.88: comp.-star mags taken from Henden photometry near HU Aqr [GON05]. Sept. 13.84: search ephemeris from MPC website; checked w/ Digitized Sky survey; limiting stellar mag 15.5 [HAS02]. Oct. 5.41 and 6.42: already bright and easy to see; somewhat diffuse and dim [YOS04]. Oct. 14.80: comet close to a couple of 14th-mag stars [BOU]. Oct. 16.46: `Guide 8.0` software used for comp.-star mags; $B-V$ values of comp. star was +0.54 [TSU02].

◇ *Comet C/2006 P1 (McNaught)* ⟹ 2007 Jan. 12.61: ref. for mag was Venus [NOV01].

◇ *Comet C/2006 S5 (Hill)* ⟹ 2007 Oct. 5 and 6: not visible because it was close to moon, and the area was covered by thin clouds both nights [YOS04].

◇ *Comet C/2006 U6 (Spacewatch)* ⟹ 2007 Oct. 5.68 and 19.54: CCD image w/ 0.5-m Uppsala D yields total mag 15.5 (UCAC-2 catalogue presumably used for comp.-star mags); images stacked w/ *Astrometrica 4.4.1.364* software; 30″ coma; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Observatory, Australia]. Oct. 5.68: tail 1′.0 long in p.a. 320° [R. H. McNaught, Siding Spring Obs., Australia]. Oct. 19.54: strong central cond.; broad tail 80″ long in p.a. 345° [R. H. McNaught, Siding Spring Obs., Australia].

◇ *Comet C/2006 VZ_{13} (LINEAR)* ⟹ 2007 Aug. 1.93 and 3.93: comp. stars have V = 7.79 ($B-V$ = +0.18) and 7.90 (+0.29) [AMO01]. Aug. 2.28: obs. from at the foot of Koko Head on Oahu island, Hawaii [YOS04]. Aug. 4.84 and 5.84: obs. ≈ 15° above horizon; twilight [LEH]. Aug. 6.37: "strongly enhanced through Swan Band filter" [SEA]. Aug. 7.92: comp. stars have V = 8.14 ($B-V$ = +1.02) and 8.36 (+1.05) [AMO01]. Aug. 8.37: "not as easily visible as on previous nights" [SEA]. Aug. 8.51: `Guide 8.0` software used for comp.-star mags [YOS02]. Aug. 9.46: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V$ = +0.47 [TSU02]. Aug. 14.40: "not very obvious in cone of zodiacal light, but enhanced through Swan Band filter" [SEA]. Aug. 15.39: "at 71× in 25.4-cm L, comet appeared centrally condensed but without stellar cond.; w/ averted vision, a spike of ion tail extended from center of coma toward E, but could not be traced beyond outer boundary of coma" [SEA]. Aug. 20.91 and 21.91: comp. stars have V = 9.32 ($B-V$ = +1.17) and 9.92 (+0.95); moonlight [AMO01]. Aug. 25.91: moonlight [DES01].

◇ *Comet C/2007 F1 (LONEOS)* ⟹ 2007 Sept. 15.20: comet not obs.; geograph. lat. +43° [GON05]. Sept. 15.20 and Oct. 24.79: alt. 5° [GON05]. Sept. 15.20, 20.20, 23.20, Oct. 25.78, and 27.78: astron. twilight [GON05]. Sept. 15.20, 20.20, 23.20, Oct. 5.20, 12.21, 19.80, 25.78, and 27.78: mountain location, (very) clear sky [GON05]. Sept. 20.20, Oct. 14.81, 25.78, and 27.78: alt. 6° [GON05]. Sept. 23.20, Oct. 12.21, 13.80, 19.80, and 20.79: alt. 7° [GON05]. Oct. 5.20: alt. 8° [GON05]. Oct. 5.20 and 12.21: zodiacal light [GON05]. Oct. 5.82: very strong central cond. and bright coma; $B-V$ values of comp. stars were +0.54, +0.56, and +0.61 [KAD02]. Oct. 5.83 and 6.83: extremely low in the sky when dark, but obs. comet after twilight began and the comet was higher; "surprised that it looked very strongly condensed and easy to see on Oct. 5; however, it was much harder to see on Oct. 6 than the previous day, possibly due to the sky conditions" [YOS04]. Oct. 6.80 and 22.33: `StellaNavigator (ver. 8)` software used for comp.-star mags [OOT]. Oct. 7.16: comet at alt. 10°; comp. stars within 1° of comet's alt. [MEY]. Oct. 7.77: strongly condensed coma w/ steep brightness increase towards center; obs. under significantly brightened sky background [KAM01]. Oct. 7.77-23.72: images show a narrow gas tail and a shorter and more-diffuse dust tail; the tab. tail lengths and position angles refer to the former component [QVA]. Oct. 7.78: briefly but clearly seen before the comet sank in hazy murk near the horizon [BOU, DIJ]. Oct. 7.78: w/ 10.0-cm R, comet showed a diffuse and blue-green coma w/ an apparently stellar central cond. of mag

9.2 (ref = TK); the coma appeared smaller and somewhat fainter than M3; no tail was seen; comet was also fairly easily seen through 7×50 B [GRA04]. Oct. 9.69, 10.68, and 12.69: alt. 15°; small-city light pollution; comp.-star mags from `Cartes du Ciel 2.76` software ("Electronic Sky", `www.astrosurf.com/astropc`), evidently involving something called `Program StarCalc 5.73` [NOV01]. Oct. 9.83 and 21.38: `StellaNavigator (ver. 8.1)` software used for comp.-star mags [NAG08]. Oct. 10.17: alt. 17°; solar alt. −13° [GRA04]. Oct. 10.80: comet still somewhat fainter than M3, although the globular cluster was seen at a higher alt. (7° *vs.* 14°); some interference from high clouds [GRA04]. Oct. 13.75: "more condensed and smaller than 6 days ago" [MEY]. Oct. 13.76: onset of tail visible in p.a. 350° [DIJ]. Oct. 13.76: coma morphology similar to Oct. 7; no false nucleus visible; obs. under medium-brightened sky background [KAM01]. Oct. 14.08: as per Oct. 9.69, except alt. 11° [NOV01]. Oct. 14.76: coma morphology unchanged; no false nucleus discernible; faint, narrow tail surprisingly well visible under a transparent sky [KAM01]. Oct. 16.76: comet quite easily seen due to a dark sky background; apparent brightess of coma was similar to M3; tail not visible; alt. 10°; solar alt. −17° [GRA04]. Oct. 17.38: $B-V$ values of comp. stars were +0.51 and +0.52 [TSU02]. Oct. 17.38 and 21.38: `Guide 8.0` software used for comp.-star mags [TSU02]. Oct. 17.75: w/ 9×63 B, soft "star" in deep twilight sky; w/ 20-cm T (50×), surprisingly small, very condensed coma w/o a discernible false nucleus; faint tail rather well visible [KAM01]. Oct. 17.76: CCD image taken w/ 10-cm R (+ V filter) shows an asymmetric coma, along w/ a narrow ion tail and a diffuse and shorter dust tail [QVA, via GRA04]. Oct. 17.80: well visible as a diffuse star, despite a true alt. of only 4°.3 [GRA04]. Oct. 19.80, 20.79, 24.79, 25.78, and 27.78: moonlight [GON05]. Oct. 21.00: twilight [CRE01]. Oct. 21.38: comp. star has $B-V$ = +0.51 [TSU02]. Oct. 21.39: `Guide 8.0` software used for comp.-star mags [NAG04]. Oct. 21.68: as per Oct. 9.69, except alt. 10° [NOV01]. Oct. 23.75: moonlight; brief obs. through well-placed gap in drifting cloud [BOU].

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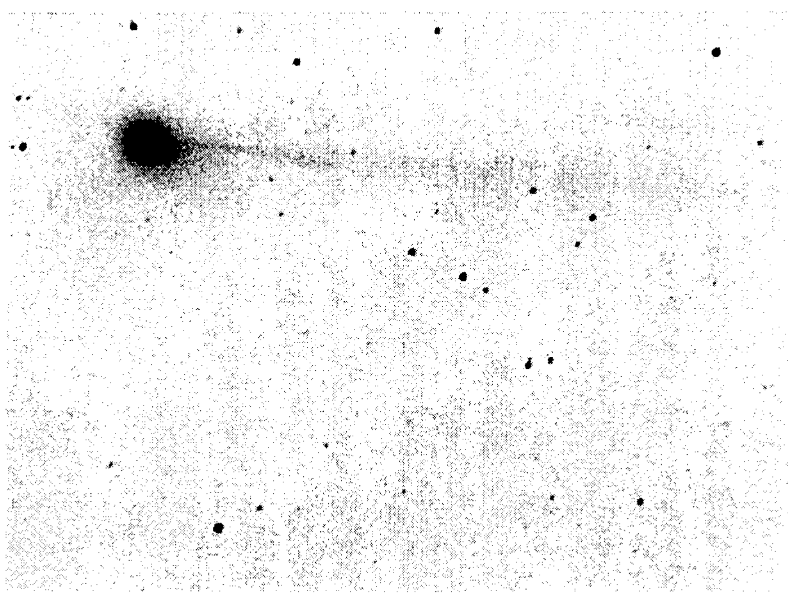

V-band CCD image of comet C/2007 F1 taken by Jan Qvam (Borrevannet, Horten, Norway) using the Horten Natursenter's 10-cm R on 2007 Oct. 17.76. Visible is an asymmetric coma and a narrow ion tail, plus a shorter, diffuse dust tail.

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◇ *Comet C/2007 G1 (LINEAR)* ⟹ 2007 Aug. 9.53, 24.47, Sept. 10.48, 14.48, and Oct. 17.42: `Guide 8.0` software used for comp.-star mags [TSU02]. Aug. 9.53, 24.47, and Sept. 10.48: comp. star has $B-V$ = +0.51 [TSU02]. Sept. 14.48: comp. star has $B-V$ = +0.34 [TSU02]. Oct. 17.42: comp. star has $B-V$ = +0.63 [TSU02].

◇ *Comet P/2007 H1 (McNaught)* ⟹ 2007 Aug. 9.66: comp. star has $B-V$ = +0.59 [TSU02]. Aug. 9.66, Sept. 10.60, and Oct. 11.54: `Guide 8.0` software used for comp.-star mags [TSU02]. Aug. 16.16: mountain location, very clear sky; nearby field stars checked via Digitized Sky Survey [GON05]. Aug. 16.16, Sept. 8.10, 10.02, 15.16, 20.16, 23.17: comp.-star mags taken from Henden photometry near WW Cet [GON05]. Sept. 10.60: comp. star has $B-V$ = +0.56 [TSU02]. Sept. 20.88: search ephemeris from MPC website; checked w/ Digitized Sky survey; limiting stellar mag 15.5 [HAS02]. Oct. 5.48 and 6.60: "very easy to see; significantly brighter than the other 13th- to 14th-mag comets on the same night; it looked similar to C/2003 WT$_{42}$ in 2006, as it does on the CCD images" [YOS04]. Oct. 11.54: comp. star has $B-V$ = +0.54 [TSU02].

◇ *Comet C/2007 P1 (McNaught)* ⟹ 2007 Aug. 14.76-14.82: CCD images w/ 0.5-m Uppsala D; five 60-sec frames stacked w/ *Astrometrica 4.4.1.364* software, showing tails 1'.0 long in p.a. 340° and 0'.3 long in p.a. 155°; comet diffuse in poor seeing; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Observatory, Australia].

◇ *Comet P/2007 R1 (Larson)* ⟹ 2007 Oct. 16.52: `Guide 8.0` software used for comp.-star mags; comp. star has

$B-V = +0.52$ [TSU02].

◇ *Comet P/2007 R2 (Gibbs)* ⟹ 2007 Sept. 26.34: CCD images taken w/ the 1.5-m L show a "fuzzy object w/ a tail at least 10″ long in p.a. 250° (at least 30° wide); mag 18.5-18.9 in four astrometric exposures submitted to Minor Planet Center [A. Boattini, Mt. Lemmon, Arizona].

◇ *Comet P/2007 R4 (Garradd)* ⟹ 2007 Oct. 11.65: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.61$ [TSU02]. Oct. 16.72: CCD image w/ 0.5-m Uppsala D yields total mag 18.0; images stacked w/ *Astrometrica 4.4.1.364* software, showing the comet to be diffuse w/ a 20″ tail in p.a. 260°; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Observatory, Australia].

◇ *Comet P/2007 S1 (Zhao)* ⟹ 2007 Oct. 16.57: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.61$ [TSU02].

◇ *Comet C/2007 T1 (McNaught)* ⟹ 2007 Oct. 10.40: `Guide 8.0` software used for comp.-star mags; comp. star has $B-V = +0.53$ [TSU02]. Oct. 11.42: `Guide 8.0` software used for comp.-star mags [YOS02]. Oct. 11.83, 13.82, and 14.82: mountain location, very clear sky; zodiacal light [GON05]. Oct. 14.40: two 20-sec CCD exposures separately yield total mag 12.4 (comet "clear of interfering stars, so mag is likely reliable") [R. H. McNaught, Siding Spring Observatory, Australia]. Oct. 14.40, 19.41, and 21.40: CCD images taken w/ 50-cm Uppsala D; astrometry sent to Minor Planet Center [R. H. McNaught, Siding Spring Obs., Australia]. Oct. 19.41, 21.40, and 21.41: images stacked w/ *Astrometrica 4.4.1.364* software; inner coma is strongly asymmetric, and brighter to the east; CCD exposures separately yield total mag 12.9 (UCAC-2 catalogue presumably used for comp.-star mags) [R. H. McNaught, Siding Spring Obs., Australia]. Oct. 19.41: strong central cond. [R. H. McNaught, Siding Spring Obs., Australia].

◇ *Comet C/2007 T5 (Gibbs)* ⟹ 2007 Oct. 23.44: CCD images w/ 70-cm L (astrometry submitted to Minor Planet Center) show a faint, narrow, straight tail ≈ 1′ long in p.a. ≈ 290°; mag of condensed center 18.0-19.5 over 0.03 day (not necessarily a real variation – Ed.) [G. Hug, Eskridge, KS, U.S.A.].

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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 [16 = Japanese observers (via Akimasa Nakamura, Kuma, Ehime); 32 = Hungarian observers (via Krisztián Sárneczky, Budapest); etc.]:*

AMO01	35	Alexandre Amorim, Brazil
BOU		Reinder J. Bouma, Netherlands
BRU	42	Ivan S. Brukhanov, Belarus
CHE03	33	Kazimieras T. Cernis, Lithuania
COM	11	Georg Comello, The Netherlands
CRE01		Phillip J. Creed, OH, U.S.A.
DAH	24	Haakon Dahle, Norway
DES01		Jose G. de Souza Aguiar, Brazil
DIE02		Alfons Diepvens, Belgium
DIJ		Edwin van Dijk, The Netherlands
*FER04		David Fernandez, Spain
FOG		Sergio Foglia, Italy
FUK02	16	Hideo Fukushima, Tokyo, Japan
GIA01		Antonio Giambersio, Italy
GIL01	11	Guus Gilein, The Netherlands
*GOB01		Franck Gobet, Cestas, France
GOL	19	Vladimir A. Golubev, Belarus
GON05		Juan Jose Gonzalez, Spain
GON06		Virgilio Gonano, Udine, Italy
GRA04	24	Bjoern Haakon Granslo, Norway
GRE		Daniel W. E. Green, U.S.A.
HAS02		Werner Hasubick, Germany
KAD02	16	Ken-ichi Kadota, Ageo, Japan
KAM01		Andreas Kammerer, Germany
KAR02	21	Timo Karhula, Virsbo, Sweden
KAR03	32	Ádám Kárp'ati, Hungary
LAB02		Carlos Labordena, Spain
LEH		Martin Lehky, Czech Republic
LIN04		Michael Linnolt, HI, U.S.A.
MAC		Donald E. Machholz, CA, U.S.A.
MAR02	13	Jose Carvajal Martinez, Spain
MAR03		Brian G. Marsden, MA, U.S.A.
MCA		Stephen McAndrew, NSW, Australia
MEY	28	Maik Meyer, Germany
MIT	16	Shigeo Mitsuma, Honjo, Japan
MIY01	16	Osamu Miyazaki, Ishioka, Japan
MOM	16	Masahiko Momose, Shiojiri, Japan
MOR09		Philippe Morel, France
MUR02	16	Shigeki Murakami, Niigata, Japan
NAG04	16	Kazuro Nagashima, Ikoma, Japan
NAG08	16	Yoshimi Nagai, Gunma, Japan
NAK07		Syuichi Nakano, Japan
NEV	42	Vitali S. Nevski, Belarus
*NOV01		Artyom O. Novichonok, Russia
OOT	16	Isao Ootsuki, Marumori, Japan
PAR03	18	Mieczyslaw L. Paradowski, Poland
PER01		Alfredo J. S. Pereira, Portugal
PIL01		Uwe Pilz, Leipzig, Germany
*QVA	24	Jan Qvam, Borrevannet, Norway
*RAO		Joe Rao, NY, U.S.A.
SAN07	32	Gâbor Sânta, Hungary
SCA02		Toni Scarmato, Calabria, Italy
SEA	14	David A. J. Seargent, Australia
SHU	42	Sergey E. Shurpakov, Belarus
SKI	24	Oddleiv Skilbrei, Norway
SOU01	35	Willian C. de Souza, Brazil
SZA		Sândor Szabô, Sopron, Hungary
TOT03	32	Zoltân Tôth, Hungary

TSU02 16	Mitsunori Tsumura, Japan	YE	Quanzhi Ye, Guangzhou, China
WAR01	Johan Warell, Sweden	YOS02 16	Katsumi Yoshimoto, Hirao, Japan
*WHE01	Russell Wheeler, Edmond, OK, USA	YOS04 16	Seiichi Yoshida, Kanagawa, Japan

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NOTE: *The tabulated CCD data summary begins on page 144 of this issue.*

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Tabulated Visual-Data Summary

As begun the July 2007 issue, we now publish summaries of contributed tabulated data instead of publishing each line of observation that is contributed to the *ICQ*; the following format serves the purpose of summarizing all the comets that had data reported with their observational arcs for each observer. The full 80-character observation records are posted at the *ICQ* website (`http://www.cfa.harvard.edu/icq/icqobs.html`), and are available upon request by e-mail to the *ICQ* Editor.

The tabulation below lists, for each comet, the first and last observation (with associated total visual magnitude estimate) for each observer, listed in alphabetical order of the observers within each comet's listing (the usual 3-letter, 2-digit observer code coming under the column `Obs.`, whose key is provided above). The final column (separated by a slash, /, from the observer code) provides the number of individual 80-character observation records entered into the *ICQ* archive from that observer for the particular comet for this issue; when only one observation was submitted by a specific observer for a given comet, the last column is left blank (with no slash mark after the observer code). The complete observations in their 80-column form are posted at the *ICQ* website and can be obtained directly by request from the *ICQ* Editor.

Comet 8P/Tuttle

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 30.76	13.2			BOU
2007 10 30.77	12.7			DIJ
2007 09 08.01	[15.2			MAR02
2007 09 14.90	13.3:	2007 09 16.04	13.5:	PAR03/ 2
2007 10 16.69	[12.8	2007 10 18.68	[13.2	YOS02/ 2
2007 10 05.43	[14.6	2007 10 06.43	[14.5	YOS04/ 2

Comet 17P/Holmes

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 27.10	1.9	2007 10 28.16	2.7	AMO01/ 5
2007 10 30.03	2.4	2007 10 30.77	2.5	BOU / 4
2007 10 25.83	2.3	2007 10 29.70	2.8	BRU / 5
2007 10 26.67	2.2	2007 10 31.81	2.5	CHE03/ 10
2007 10 30.05	2.8	2007 10 30.76	2.7	COM / 2
2007 10 25.15	2.6	2007 10 30.05	2.6	CRE01/ 5
2007 10 24.93	2.7	2007 10 28.75	2.5	DAH / 4
2007 10 28.13	2.1	2007 10 28.14	2.2	DES01/ 2
2007 10 30.78	2.3	2007 10 31.77	2.3	DIE02/ 2
2007 10 29.84	2.3	2007 10 30.77	2.6	DIJ / 4
2007 10 25.21	2.9			FER04
2007 10 27.74	2.1			FOG
2007 10 24.78	3.0	2007 10 24.82	2.8	FUK02/ 2
2007 10 24.80	2.7	2007 10 28.71	2.8	GIA01/ 2
2007 10 29.89	2.6	2007 10 30.77	2.5	GIL01/ 3
2007 10 26.82	2.6	2007 11 01.90	3.0	GOB01/ 10
2007 10 29.86	2.4	2007 10 30.81	2.6	GOL / 2
2007 10 24.80	2.7	2007 10 31.81	2.8	GON05/ 10
2007 10 28.81	2.7			GON06
2007 10 24.89	2.6	2007 10 31.10	9.0	GRA04/ 11
2007 10 26.20	2.6	2007 10 31.22	2.5	GRE / 5
2007 10 28.74	2.4	2007 10 31.80	2.4	KAM01/ 3

Comet 17P/Holmes [cont.]

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 30.76	2.4			KAR02
2007 10 25.33	2.7	2007 10 30.32	2.5	LIN04/ 2
2007 10 25.84	2.3	2007 10 31.90	2.7	MAR02/ 6
2007 10 26.12	2.6			MAR03
2007 10 31.00	2.4	2007 10 31.81	2.5	MEY / 4
2007 10 24.60	3.5	2007 10 30.82	2.6	MIT / 8
2007 10 24.52	3.8	2007 10 29.45	2.8	MIY01/ 4
2007 10 25.44	2.6			MOM
2007 10 31.86	2.3			MOR09
2007 10 25.42	2.8	2007 10 28.43	2.5	MUR02/ 3
2007 10 28.48	2.5	2007 10 31.60	2.6	NAG04/ 2
2007 10 27.57	2.4	2007 10 31.57	2.4	NAG08/ 6
2007 10 24.79	2.7	2007 10 30.69	2.5	NEV / 5
2007 10 30.64	2.6			NOV01
2007 10 27.91	2.4	2007 10 29.92	2.4	PAR03/ 7
2007 10 26.07	2.6	2007 10 31.88	2.4	PER01/ 6
2007 10 27.92	2.6	2007 10 31.75	1.9	PIL01/ 4
2007 10 28.10	2.5	2007 10 29.12	2.5	RAO / 2
2007 10 26.58	2.4			SEA
2007 10 24.68	3.0	2007 10 29.98	2.6	SHU / 11
2007 10 25.75	2.4	2007 10 30.90	2.2	SKI / 4
2007 10 27.16	2.2	2007 10 27.16	2.3	SOU01/ 3
2007 08 15.03	14.4			TOT03
2007 10 25.61	2.3			TSU02
2007 10 25.81	2.6	2007 10 30.91	2.2	WAR01/ 3
2007 10 26.39	2.3	2007 10 30.45	2.6	WHE01/ 4
2007 10 25.6	3.2			YE
2007 10 24.81	2.8	2007 10 30.54	2.4	YOS02/ 9
2007 10 05.74	[14.1	2007 10 31.47	2.7	YOS04/ 20

Comet 29P/Schwassmann-Wachmann

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 05.77	14.1			YOS04

Comet 46P/Wirtanen

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 13.07	[15.4			MAR02

Comet 50P/Arend

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 08.04	[14.9			MAR02
2007 09 14.93	12.8:	2007 09 16.02	13.4:	PAR03/ 2
2007 10 05.73	[14.2	2007 10 06.65	[14.3	YOS04/ 2

Comet 73P/Schwassmann-Wachmann [component C stated or presumed]

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2006 04 30.89	6.2			NOV01

Comet 93P/Lovas

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 14.83	13.7	2007 10 30.79	13.4	BOU / 2
2007 10 30.79	13.1			DIJ
2007 09 10.18	14.3			GON05
2007 09 20.89	13.2			HAS02

Comet 93P/Lovas [cont.]

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 16.00	13.9			LAB02
2007 08 13.10	[15.1	2007 10 13.90	13.8	MAR02/ 3
2007 09 21.97	14.3			NEV
2007 09 16.00	12.7:			PAR03
2007 09 15.92	13.5			SZA
2007 09 09.95	15.1	2007 09 13.87	15.1	TOT03/ 2
2007 10 05.48	13.4	2007 10 06.62	13.4	YOS04/ 2

Comet 96P/Machholz

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 04 05.08	[5 :	2007 07 07.40	[13.5	MAC / 57

Comet 110P/Hartley

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 08.05	[15.3			MAR02
2007 10 05.76	[14.4			YOS04

Comet 188P/LINEAR-Mueller

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 14.86	14.2:			BOU
2007 10 11.96	13.8			GON05
2007 10 05.46	[14.1	2007 10 06.64	14.4	YOS04/ 2

Comet C/2005 L3 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 07.91	14.3			GON05
2007 08 05.88	14.1	2007 09 13.83	14.2	HAS02/ 2
2007 08 23.86	13.4	2007 09 08.84	13.8	LAB02/ 2
2007 08 04.85	13.8	2007 08 14.86	13.9	LEH / 4
2007 08 12.99	15.2	2007 09 07.93	15.3	MAR02/ 2
2007 08 18.86	13.6:	2007 08 18.87	13.3:	PAR03/ 2
2007 08 05.86	14.6	2007 09 13.83	15.0	TOT03/ 4
2007 10 05.40	14.1	2007 10 06.41	[13.9	YOS04/ 2

Comet C/2006 OF_2 (Broughton)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 14.80	13.5:			BOU
2007 08 10.12	14.2	2007 10 11.88	13.5	GON05/ 4
2007 09 13.84	13.6			HAS02
2007 09 08.90	13.6	2007 09 15.97	13.6	LAB02/ 2
2007 08 13.02	14.1	2007 10 13.91	14.9	MAR02/ 3
2007 09 14.83	14.0	2007 10 11.73	14.2	NEV / 2
2007 09 14.87	13.8:			PAR03
2007 09 15.82	14.4			SZA
2007 08 05.88	14.5	2007 09 13.84	14.6	TOT03/ 4
2007 10 05.41	13.5	2007 10 06.42	13.5	YOS04/ 2

Comet C/2006 P1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 12.61	-4.0:			NOV01

Comet C/2006 S5 (Hill)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 17.01	13.6:			PAR03

Comet C/2006 VZ_13 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 01.93	7.8	2007 08 21.91	9.5	AMO01/ 5
2007 08 25.91	10.2			DES01
2007 08 03.90	8.1	2007 08 09.90	8.4	GON05/ 3
2007 08 01.87	8.2			HAS02
2007 07 08.96	7.7			KAR03
2007 08 04.86	8.6	2007 08 23.85	9.0	LAB02/ 2
2007 08 01.86	8.1	2007 08 05.84	8.4	LEH / 3
2007 08 05.28	9.0			LIN04
2007 08 02.85	8.6:	2007 08 06.83	8.8:	PAR03/ 2
2007 08 04.42	8.6	2007 08 15.39	9.1	SEA / 5
2007 08 08.51	9.2			YOS02
2007 08 02.28	8.2			YOS04

Comet C/2007 E2 (Lovejoy)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 04.89	13.8	2007 08 14.84	14.3	LEH / 4

Comet C/2007 F1 (LONEOS)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 02.79	7.6	2007 10 23.75	5.5:	BOU / 8
2007 10 16.70	6.8	2007 10 19.70	6.0	CHE03/ 2
2007 10 21.00	5.3			CRE01
2007 10 14.75	6.4	2007 10 20.74	5.8	DIE02/ 4
2007 10 02.78	7.8	2007 10 22.74	5.6	DIJ / 9
2007 09 15.20	[10.0	2007 10 27.78	5.2	GON05/ 18
2007 10 06.16	7.2	2007 10 17.80	6.1	GRA04/ 8
2007 09 24.14	9.5	2007 10 18.73	6.3	HAS02/ 2
2007 10 07.77	6.8:	2007 10 17.75	6.3	KAM01/ 5
2007 10 20.77	6.5	2007 10 21.77	6.2	LAB02/ 2
2007 10 07.16	6.7	2007 10 15.18	6.2	MEY / 3
2007 10 21.39	6.0			NAG04
2007 10 09.83	7.0	2007 10 21.38	5.3	NAG08/ 2
2007 10 09.69	[6.0	2007 10 21.68	5.7	NOV01/ 6
2007 10 06.80	7.8:	2007 10 22.33	5.4:	OOT / 2
2007 09 30.74	8.4	2007 10 20.72	5.7:	PAR03/ 4
2007 10 05.83	7.7			PIL01
2007 10 05.83	7.5	2007 10 06.83	7.4	YOS04/ 2

Comet P/2007 H1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 13.96	12.8	2007 10 14.89	12.8	BOU / 2
2007 09 08.11	13.3			DES01
2007 09 13.97	12.6			DIJ
2007 08 16.16	13.5	2007 10 11.91	12.7	GON05/ 7
2007 09 20.88	13.5			HAS02
2007 09 08.98	13.3	2007 09 16.02	13.5	LAB02/ 2
2007 08 13.09	14.3	2007 10 13.89	14.0	MAR02/ 3
2007 09 21.96	13.5			NEV
2007 09 15.97	13.5:			PAR03
2007 09 16.00	13.3			SAN07
2007 10 08.50	13.1	2007 10 09.44	13.2	SEA / 2
2007 08 15.01	14.0	2007 09 09.94	14.2	TOT03/ 2
2007 10 05.48	12.6	2007 10 06.60	13.0	YOS04/ 2

Comet C/2007 T1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 14.77	10.7			BOU
2007 10 11.82	11.1	2007 10 14.82	10.3	GON05/ 4
2007 10 14.24	10.6			LIN04
2007 10 13.81	10.4			MAR02
2007 10 11.42	11.6			YOS02

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Tabulated CCD-Data Summary

The tabulation below lists, for each comet, the first and last observation, with associated CCD magnitude measurement and "passband" (the one-letter code following the magnitude being the "magnitude method", which for CCDs has C = unfiltered CCD, k = Cousins *R*-band, etc.) for each observer, listed in alphabetical order of the observers within each comet's listing (the usual 3-letter, 2-digit observer code coming under the column Obs., whose key is provided above). The final column (separated by a slash, /, from the observer code) provides the number of individual 80-character observation records entered into the *ICQ* archive from that observer for the particular comet for this issue; when only one observation was submitted by a specific observer for a given comet, the last column is left blank (with no slash mark after the observer code). The complete observations in their 80-column form are posted at the *ICQ* website and can be obtained directly by request from the *ICQ* Editor. See the remarks on pages 96 and 105 of the July 2007 issue, and page 140 of this issue, for additional information on this new summary tabulation.

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Comet 2P/Encke

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 04.44	17.2 C	2007 08 08.40	17.6 C	MCA / 3
2007 04 07.83	8.9 V	2007 04 11.84	8.8 V	QVA / 2
2007 01 14.66	15.0 C			SHU

Comet 4P/Faye

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2006 12 16.82	12.7 C	2007 04 06.75	14.2 C	SHU / 16

Comet 8P/Tuttle

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 02.94	18.3 c	2007 09 06.85	18.5 c	NEV / 4
2007 10 09.96	15.9 C	2007 10 30.80	14.8 C	SHU / 4
2007 08 09.69	18.3 C	2007 10 16.62	16.4 C	TSU02/ 3

Comet 17P/Holmes

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 15.99	16.5 C	2007 09 21.06	16.4 C	NEV / 4
2007 10 29.85	2.4 V			QVA
2007 10 09.86	16.4 C	2007 10 25.68	2.9 C	SHU / 4
2007 08 09.75	15.5 C			TSU02
2007 07 25.72	15.7 C	2007 10 27.48	6.3 c	YOS02/ 3

Comet 29P/Schwassmann-Wachmann

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 02.97	17.4 C	2007 09 11.06	16.7 C	NEV / 2
2007 01 14.75	16.2 C	2007 10 16.88	15.5 C	SHU / 8

Comet 44P/Reinmuth

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 09.57	17.9 C			TSU02

Comet 46P/Wirtanen

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 09.51	17.3 C	2007 10 02.44	17.3 C	MCA / 14
2007 10 16.49	15.4 C			TSU02

Comet 50P/Arend

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 07.02	17.4 C	2007 09 20.97	16.8 C	NEV / 3
2007 10 09.80	15.3 C	2007 10 30.70	16.0 C	SHU / 3
2007 08 09.73	17.2 C	2007 10 11.62	16.0 C	TSU02/ 2

Comet 75P/Kohoutek

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 10.04	16.8 C			SHU

Comet 76P/West-Kohoutek-Ikemura

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 14.81	16.5 C	2007 01 18.10	16.4 C	SHU / 2

Comet 93P/Lovas

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 07.95	16.7 C	2007 09 20.95	15.2 C	NEV / 5
2007 08 16.97	14.7 C	2007 10 30.71	13.4 C	SHU / 7
2007 10 11.40	14.0 C			TSU02

Comet 96P/Machholz

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 04 19.79	8.5 C			NAK07
2007 05 06.01	12.9 C	2007 06 08.90	14.5 C	SHU / 7
2007 08 09.50	17.3 C			TSU02

Comet 108P/Ciffreo

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 11.08	17.4 C			NEV

Comet 110P/Hartley

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 08.96	18.2 C			NEV

Comet 113P/Spitaler

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 20.89	18.4 C			NEV

Comet 125P/Spacewatch

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 09.47	16.0 C	2007 09 14.44	16.3 C	TSU02/ 3

Comet 128P/Shoemaker-Holt

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 10.07	16.8 C			SHU
2007 10 16.75	18.8 C			TSU02

Comet 136P/Mueller

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 01.51	17.5 C	2007 10 13.54	17.9 C	MCA / 6
2007 10 11.49	16.7 C			TSU02

Comet 139P/Vaisala-Oterma

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 06.93	18.9 C			NEV
2007 10 11.57	17.4 C			TSU02

Comet 177P/Barnard

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2006 07 13.86	13.1 C	2006 08 14.80	15.9 C	SCA02/244

Comet 188P/LINEAR-Mueller

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 20.85	15.8 C			NEV
2007 10 16.75	15.0 C			SHU
2007 10 11.44	15.5 C			TSU02

Comet 189P/NEAT

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 07 31.87	17.4 c	2007 08 21.85	18.2 c	NEV / 8
2007 08 09.63	17.3 C	2007 08 24.51	17.9 C	TSU02/ 2

Comet 191P/McNaught

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 07.00	17.1 C	2007 09 21.01	17.1 C	NEV / 2
2007 10 16.99	15.3 C	2007 10 30.84	15.0 C	SHU / 2
2007 10 11.69	15.9 C			TSU02

Comet C/2002 VQ_94 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 02 23.98	16.3 C	2007 04 15.96	15.0 C	SHU / 4

Comet C/2003 WT_42 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 02 16.76	14.9 C	2007 04 14.94	15.4 C	SHU / 5

Comet C/2004 B1 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 02 24.01	16.2 C			SHU

Comet C/2005 E2 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 13.04	16.0 C	2007 02 25.77	16.5 C	SHU / 6

Comet C/2005 EL_173 (LONEOS)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 24.72	16.9 C	2007 09 24.74	16.7 C	MCA / 2

Comet C/2005 L3 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 07 31.85	14.8 C	2007 08 09.89	14.8 C	NEV / 2
2007 08 03.84	14.2 C	2007 10 16.70	14.5 C	SHU / 8
2007 08 09.59	14.6 C	2007 10 02.43	15.1 C	TSU02/ 4

Comet C/2005 S4 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 30.76	17.0 C			SHU
2007 09 10.55	17.4 C			TSU02

Comet P/2006 HR_30 (Siding Spring)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 09.70	14.2 C	2007 01 22.77	13.9 C	SHU / 5

Comet C/2006 K1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 01.74	17.0 C	2007 10 02.73	16.9 C	MCA / 4

Comet C/2006 K3 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 11.00	18.3 C			NEV
2007 10 09.86	16.6 C	2007 10 16.87	16.5 C	SHU / 2
2007 07 25.77	16.5 C			YOS02

Comet C/2006 K4 (NEAT)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 07.56	16.3 C	2007 08 08.40	16.1 C	MCA / 2

Comet C/2006 L1 (Garradd)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 13.04	14.7 C	2007 01 22.78	14.0 C	SHU / 4

Comet C/2006 L2 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 18.08	14.8 C			SHU

Comet C/2006 M4 (SWAN)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 01 10.63	10.9 C	2007 01 12.63	12.2 C	SHU / 2

Comet C/2006 OF_2 (Broughton)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 08 11.93	14.7 C	2007 09 20.79	14.6 C	NEV / 7
2007 08 10.86	14.2 C	2007 10 30.72	14.1 C	SHU / 8
2007 10 16.46	14.8 C			TSU02

Comet C/2006 Q1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 01.77	15.1 C	2007 10 02.78	14.7 C	MCA / 3

Comet C/2006 S5 (Hill)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 09.02	16.5 C	2007 09 21.04	16.2 C	NEV / 2
2007 10 10.02	15.0 C			SHU

Comet C/2006 U6 (Spacewatch)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 13.59	16.3 C	2007 09 24.60	16.3 C	MCA / 8

Comet C/2006 VZ_13 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 05 19.93	13.9 C	2007 07 31.82	10.2 C	SHU / 18
2007 08 09.46	10.5 C			TSU02

Comet C/2006 W3 (Christensen)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 14.93	16.7 C			NEV

Comet C/2006 XA_1 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 04 13.77	14.6 C	2007 05 19.85	13.1 C	SHU / 5

Comet C/2007 E1 (Garradd)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 04 13.93	12.8 C	2007 05 19.83	13.5 C	SHU / 6

Comet C/2007 E2 (Lovejoy)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 04 15.07	11.5 C	2007 06 08.93	13.4 C	SHU / 10

Comet C/2007 F1 (LONEOS)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 05.82	8.4 C			KAD02
2007 10 07.77	7.7 V	2007 10 23.72	6.0:V	QVA / 7
2007 10 10.09	8.0 C	2007 10 14.71	7.5 C	SHU / 2
2007 10 17.38	7.8 C	2007 10 21.38	6.8 C	TSU02/ 2

Comet C/2007 G1 (LINEAR)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 07 31.89	16.6 C	2007 09 18.77	16.4 C	NEV / 8
2007 07 19.98	15.9 C	2007 10 14.76	16.9 C	SHU / 8
2007 08 09.53	17.1 C	2007 10 17.42	16.4 C	TSU02/ 5

Comet P/2007 H1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 01.48	14.9 C	2007 10 02.57	14.9 C	MCA / 2
2007 08 04.95	15.0 C	2007 09 20.91	13.9 C	NEV / 7
2007 09 03.00	13.6 C	2007 10 16.77	15.3 C	SHU / 3
2007 08 09.66	14.5 C	2007 10 11.54	13.6 C	TSU02/ 3

Comet C/2007 N3 (Lulin)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 13.43	17.7 C	2007 10 04.44	17.7 C	MCA / 8

Comet C/2007 Q3 (Siding Spring)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 09 13.65	17.3 C	2007 10 13.68	17.2 C	MCA / 16

Comet P/2007 R1 (Larson)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 16.52	17.0 C			TSU02

Comet P/2007 R4 (Garradd)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 01.58	18.2 C	2007 10 13.61	18.4 C	MCA / 8
2007 10 11.65	17.9 C			TSU02

Comet P/2007 S1 (Zhao)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 16.57	18.1 C			TSU02

Comet C/2007 T1 (McNaught)

First Date UT	Mag.	Last Date UT	Mag.	Obs. / No.
2007 10 14.70	12.8 C	2007 10 16.69	12.6 C	SHU / 2
2007 10 10.40	12.2 C			TSU02

DESIGNATIONS OF RECENT COMETS

Listed below, for handy reference, are the last 20 comets (non-spacecraft) to have been given designations — with the notable exception of P/2007 R5 = 1999 R1 = 2003 R5 (SOHO), a short-period comet observed only via the SOHO spacecraft. The name, preceded by a star (⋆) if the comet was a new discovery (compared to a recovery from predictions of a previously-known short-period comet) or a # if a re-discovery of a 'lost' comet. Also tabulated below 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. (Additional explanatory information is given for the list in the Apr. 2005 issue, p. 137.) [Update of list in the Oct. 2006 issue, p. 181].

	New-Style Designation	P	T	q	*IAUC*
⋆	C/2005 YW (LINEAR)		12/7/06	1.99	8760
⋆	P/2006 U1 (LINEAR)	4.63	8/28/06	0.51	8763
	179P/2006 U2 (Jedicke)	14.4	12/2/07	4.09	8764
	180P/2006 U3 (NEAT)	7.5	5/26/08	2.47	8765
	181P/2006 U4 (Shoemaker-Levy)	7.5	11/25/06	1.13	8767
⋆	P/2006 U5 (Christensen)	6.63	1/18/07	2.33	8768
⋆	C/2006 U6 (Spacewatch)		6/5/08	2.50	8769
⋆	C/2006 U7 (Gibbs)	41.6	3/29/07	4.42	8769
⋆	C/2006 V1 (Catalina)		11/26/07	2.67	8774
⋆	P/2006 W1 (Gibbs)	13.9	3/29/06	1.70	8775
	182P/2006 W2 (LONEOS)	5.02	2/6/07	0.98	8776
⋆	C/2006 W3 (Christensen)		7/6/09	3.13	8777
⋆	195P/2006 W4 (Hill)	16.5	1/21/09	4.44	8779
⋆	C/2006 VZ_{13} (LINEAR)		8/10/07	1.02	8781
⋆	C/2006 X1 (LINEAR)		3/5/06	6.13	8783
⋆	C/2006 YC (Catalina-Christensen)		9/11/06	4.95	8785
	183P/2006 Y1 (Korlević-Jurić)	9.56	5/8/08	3.89	8786
⋆	P/2006 Y2 (Gibbs)	5.27	12/28/06	1.25	8787
⋆	C/2006 XA_1 (LINEAR)		7/21/07	1.80	8790
#	184P/2007 A1 (Lovas)	6.62	12/12/06	1.40	8791
⋆	P/2007 A2 (Christensen)	15.9	1/17/07	2.80	8794
	185P/2007 A3 (Petriew)	5.47	2/24/07	0.94	8795
⋆	P/2007 B1 (Christensen)	14.1	1/19/07	2.44	8797
⋆	C/2007 B2 (Skiff)		8/20/08	2.97	8799
⋆	186P/2007 B3 (Garradd)	10.6	3/20/08	4.26	8801
⋆	P/2006 XG_{16} (Spacewatch)	6.92	2/9/07	2.10	8802
⋆	P/2007 C1 (Christensen)	6.52	3/5/07	2.05	8805
⋆	P/2007 C2 (Catalina)	18.6	9/4/07	3.78	8806
⋆	C/2007 D1 (LINEAR)		6/19/07	8.79	8808
⋆	C/2007 D2 (Spacewatch)		11/24/06	1.25	8809
⋆	C/2007 D3 (LINEAR)		5/27/07	5.21	8810
⋆	C/2007 E1 (Garradd)		5/23/07	1.29	8818
⋆	C/2007 E2 (Lovejoy)		3/27/07	1.09	8819
⋆	C/2007 F1 (LONEOS)		10/28/07	0.40	8823
	187P/2007 E3 (LINEAR)	9.40	10/6/08	3.69	8827
⋆	C/2007 G1 (LINEAR)		11/16/08	2.65	8828
⋆	P/2007 H1 (McNaught)	7.02	8/17/07	2.28	8830
⋆	C/2007 H2 (Skiff)		2/17/07	1.41	8831
⋆	P/2007 H3 (Garradd)	6.55	8/15/07	1.83	8833
⋆	C/2006 WD_4 (Lemmon)		4/28/07	0.59	8835
⋆	C/2007 JA_{21} (LINEAR)		11/14/06	5.37	8837
⋆	C/2007 K1 (Lemmon)		5/8/07	9.24	8838
⋆	P/2007 K2 (Gibbs)	19.0	6/8/07	2.27	8838
⋆	C/2007 K3 (Siding Spring)		4/21/08	2.05	8839
⋆	C/2007 K4 (Gibbs)		5/3/07	3.53	8839

DESIGNATIONS OF RECENT COMETS

[table continued from previous page]

	New-Style Designation	*P*	*T*	*q*	*IAUC*
⋆	C/2007 K5 (Lovejoy)		5/1/07	1.15	8840
⋆	C/2007 K6 (McNaught)		7/1/07	3.43	8841
⋆	C/2007 M1 (McNaught)		8/12/08	7.47	8849
⋆	C/2007 M2 (Catalina)		12/8/08	3.54	8852
⋆	C/2007 M3 (LINEAR)		9/4/07	3.47	8852
	188P/2007 J7 (LINEAR-Mueller)	9.13	12/16/07	2.55	8853
⋆	191P/2007 N1 (McNaught)	6.64	9/13/07	2.05	8855
	189P/2007 N2 (NEAT)	4.98	7/25/07	1.17	8856
⋆	C/2007 N3 (Lulin)		1/10/09	1.21	8857
⋆	C/2007 O1 (LINEAR)		6/3/07	2.88	8858
	190P/2007 O2 (Mueller)	8.73	7/8/07	2.03	8859
⋆	C/2007 P1 (McNaught)		4/3/07	0.51	8861
⋆	C/2007 Q1 (Garradd)		12/10/06	2.98	8863
⋆	P/2007 Q2 (Gilmore)	13.2	8/23/07	1.84	8865
⋆	C/2007 Q3 (Siding Spring)		10/7/09	2.25	8865
⋆	P/2007 R1 (Larson)	14.8	8/25/07	4.35	8867
⋆	P/2007 R2 (Gibbs)	6.38	8/26/07	1.47	8868
⋆	P/2007 R3 (Gibbs)	8.86	7/6/07	2.50	8869
⋆	P/2007 R4 (Garradd)	14.1	9/27/07	1.92	8870
#	P/2007 R5 (SOHO)	3.99	9/11/07	0.05	8871
⋆	P/2007 S1 (Zhao)	7.40	12/6/07	2.49	8873
⋆	C/2007 S2 (Lemmon)	44.4	9/14/08	5.56	8876
⋆	C/2007 T1 (McNaught)		12/12/07	0.97	8877
⋆	P/2007 T2 (Kowalski)	5.43	9/19/07	0.70	8878
	192P/2007 T3 (Shoemaker-Levy)	16.4	12/17/07	1.46	8879
⋆	P/2007 T4 (Gibbs)	12.0	7/20/07	2.01	8880
⋆	C/2007 T5 (Gibbs)		5/24/08	4.05	8880
⋆	P/2007 T6 (Catalina)	9.52	8/19/07	2.23	8881
⋆	C/2007 U1 (LINEAR)		8/7/08	3.33	8884
	193P/2007 U2 (LINEAR-NEAT)	6.74	2/20/08	2.16	8885
⋆	P/2007 V1 (Larson)	11.1	12/8/07	2.68	8893
⋆	P/2007 V2 (Hill)	8.20	7/30/07	2.77	8894
⋆	C/2007 W1 (Boattini)		6/24/08	0.85	8899
	194P/2007 W2 (LINEAR)	8.04	2/26/08	1.71	8900
⋆	C/2007 W3 (LINEAR)		6/2/08	1.78	8901
⋆	C/2007 Y1 (LINEAR)		3/19/08	3.34	8904
⋆	C/2007 Y2 (McNaught)		4/11/08	4.21	8908

Φ Φ Φ

2006 and 2007 Edgar Wilson Awards

The 2006 Edgar Wilson Awards for comet discoveries by amateur astronomers went to the following three individuals: Charles Wilson Juels (Fountain Hills, AZ, U.S.A.) and Paulo Renato Centeno Holvorcem (Campinas, Brazil) for C/2005 N1; and John Broughton (Reedy Creek, Qld., Australia) for P/2005 T5. The 2007 Edgar Wilson Awards went to the following three individuals for four different comets: John Broughton (Reedy Creek, Qld., Australia) for C/2006 OF_2; David H. Levy (Tucson, AZ, U.S.A.) for P/2006 T1; and Terry Lovejoy (Thornlands, Qld., Australia) for C/2007 E2 and C/2007 K5. The announcements were made on *IAU Circulars* 8730 and 8854.

Details on the Edgar Wilson Award, including a list of all previous recipients, are available on the World Wide Web at `http://www.cfa.harvard.edu/iau/special/EdgarWilson.html`.

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