February 2023

ALPO Comet News

A Publication of the Comets Section of the Association of Lunar and Planetary Observers

C/2022 E3 (ZTF) at its Best!

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On the Front Cover:

Two views of C/2022 E3 (ZTF) at its best.

On the right, Dan Bartlett (June Lake, CA) imaged the comet on 2023 January 27 with a Samyang 135mm f/2.8 lens and ZWO ASI294mcP camera. The exposure consists on 69x120s exposures and covers 8.3x45 degrees of sky.

For those of us without digital eyes, the sketch on the left by Michel Deconinck perfectly portrays the comet's naked eye appearance among the stars of the northern polar sky. Michel's watercolor was made on February 1 from his backyard in Verdon, France.

The monthly ALPO Comet News PDF can be found on the ALPO Comets Section website (http://www.alpo-astronomy.org/cometblog/). A shorter version of this report is posted on a dedicated Cloudy Nights forum (https://www.cloudynights.com/topic/862336-alpo-comet-news-for-fdebruary-2023/) All are encouraged to join the discussion over at Cloudy Nights. The ALPO Comets Section welcomes all comet related articles, observations, images, drawings, magnitude estimates, or spectra. One does not have to be a member of ALPO to submit material, though membership is appreciated.

Please send your observations to the Comets Section at < comets@alpo-astronomy.org >, Coordinator Carl Hergenrother < carl.hergenrother@alpo-astronomy.org > and/or Acting Assistant Coordinator Michel Deconinck < michel.deconinck@alpo-astronomy.org >.

To learn more about the ALPO, please visit us @ http://www.alpo-astronomy.org.

Summary

C/2022 E3 (ZTF) is at its best as February starts. Several observers have made naked eye detections during the last week of January. At between magnitude 4.6 and 5.1, ZTF is a very easy binocular object but will require dark skies to be seen with the naked eye. With a close approach to Earth at 0.29 au on February 1, the comet should fade rather rapidly in February and may be as faint as magnitude 8 by the end of the month. Though fading, its southern motion will allow southern mid-latitude observers a chance to see it early in the month.

C/2022 E3 (ZTF) is not the only reasonably bright comet. In the southern hemisphere, C/2017 K2 (PANSTARRS) is at 8th magnitude. Northern observers will also be able to follow 9th magnitude comets C/2020 V2 (ZTF), C/2022 A2 (PANSTARRS), and C/2022 U2 (ATLAS). While C/2020 V2 (ZTF) and C/2022 A2 (PANSTARRS) are limited to northern observers, C/2022 U2 (ATLAS) will be visible from the southern hemisphere as well.

Last month's brightest comet wasn't C/2022 E3 (ZTF) but rather 96P/Machholz at 0th to 2nd magnitude. Unfortunately, it was only visible through the eyes of the SOHO and STEREO-A spacecraft as it was only a few degrees from the Sun at its brightest in late January. Eagle eyed observers with a clear horizon may spot 96P later in the month low in the morning sky though it should have faded to 8-10th magnitude by then.

Last month the ALPO Comets Section received 83 magnitude estimates and 122 images/sketches of comets C/2022 U2 (ATLAS), C/2022 P1 (NEOWISE), C/2022 E3 (ZTF), C/2022 A2 (PANSTARRS), C/2021 Y1 (ATLAS), C/2021 X1 (Maury-Attard), C/2021 QM45 (PANSTARRS), C/2020 V2 (ZTF), C/2020 S4 (PANSTARRS), C/2019 U5 (PANSTARRS), C/2019 L3 (ATLAS), C/2017 K2 (PANSTARRS), 96P/Machholz, and 29P/Schwassmann-Wachmann. A big thanks to our recent contributors: Michael Amato, Dan Bartlett, Michel Besson, Todd Bossaller, Denis Buczynski, J. J. Gonzalez, Jose Guilherme de Souza Aguiar, Christian Harder, Carl Hergenrother, Eliot Herman, Rik Hill, Michael Jäger, Martin Mobberley, Charles Morris, Mike Olason, Phill Parslow, Ludovic Perbet, Uwe Pilz, Allan Rahill, Efrain Morales Rivera, Gregg Ruppel, Anaël Semiat, Richard Schmude, Jr., Chris Schur, Greg T. Shanos, and Chris Wyatt.

Request for Observations

As always, the Comet Section is happy to receive all comet observations, whether textual descriptions, images, drawings, magnitude estimates, or spectra. Please send your observations via email to the Comets Section <

comets @ alpo-astronomy . org >, Comets Section Coordinator Carl Hergenrother < carl.hergenrother @ alpo-astronomy . org > and/or Comets Section Acting Assistant Coordinator Michel Deconinck < michel.deconinck @ alpo-astronomy . org >.

Photometric Corrections to Magnitude Measurements

We try to include up-to-date lightcurves for the comets discussed in these reports as well as applying aperture and personal corrections to the visual observations and personal just corrections to digital observations. All magnitude estimates are affected by many factors including instrumental (aperture, focal length, magnification, type of optics), environmental (sky brightness due to moonlight, light pollution, twilight, aurora activity, zodiacal light, etc.), cometary (degree of condensation, coma color, strength and type of gas emission lines, coma-tail interface) and personal (sensitivity to different wavelengths, personal technique, observational biases). The first correction used here corrects for differences in aperture [Charles S. Morris, On Aperture Corrections for Comet Magnitude Estimates. Publ Astron Soc Pac 85, 470, 1973]. Visual observations are corrected to a standard aperture of 6.78 cm by 0.019 magnitudes per centimeter for refractors and 0.066 magnitudes per centimeter for reflectors. After applying the aperture correction and if a sufficient number of visual observations are submitted for a particular comet, we also determine personal corrections for each observer for each individual comet. For digital observations only a personal correction is applied. A single observer submitting both visual and digital magnitude measurements may also have separate corrections for each observing method. If the magnitudes shown in the text don't match those plotted in the lightcurves, it is because of the application of these corrections.

Acknowledgements

In addition to observations submitted directly to the ALPO, we occasionally use data from other sources to augment our analysis. We would like to acknowledge with thanks observations submitted directly to the ALPO as well as those originally submitted to the International Comet Quarterly, Minor Planet Center, and COBS Comet Observation Database. In particular we have been using observations submitted to the COBS site by Thomas Lehmann for our analyzes so we would like to thank Thomas for his COBS observations. We would also like to thank the Jet Propulsion Laboratory for making available their Small-Body Browser and Orbit Visualizer and Seiichi Yoshida for his Comets for Windows programs that are used to produce the lightcurves and orbit diagrams in these pages. And last but not least, we'd like to thank Syuichi Nakano and the Minor Planet Center for their comet orbit elements, the asteroid surveys and dedicated comet hunters for their discoveries, and all of the observers who volunteer their time to adding to our knowledge of these amazing objects.

Thank you to everyone who contributed to the ALPO Comets Section!

Clear skies!
- Carl Hergenrother

Comets Calendar

Lunar Phases

Feb 05 - Full Moon
Feb 13 - Last Quarter Moon
Feb 20 - New Moon
Feb 27 - First Quarter Moon

Comets at Perihelion

Feb 01 - 281P/MOSS [q = 4.03 au, 10.8-yr period, V ~ 19, discovered in 2013 by Morocco Oukaimeden Sky Survey, pre-discovery observations from 2000 and 2002, 3rd observed return, few recent observations so may be fainter than expected]
Feb 09 - C/2020 S4 (PANSTARRS) [q = 3.37 au, V ~ 15-16]
Feb 11 - C/2021 C5 (PANSTARRS) [q = 3.24 au, V ~ 16]
Feb 18 - C/2022 A2 (PANSTARRS) [q = 1.74 au, V ~ 8-9, more below]

Photo Opportunities

Feb 06 - C/2022 E3 (ZTF) and C/2022 U2 (ATLAS) pass within ~20' of each other
Feb 08-11 - 81P/Wild passes within a degree of the large emission nebula IC 4592
Feb 11-12 - C/2022 U2 (ATLAS) passes close to the Flaming Star Nebula (IC 405), bright emission nebula IC 410, and 7th mag open star cluster NGC 1893
Feb 11 - C/2022 E3 (ZTF) and Mars are within 1 deg of each other
Feb 13 - C/2022 E3 (ZTF) passes 0.5 deg from 6th mag open star cluster NGC 1647
Feb 16-17 - C/2022 U2 (ATLAS) moves along the western edge of the large supernova remnant Simeis 147

Recent Magnitudes Contributed to the ALPO Comets Section

Comet Des	YYYY MM DD.DD (UT)		Mag	SC	APER	FL	POW	COMA Dia	COMA DC	TAIL LENG	TAIL PA	ICQ CODE	Observer Name
C/2022 U2 (ATLAS)					T								
2022U2	2023 01 22.84	S	9.7	TK	20.3T10		77	6	2/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022U2	2023 01 21.42	S	9.7	TK	12.5B		30	6	1			ICQ xx	HER02 Carl Hergenrother
2022U2	2023 01 20.77	S	9.5	TI	25.2L	4	68	5	2			ICQ XX	HAR11 Christian Harder
2022U2	2023 01 18.76	S	10.0	TI	29.8L	4	66	3.3	2			ICQ XX	HAR11 Christian Harder
2022U2	2023 01 17.76	S	9.7	TI	29.8L	4	66	4.3	2			ICQ XX	HAR11 Christian Harder
2022U2	2023 01 11.76	S	10.0	TI	25.2L	4	68	3.5	2			ICQ XX	HAR11 Christian Harder
2022U2	2023 01 03.83	S	12.9	HS	32.0L	5	144					ICQ XX	PIL01 Uwe Pilz
2022U2	2023 01 03.24	S	11.0	TI	25.2L	4	92	2.5	2			ICQ XX	HAR11 Christian Harder
2022U2	2023 01 03.24	S	10.3	TK	20.3T10		77	8	2/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2022 E3 (ZTF)													
2022E3	2023 01 30.80	S	5.0	TI	10.0L	4	22	15	4			ICQ XX	HAR11 Christian Harder
2022E3	2023 01 30.46	S	5.0	AC	5.0B		7	15	5/			ICQ XX	AGUaa Salvador Aguirre
2022E3	2023 01 30.42	S	5.0	AC	5.0B		7	15	5/			ICQ XX	AGUaa Salvador Aguirre
2022E3	2023 01 29.52	I	5.1	TK	0.6E		1	25	6			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 29.52	S	5.2	TK	1.2B		2	25	6			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 29.46	I	5.0:AC		5.0B		7					ICQ XX	AGUaa Salvador Aguirre
2022E3	2023 01 29.10	S	4.8	TK	0.7E	3	1					ICQ XX	PIL01 Uwe Pilz
2022E3	2023 01 28.48	S	4.6	HI	0.0		1	&30	2			ICQ xx	MOR Charles Morris
2022E3	2023 01 28.43	M	4.8	HI	5.0		10	23	5	15.0	264	ICQ xx	MOR Charles Morris
2022E3	2023 01 28.43				5.0		10			4.5	65	ICQ xx	MOR Charles Morris
2022E3	2023 01 27.53	S	5.2	TK	0.6E		1	20	7			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 27.53	S	5.2	TK	1.2B		2	20	6			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 27.48	S	5.5	AC	5.0B		7	10	5/			ICQ XX	AGUaa Salvador Aguirre
2022E3	2023 01 27.42	M	5.0	HI	5.0		10	20	6	9.0	280	ICQ xx	MOR Charles Morris
2022E3	2023 01 27.42				5.0		10			4.5	106	ICQ xx	MOR Charles Morris
2022E3	2023 01 27.42	S	4.8	HI	0.0		1					ICQ xx	MOR Charles Morris
2022E3	2023 01 26.41	M	5.2	HI	5.0		10	20	6	10.0	290	ICQ xx	MOR Charles Morris
2022E3	2023 01 26.41				5.0		10			2.75	126	ICQ xx	MOR Charles Morris
2022E3	2023 01 25.51	S	5.2	TK	1.2B		2	25	5			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 25.45	M	5.3	HI	5.0		10	23	6	8.7	290	ICQ xx	MOR Charles Morris
2022E3	2023 01 25.45				5.0		10			1.25	96	ICQ xx	MOR Charles Morris
2022E3	2023 01 24.41	M	5.6	HI	5.0		10	21	4	5.5	312	ICQ xx	MOR Charles Morris
2022E3	2023 01 24.41				5.0		10			0.83	109	ICQ xx	MOR Charles Morris
2022E3	2023 01 23.19	I	5.5	-	12.5B	5	25	10	6	1	320	ICQ XX	DECaa Michel Deconinck
2022E3	2023 01 22.98	S	5.5	TK	0.0E		1	15	6			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022E3	2023 01 22.94	S	5.7	TK	5.0B		10	15	5	1.8	300	ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022E3	2023 01 22.35	M	5.8	HI	5.0		10	15	4	6.0	315	ICQ xx	MOR Charles Morris
2022E3	2023 01 21.44	M	5.9	HI	5.0		10	15	4	3.75	318	ICQ xx	MOR Charles Morris
2022E3	2023 01 21.41	S	5.5	TK	1.2B		2	15	5			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 20.74	-	6.0	TI	5.0B		7	21	4			ICQ XX	HAR11 Christian Harder
2022E3	2023 01 20.74	S	6.2	TI	25.2L	4	41	8	4	26	m320	ICQ XX	HAR11 Christian Harder
2022E3	2023 01 19.17	S	5.4	TK	0.7E	3	1	8				ICQ XX	PIL01 Uwe Pilz
2022E3	2023 01 19.17	S	5.4	TK	7.0B	6	16	8	S6	0.8	300	ICQ XX	PIL01 Uwe Pilz
2022E3	2023 01 18.74	S	6.1	TI	8.0R	5	26	10	4			ICQ XX	HAR11 Christian Harder
2022E3	2023 01 18.46	M	6.3	HI	5.0		10	12	5			ICQ xx	MOR Charles Morris
2022E3	2023 01 14.52	S	6.5	TK	5.0B		10	12	5			ICQ xx	HER02 Carl Hergenrother
2022E3	2023 01 03.21	S	6.8	TI	10.0L	4	22	7	4			ICQ XX	HAR11 Christian Harder
2022E3	2023 01 03.20	S	6.7	TK	5.0B		10	10	5/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2022 A2 (PANSTARRS)													
2022A2	2023 01 27.53	S	9.0	TK	12.5B		30	4.5	5			ICQ xx	HER02 Carl Hergenrother
2022A2	2023 01 22.85	S	8.9	TK	20.3T10		77	6	3/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022A2	2023 01 21.12	S	9.3	TI	25.2L	4	68	4.5	3/			ICQ XX	HAR11 Christian Harder
2022A2	2023 01 20.76	S	9.0	TI	25.2L	4	68	3.5	3			ICQ XX	HAR11 Christian Harder
2022A2	2023 01 18.75	S	9.4	TI	29.8L	4	66	4.3	4			ICQ XX	HAR11 Christian Harder
2022A2	2023 01 17.75	S	9.0	TI	29.8L	4	66	3.5	4			ICQ XX	HAR11 Christian Harder
2022A2	2023 01 15.71	S	8.9	TK	7.0B	6	16	2.5	3			ICQ XX	PIL01 Uwe Pilz
2022A2	2023 01 11.77	S	9.2	TI	25.2L	4	68	3.5	3/			ICQ XX	HAR11 Christian Harder
2022A2	2023 01 03.22	S	9.4	TI	25.2L	4	68	5	4			ICQ XX	HAR11 Christian Harder
2022A2	2023 01 03.22	S	9.5	TK	20.3T10		77	5	3/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2020 V2 (ZTF)													
2020V2	2023 01 22.83	S	9.6	TK	20.3T10		77	3.5	4/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2020V2	2023 01 21.43	S	9.5	TK	12.5B		30	2.5	4			ICQ xx	HER02 Carl Hergenrother
2020V2	2023 01 20.78	S	9.8	TI	25.2L	4	68	2.8	4			ICQ XX	HAR11 Christian Harder
2020V2	2023 01 18.77	S	9.8	TI	29.8L	4	66	3	4			ICQ XX	HAR11 Christian Harder
2020V2	2023 01 17.76	S	9.5	TI	29.8L	4	66	3.5	4			ICQ XX	HAR11 Christian Harder
2020V2	2023 01 15.72	S	9.1	TK	7.0B	6	16	5	3			ICQ XX	PIL01 Uwe Pilz

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   2020V2  2023 01 11.76  S  9.8 TI 25.2L 4  68   3.5  4   2.5 m 30 ICQ XX HAR11 Christian Harder
   2020V2  2023 01 03.23  S  9.9 TI 25.2L 4  68   2.7  4            ICQ XX HAR11 Christian Harder
   2020V2  2023 01 03.23  S  9.7 TK 20.3T10  77   3.5  4            ICQ XX GON05 Juan Jose Gonzalez Suarez
C/2019 U5 (PANSTARRS)
   2019U5  2023 01 18.26  M 11.8 AQ 30.0L 5 122   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2023 01 17.24  M 11.7 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2023 01 03.25  S 11.2 TK 20.3T10  77   4    2            ICQ XX GON05 Juan Jose Gonzalez Suarez
C/2019 L3 (ATLAS)
   2019L3  2023 01 13.02  M 11.7 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
C/2017 K2 (PANSTARRS)
   2017K2  2023 01 25.45 xM  8.6 TK  7.0B    15   7.0  4            ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 18.44 xM  8.5 TK  7.0B    15   6    5            ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 15.44 xM  8.4 TK  7.0B    15   8.0  4/           ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 14.45 xM  8.6 TK  7.0B    15   6.0  5/           ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 09.44 xM  8.1 TK  7.0B    15   7.0  4            ICQ XX WYA   Christopher Wyatt
118P/Shoemaker-Levy
118        2023 01 13.01  M 13.4 AQ 30.0L 5 122   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
81P/Wild
 81        2023 01 18.27  M 11.7 AQ 30.0L 5 101   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
29P/Schwassmann-Wachmann
 29        2023 01 22.86  S 11.0 TK 20.3T10  77   3.5  1/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 29        2023 01 18.78  S 11.2 TI 29.8L 4 108   2    1            ICQ XX HAR11 Christian Harder
 29        2023 01 12.97  M 12.7 AQ 30.0L 5 101   1    5            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2023 01 11.78  S 10.8 TI 25.2L 4  92   2.5  1            ICQ XX HAR11 Christian Harder
 29        2023 01 03.84  S 12.0 TK 32.0L 5 144        7            ICQ XX PIL01 Uwe Pilz
 29        2023 01 03.26  S 11.1 TK 20.3T10 100   3    1/           ICQ XX GON05 Juan Jose Gonzalez Suarez
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New Discoveries, Recoveries and Other Comets News

New Discoveries and Recoveries

P/2023 B1 (PANSTARRS) – P/2023 B1 (PANSTARRS) appears to be a Centaur comet that has recently undergone an outburst. The Pan-STARRS program used the Pan-STARRS2 1.8-m on Haleakala, Maui to find this comet on 2023 January 21 at 17th magnitude. The ATLAS program found a pre-discovery observation from January 13 when the comet appeared nearly stellar and probably at the early stages of its outburst. P/2023 B1 is on a low eccentricity (e = 0.13) Centaur orbit just outside of Jupiter's orbit with perihelion on 2023 August 13 at 6.13 au. [CBET 5209, MPEC 2023-B118]

C/2023 A1 (Leonard) – The first new comet discovery of 2023 was made by Greg Leonard (University of Arizona) with the Mount Lemmon Survey's 1.5-m reflector on 2023 January 9 at 18th magnitude. C/2023 A1 (Leonard) should peak at 16th magnitude around the time of its 2023 March 18 perihelion at 1.84 au. [CBET 5208, MPEC 2023-B66]

C/2022 Y2 (Lemmon) – A 20th magnitude apparently asteroidal object was discovered by the Catalina Sky Survey with the University of Arizona Mount Lemmon 1.5-m on 2022 December 24. The object was found to be cometary in follow-up observations after it was placed on the MPC NEOCP. C/2022 Y2 (Lemmon) is a Halley-type comet on an 87-year orbit. It is currently near its peak brightness of 18th magnitude. Perihelion will be on 2023 March 22 at 2.54 au. [CBET 5214, MPEC 2023-B225]

C/2022 Y1 (Hogan) – Joshua Hogan (University of Arizona) discovered his 1st comet with the Catalina Sky Survey's Mount Lemmon 1.5-m. C/2022 Y1 (Hogan) was 19th magnitude at discovery on 2022 December 24. Mount Lemmon pre-discovery observations were found back to November 5 when the comet was 20-21st magnitude. The comet is on a 44-year orbit and passed perihelion on 2022 November 27 at 2.96 au. [CBET 5205, MPEC 2023-A37]

C/2022 W3 (Leonard) – Greg Leonard (University of Arizona) found a new 19th magnitude long-period comet on images taken with the Mount Lemmon Survey's 1.5-m reflector on 2022 November 26. C/2022 W3 (Leonard) should peak around 14th magnitude this summer when it arrives at perihelion on 2023 June 22 at 1.40 au. If Leonard is a dynamically old comet, it may become brighter than magnitude 14. [CBET 5204, MPEC 2023-A29]

C/2022 W2 (ATLAS) – The "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) search program found a new 18th magnitude long-period comet on 2022 November 24 with their 0.5-m f/2 Schmidt reflector at Haleakala, Hawaii. Prediscovery observation by the Zwicky Transient Facility (ZTF) were found on 3 nights in November. C/2022 W2 (ATLAS) will peak at 17th magnitude around the time of its 2023 March 8 perihelion at 3.12 au. [CBET 5203, MPEC 2023-A28]

Comets Brighter Than Magnitude 6

C/2022 E3 (ZTF)

Discovered 2022 March 2 by the Zwicky Transient Facility (ZTF)
Dynamically old long-period comet

Orbit (from Minor Planet Center, MPEC 2023-B154)

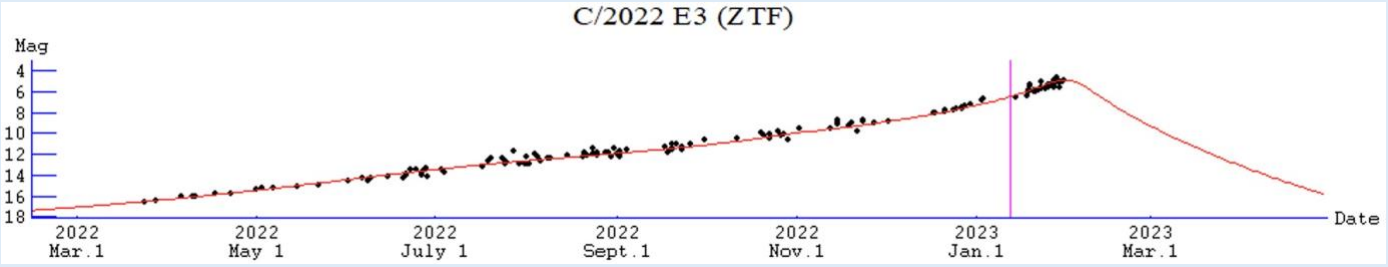
```
    C/2022 E3 (ZTF)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Jan. 12.78511 TT                                  Rudenko
q   1.1122491           (2000.0)            P                Q
z  -0.0002941      Peri.  145.81563     -0.60064727     -0.07340650
 +/-0.0000004      Node   302.55573     +0.33752778     +0.87940801
e   1.0003271      Incl.  109.16853     +0.72477435     -0.47037543
From 5349 observations 2021 July 10-2023 Jan. 27, mean residual 0".6.
1/a(orig) = +0.000764 AU**-1, 1/a(fut) = -0.000025 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2022 E3 (ZTF)                                                        Max El
                                                                        (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2023-Feb-01  07 07  +75 20   1.155   0.285    120E   Cam   4.9     56    0
2023-Feb-06  05 08  +46 34   1.180   0.317    120E   Aur   5.2     84    3
2023-Feb-11  04 48  +26 11   1.209   0.419    112E   Tau   5.9     76   22
2023-Feb-16  04 41  +14 37   1.242   0.551    103E   Tau   6.6     65   31
2023-Feb-21  04 38  +07 45   1.279   0.697     97E   Tau   7.3     57   36
2023-Feb-26  04 38  +03 19   1.320   0.847     91E   Tau   7.8     51   38
2023-Mar-03  04 38  +00 17   1.363   0.998     86E   Tau   8.3     46   40
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  5.8 + 5 log d + 12.3 log r [Through T-70 days]
m1 =  6.9 + 5 log d +  6.8 log r [T-70 to perihelion]
m1 =  7.0 + 5 log d + 10.0 log r [Since perihelion, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

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Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
              (UT)                    T         Dia  DC  LENG  PA
   2022E3  2023 01 30.80  S  5.0 TI 10.0L 4  22   15    4           ICQ XX HAR11 Christian Harder
   2022E3  2023 01 30.46  S  5.0 AC  5.0B     7   15    5/          ICQ XX AGUaa Salvador Aguirre
   2022E3  2023 01 30.42  S  5.0 AC  5.0B     7   15    5/          ICQ XX AGUaa Salvador Aguirre
   2022E3  2023 01 29.52  I  5.1 TK  0.6E     1   25    6           ICQ xx HER02 Carl Hergenrother
   2022E3  2023 01 29.52  S  5.2 TK  1.2B     2   25    6           ICQ xx HER02 Carl Hergenrother
   2022E3  2023 01 29.46  I  5.0:AC  5.0B     7                     ICQ XX AGUaa Salvador Aguirre
   2022E3  2023 01 29.10  S  4.8 TK  0.7E 3   1                     ICQ XX PIL01 Uwe Pilz
   2022E3  2023 01 28.48  S  4.6 HI  0.0      1  &30    2           ICQ xx MOR   Charles Morris
   2022E3  2023 01 28.43  M  4.8 HI  5.0     10   23    5  15.0  264 ICQ xx MOR   Charles Morris
   2022E3  2023 01 28.43             5.0     10            4.5   65 ICQ xx MOR   Charles Morris
   2022E3  2023 01 27.53  S  5.2 TK  0.6E     1   20    7           ICQ xx HER02 Carl Hergenrother
   2022E3  2023 01 27.53  S  5.2 TK  1.2B     2   20    6           ICQ xx HER02 Carl Hergenrother
   2022E3  2023 01 27.48  S  5.5 AC  5.0B     7   10    5/          ICQ XX AGUaa Salvador Aguirre
   2022E3  2023 01 27.42  M  5.0 HI  5.0     10   20    6   9.0  280 ICQ xx MOR   Charles Morris
   2022E3  2023 01 27.42             5.0     10            4.5  106 ICQ xx MOR   Charles Morris
   2022E3  2023 01 27.42  S  4.8 HI  0.0      1                     ICQ xx MOR   Charles Morris
   2022E3  2023 01 26.41  M  5.2 HI  5.0     10   20    6  10.0  290 ICQ xx MOR   Charles Morris
   2022E3  2023 01 26.41             5.0     10            2.75 126 ICQ xx MOR   Charles Morris
```

```
2022E3  2023 01 25.51  S  5.2 TK  1.2B     2  25    5            ICQ xx HER02 Carl Hergenrother
2022E3  2023 01 25.45  M  5.3 HI  5.0     10  23    6   8.7  290 ICQ xx MOR   Charles Morris
2022E3  2023 01 25.45             5.0     10              1.25   96 ICQ xx MOR   Charles Morris
2022E3  2023 01 24.41  M  5.6 HI  5.0     10  21    4   5.5  312 ICQ xx MOR   Charles Morris
2022E3  2023 01 24.41             5.0     10              0.83 109 ICQ xx MOR   Charles Morris
2022E3  2023 01 23.19  I  5.5 -  12.5B 5  25  10    6   1    320 ICQ XX DECaa Michel Deconinck
2022E3  2023 01 22.98  S  5.5 TK  0.0E     1  15    6            ICQ XX GON05 Juan Jose Gonzalez Suarez
2022E3  2023 01 22.94  S  5.7 TK  5.0B    10  15    5   1.8  300 ICQ XX GON05 Juan Jose Gonzalez Suarez
2022E3  2023 01 22.35  M  5.8 HI  5.0     10  15    4   6.0  315 ICQ xx MOR   Charles Morris
2022E3  2023 01 21.44  M  5.9 HI  5.0     10  15    4   3.75 318 ICQ xx MOR   Charles Morris
2022E3  2023 01 21.41  S  5.5 TK  1.2B     2  15    5            ICQ xx HER02 Carl Hergenrother
2022E3  2023 01 20.74  -  6.0 TI  5.0B     7  21    4            ICQ XX HAR11 Christian Harder
2022E3  2023 01 20.74  S  6.2 TI 25.2L 4  41   8    4  26   m320 ICQ XX HAR11 Christian Harder
2022E3  2023 01 19.17  S  5.4 TK  0.7E 3   1   8                 ICQ XX PIL01 Uwe Pilz
2022E3  2023 01 19.17  S  5.4 TK  7.0B 6  16   8   S6   0.8  300 ICQ XX PIL01 Uwe Pilz
2022E3  2023 01 18.74  S  6.1 TI  8.0R 5  26  10    4            ICQ XX HAR11 Christian Harder
2022E3  2023 01 18.46  M  6.3 HI  5.0     10  12    5            ICQ xx MOR   Charles Morris
2022E3  2023 01 14.52  S  6.5 TK  5.0B    10  12    5            ICQ xx HER02 Carl Hergenrother
2022E3  2023 01 03.21  S  6.8 TI 10.0L 4  22   7    4            ICQ XX HAR11 Christian Harder
2022E3  2023 01 03.20  S  6.7 TK  5.0B    10  10    5/           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

C/2022 E3 (ZTF) was the "star" of January. As predicted, it became a borderline naked eye object for those observing from dark skies with most observers reporting a peak brightness between magnitude 4.6 and 5.1. The recent peak in brightness was due to a January 12 perihelion at 1.11 au from the Sun and close approach to Earth on February 1 at 0.29 au. The close approach resulted in a large visual coma of 15'-30' in diameter though to the eye it looked like a slightly fuzzy star. Charles Morris even detected a visual gas tail up to 15 deg in length with a 4 deg dust tail in 10x50 binoculars on Jan. 28.

As we passed through the orbital plane of ZTF in late January, its tails changed in appearance and direction from night to night. For images and sketches of C/2022 E3, please check out the Comets Section image gallery (https://alpo-astronomy.org/gallery3/index.php/Comet-Images-and-Observations) and pdf version of this report which can be found at http://www.alpo-astronomy.org/cometblog/. For an excellent explanation of comet's changing appearance, check out Bob King's excellent article at skyandtelescope.org. Especially cool is the simulation of ZTF's changing tail by Gideon van Buitenen bear the bottom of the article.

ZTF starts the month near maximum brightness as it is still close to Earth. The comet should steadily fade throughout the month as it moves away from both the Earth and Sun. Though how rapidly it will fade is uncertain, it is possible it will fade to magnitude 6.0 by mid-month and close to 8.0 by the end of the month. The comet will also be moving south through Camelopardalis (Feb 1-4), Auriga (4-9), and Taurus (9-28) in the evening sky. This means observers in the southern hemisphere should be able to see ZTF early in the month.

C/2022 E3 (ZTF) was discovered on 2022 March 2 at 17th magnitude by the Zwicky Transient Facility (ZTF) with the 1.2-m f/2.4 Schmidt on Mount Palomar when it was 4.3 au from the Sun. The ZTF uses the 1.2-m f/2.4 Samuel Oschin Schmidt on Mount Palomar which is equipped with a gigantic 16x6kx6k CCD array covering 47 square degrees of sky.

ZTF is a dynamically old long-period comet which means this is not its first time approaching close to the Sun. Based on the latest orbit published by the Minor Planet Center on MPEC 2023-B154, it was last at perihelion nearly 47,000 years ago. Perturbations by the major planets do result in this possibly being its last trip through the inner solar system. The negative 1/a(fut) value means it will recede back into the depth of deep space on a hyperbolic orbit and may ultimately leave our solar system forever.

Photo Opportunities:

Feb 06	C/2022 E3 (ZTF) and C/2022 U2 (ATLAS) are within ~20' of each other
Feb 11	C/2022 E3 (ZTF) and Mars are within 1 deg of each other
Feb 13	C/2022 E3 (ZTF) passes 0.5 deg from 6th mag open star cluster NGC 1647

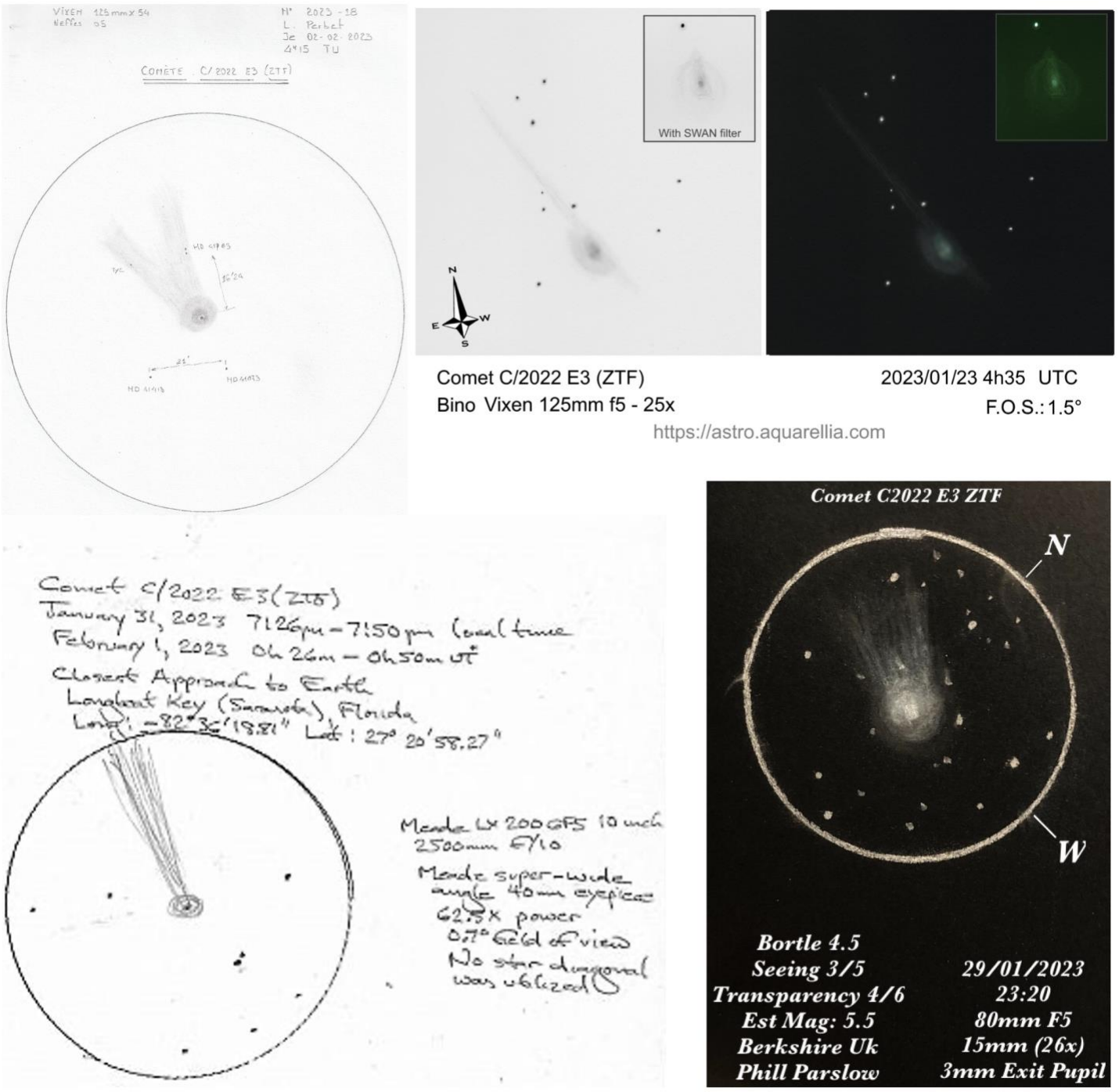


Figure 1 - A sampling of sketches of C/2022 E3 (ZTF). (Upper left) Ludovic Prebet observed on 2023 February 2 with Vixen 54x125 binoculars. (Upper right) Michel Deconinck used a parit of Vixen 25x125 binoculars on January 23. (Lower left) Gregory T. Shanos made this sketch base on his impression of ZTF on January 31 through a Meade LX200 GPS 10" SCT at f/10 and 62.5 power. (Lower right) Phill Parslow observed ZTF on January 29 with a 80mm f/5 refractor at 26 power.

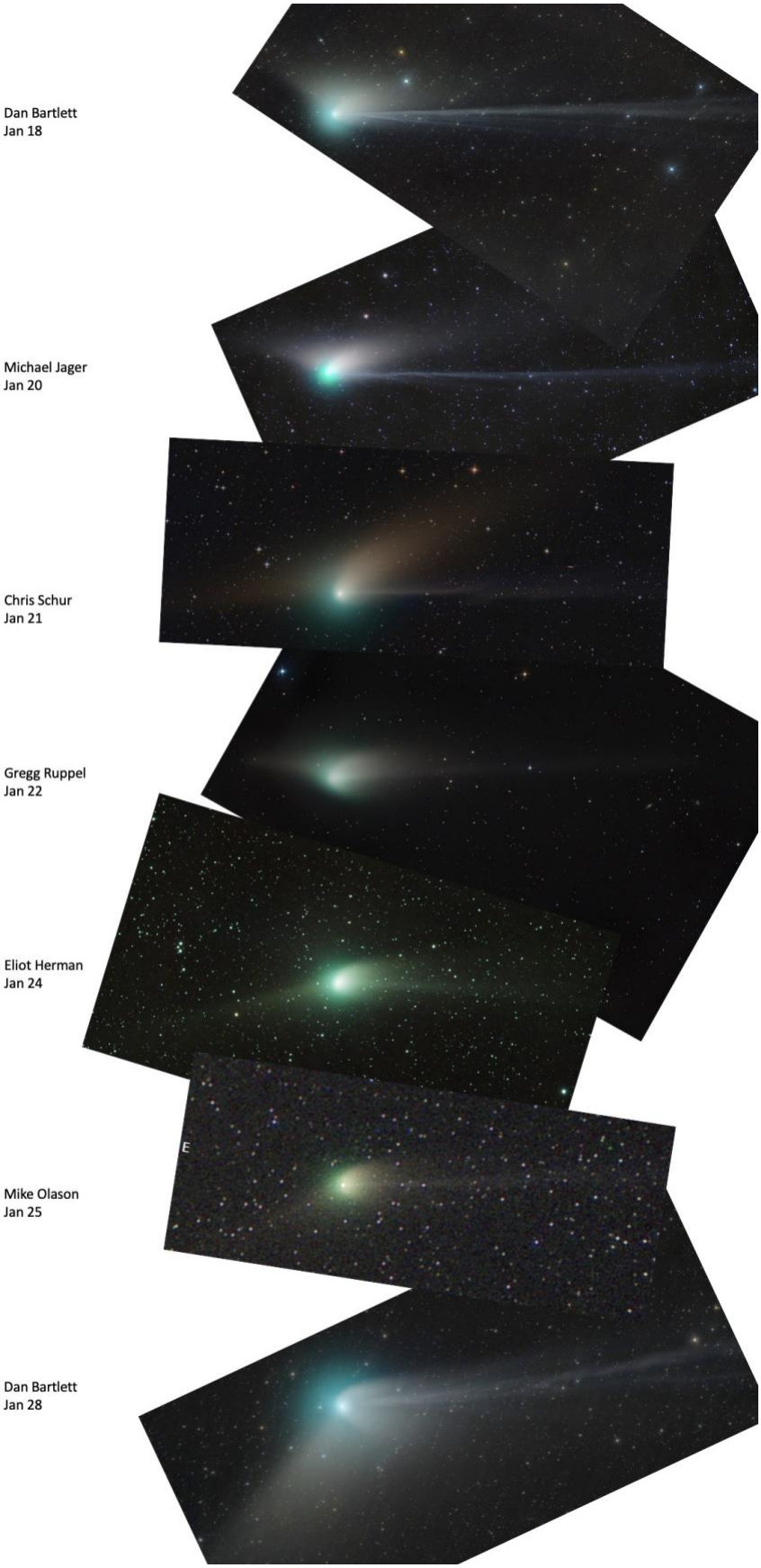


Figure 2 - A collection of images of C/2022 E3 (ZTF) straddling the time of orbit plane crossing on Jan. 23 and showing changes in the appearance of its tails. Images were taken by Dan Bartlett (Jan 18, 28), Michael Jager (Jan 20), Chris Schur (Jan 21), Gregg Ruppel (Jan 22), Eliot Herman (Jan 24), and Mike Olason (Jan 25). Images are not to scale and are aligned in the direction of the gas tail.

Comets Between Magnitude 6 and 10

C/2017 K2 (PANSTARRS)

Discovered 2017 May 21 by the Pan-STARRS survey with the Pan-STARRS1 1.8-m on Haleakala
Dynamically ??? long-period comet

Orbit (from Minor Planet Center, MPEC 2023-B154)

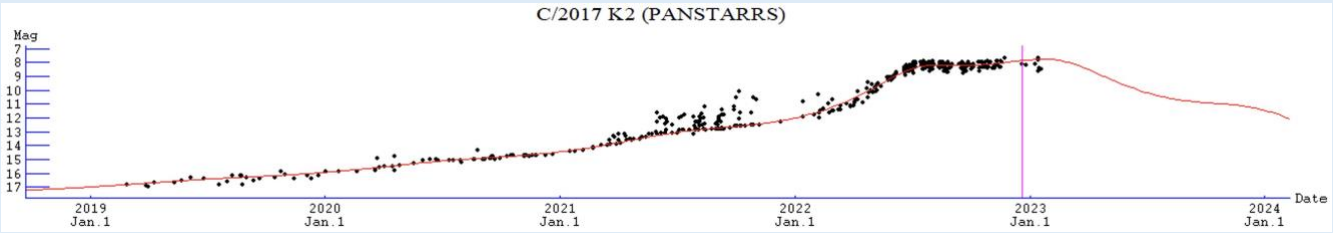
```
    C/2017 K2 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Dec. 19.68873 TT                                  Rudenko
q   1.7968936           (2000.0)            P              Q
z  -0.0004373      Peri.  236.20152     +0.01818935     +0.04921872
 +/-0.0000001      Node    88.23602     -0.18087331     +0.98247051
e   1.0007857      Incl.   87.56336     -0.98333819     -0.17980328
From 11203 observations 2015 Nov. 23-2022 Sept. 27, mean residual 0".5.
1/a(orig) = +0.000059 AU**-1, 1/a(fut) = +0.001150 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2017 K2 (PANSTARRS)                                                  Max El
                                                                       (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2023-Feb-01  22 50  -70 19   1.880   2.249     55E    Ind    7.8      0   33
2023-Feb-06  23 36  -69 11   1.900   2.236     57E    Tuc    7.8      0   35
2023-Feb-11  00 17  -67 28   1.921   2.228     59E    Tuc    7.8      0   37
2023-Feb-16  00 53  -65 15   1.945   2.227     60E    Tuc    7.8      0   39
2023-Feb-21  01 24  -62 40   1.969   2.233     61E    Hyi    7.9      0   41
2023-Feb-26  01 51  -59 49   1.996   2.246     62E    Hyi    7.9      0   42
2023-Mar-03  02 14  -56 48   2.024   2.266     63E    Hor    8.0      0   43
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  4.2 + 5 log d + 6.6 log r
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Estimates submitted to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
             (UT)                      T         Dia  DC  LENG  PA
   2017K2  2023 01 25.45 xM  8.6 TK  7.0B    15   7.0  4           ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 18.44 xM  8.5 TK  7.0B    15   6    5           ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 15.44 xM  8.4 TK  7.0B    15   8.0  4/          ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 14.45 xM  8.6 TK  7.0B    15   6.0  5/          ICQ XX WYA   Christopher Wyatt
   2017K2  2023 01 09.44 xM  8.1 TK  7.0B    15   7.0  4           ICQ XX WYA   Christopher Wyatt
```

While C/2022 E3 (ZTF) gets all the attention in the northern hemisphere, C/2017 K2 (PANSTARRS), last summer's hit comet, is still going strong but only for southern hemisphere observers. Though it is 3 magnitudes fainter than C/2022 E3, K2 is currently acting like E3's doppelganger. Images taken by Martin Mobberley show two dust tails that are separated by ~140 degrees and don't look that dissimilar from E3, late January appearence.

Chris Wyatt has been following C/2017 K2 visually, finding it at magnitude 8.4 to 8.6 with a large 6' to 8' moderately condensed coma.

Though C/2017 K2 (PANSTARRS) is only 2 months from its 2022 December 19 perihelion at 1.80 au and slowly moving away from the Sun, its distance to the Earth remains fairly constant in February at 2.2 au from Earth. As a result, it should stay nearly constant in brightness with a slight fade of only 0.1-0.2 magnitudes during the month.

As mentioned above, K2 is a southern hemisphere only object and is observable this month in the evening sky as it moves through Indus (Feb 1-5), Tucana (5-20), and Hydrus (20-28).

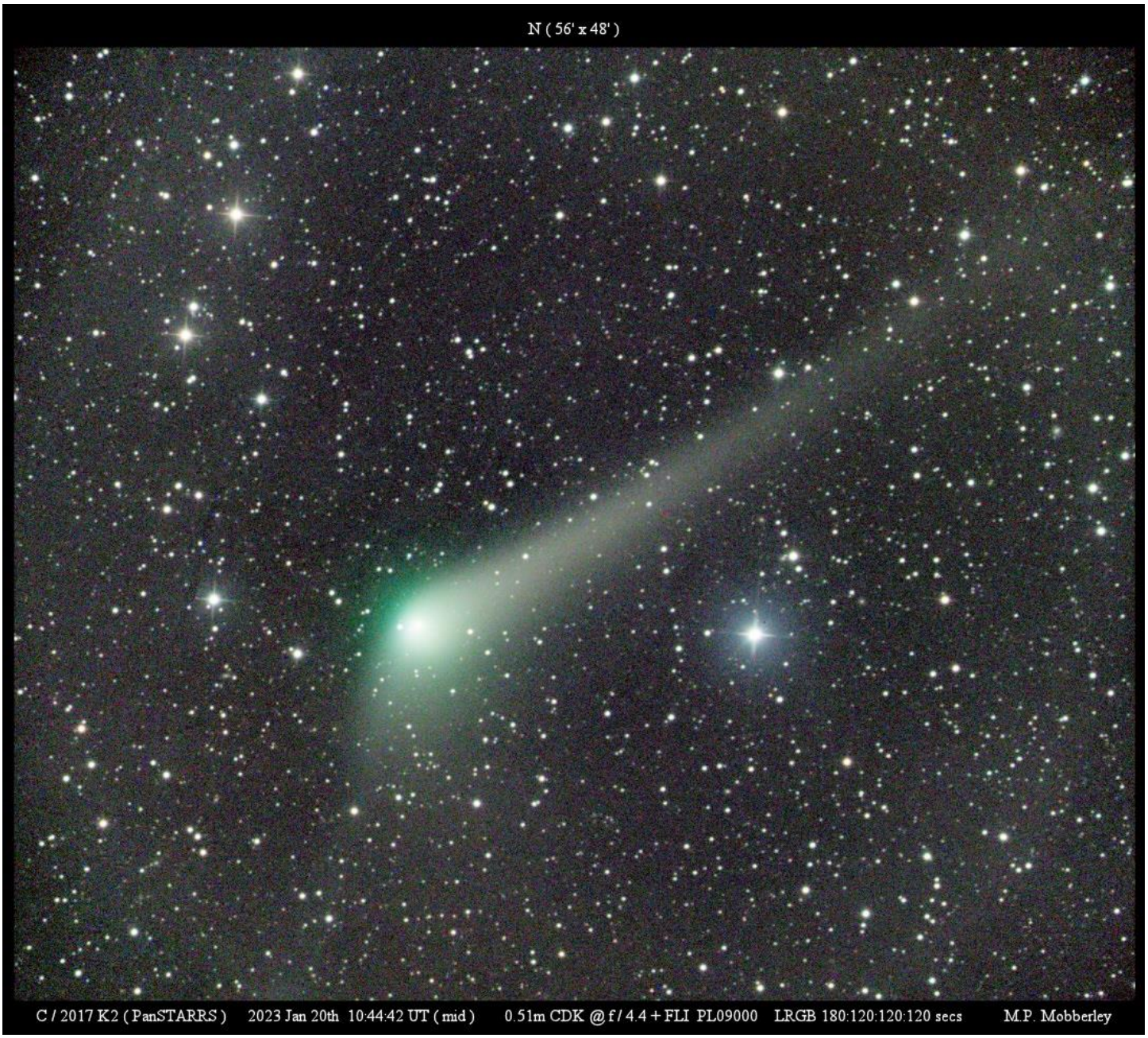


Figure 3 - Martin Mobberley imaged C/2017 K2 (PANSTARRS) on 2023 January 20 with an iTelescopes 0.51-m CDK and FLI PL09000 camera.

C/2020 V2 (ZTF)

Discovered 2020 November 2 by the ZTF survey
Dynamically new long-period comet

Orbit (from Minor Planet Center, MPEC 2023-B154)

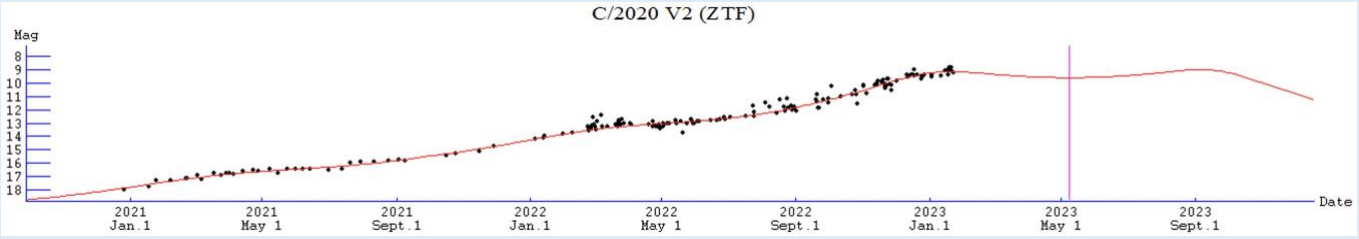
```
    C/2020 V2 (ZTF)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 May 8.56944 TT                                  Rudenko
q   2.2278276           (2000.0)            P              Q
z  -0.0004163      Peri.  162.43191     +0.69787543     +0.59389985
 +/-0.0000003      Node   212.37219     +0.53387603     -0.05877318
e   1.0009273      Incl.  131.61093     +0.47743719     -0.80238936
From 3736 observations 2020 Apr. 18-2023 Jan. 25, mean residual 0".4.
1/a(orig) = -0.000140 AU**-1, 1/a(fut) = -0.000379 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2020 V2 (ZTF)                                                      Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2023-Feb-01  01 29  +56 47   2.486   2.227     93E   Cas    9.2    64    0
2023-Feb-06  01 31  +53 34   2.461   2.287     88E   Per    9.2    62    0
2023-Feb-11  01 34  +50 35   2.438   2.353     83E   And    9.3    60    0
2023-Feb-16  01 37  +47 52   2.416   2.422     77E   And    9.3    56    0
2023-Feb-21  01 40  +45 23   2.394   2.494     72E   And    9.3    52    0
2023-Feb-26  01 43  +43 07   2.374   2.567     67E   And    9.4    48    0
2023-Mar-03  01 47  +41 04   2.355   2.640     62E   And    9.4    43    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = -1.4 + 5 log d + 15.9 log r [up to T-580 days
m1 =  3.2 + 5 log d + 10.1 log r [between T-580 and T-220 days]
m1 =  4.2 + 5 log d +  8.0 log r [T-220 days and onward, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
              (UT)                    T         Dia  DC  LENG  PA
   2020V2  2023 01 22.83  S  9.6 TK 20.3T10  77   3.5  4/          ICQ XX GON05 Juan Jose Gonzalez Suarez
   2020V2  2023 01 21.43  S  9.5 TK 12.5B    30   2.5  4           ICQ xx HER02 Carl Hergenrother
   2020V2  2023 01 18.77  S  9.8 TI 29.8L 4  66   3    4           ICQ XX HAR11 Christian Harder
   2020V2  2023 01 17.76  S  9.5 TI 29.8L 4  66   3.5  4           ICQ XX HAR11 Christian Harder
   2020V2  2023 01 15.72  S  9.1 TK  7.0B 6  16   5    3           ICQ XX PIL01 Uwe Pilz
   2020V2  2023 01 11.76  S  9.8 TI 25.2L 4  68   3.5  4  2.5 m 30 ICQ XX HAR11 Christian Harder
   2020V2  2023 01 03.23  S  9.9 TI 25.2L 4  68   2.7  4           ICQ XX HAR11 Christian Harder
   2020V2  2023 01 03.23  S  9.7 TK 20.3T10  77   3.5  4           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

C/2022 E3 (ZTF) isn't the only comet visible in reasonably sized telescopes in the northern sky. C/2020 V2 (ZTF), as well as C/2022 A2 (PANSTARRS) and C/2022 U2 (ATLAS) (more below), is also a nice northern comet.

C/2020 V2 is a dynamically new comet presumably making its first perihelion close to the Sun. Perihelion is still a few months away on 2023 May 8 at 2.23 au from the Sun. The rather distant perihelion means that like

C/2017 K2, C/2020 V2 will remain near its maximum brightness for months. As a result, the comet will stay brighter than magnitude 10 for most of 2023 with two likely peaks in brightness. The first peak occurred last month at around magnitude 9 when the comet reached the first of two minimum distances to the Earth (2023 January 6 at 2.06 au from the Earth while 2.63 au from the Sun). A second slightly brighter peak, also at magnitude 9, is predicted around the time of its second close approach (September 17 at 1.85 au from Earth and 2.68 au from the Sun). Though the comet should be intrinsically brightest around its May 8 perihelion at 2.23 au, it will be located 3.22 au from Earth and on the far side of the Sun at that time.

Visual observers (Juan Jose Gonzalez Suarez, Carl Hergenrother, Christian Harder, and Uwe Pilz) observed V2 7 nights in January and found it between magnitude 9.1 and 9.9 (aperture corrected to 9.1 to 9.6) with a slightly to moderately condensed (DC = 3-4.5) 2.7' to 5'coma. A few visual observers including Christian Harder and Ludovic Prebet observed a short tail.

This month, C/2022 V2 continues to move through the far northern evening sky in Cassiopeia (Feb 1-4), Perseus (4-10), and Andromeda (10-28).

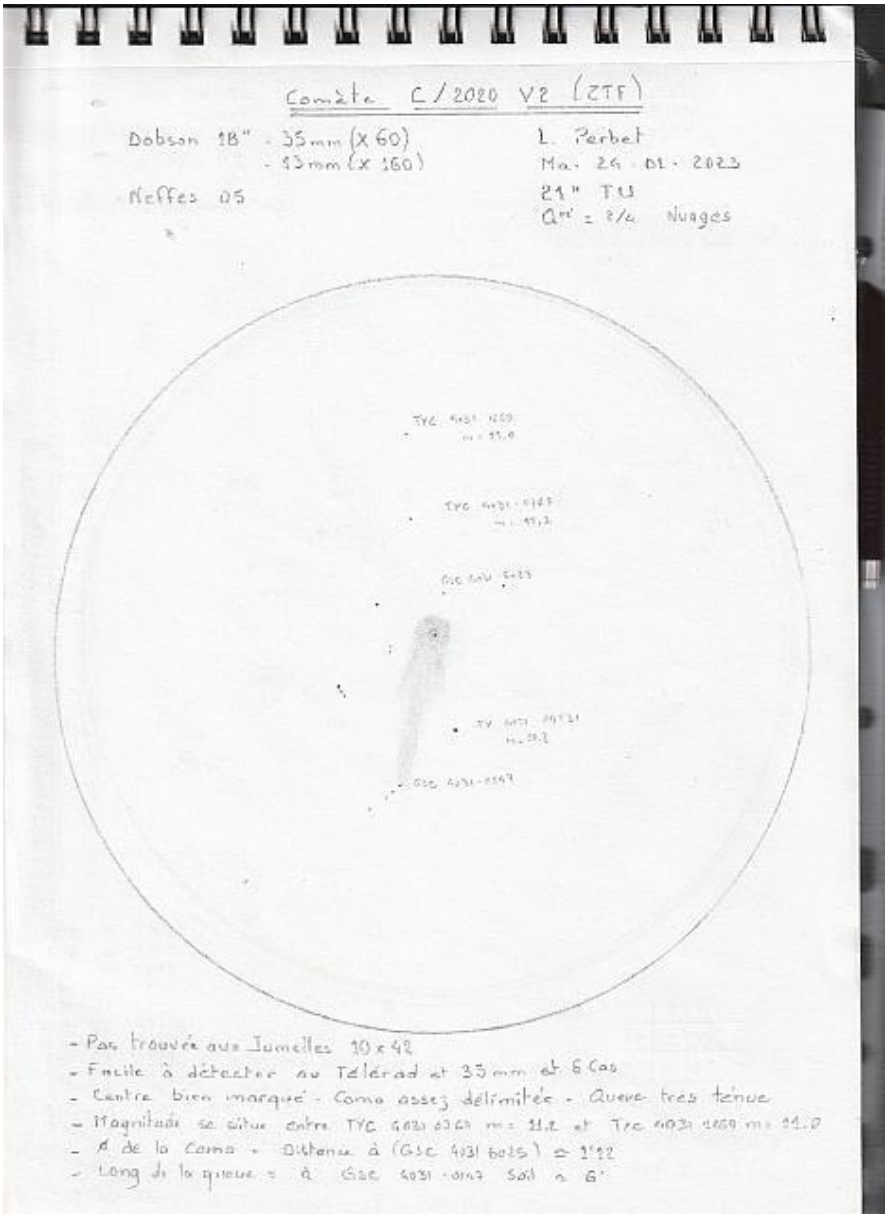


Figure 4 – Here's what C/2020 V2 (ZTF) looked like to Ludovic Prebet. Ludovic used a 18" dobsonian at 60 and 160 power on 2023 January 29.

C/2022 A2 (PANSTARRS)

Discovered 2022 January 10 by Pan-STARRS with the Pan-STARRS2 telescope at Haleakala
Dynamically new long-period comet

Orbit (from Minor Planet Center, MPEC 2022-B154)

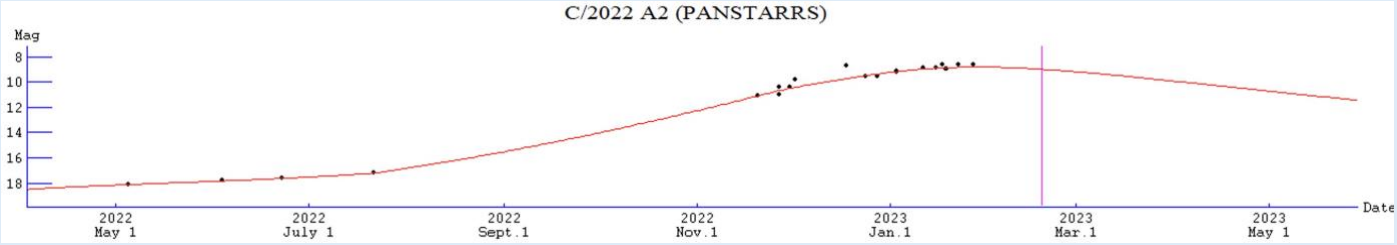
```
    C/2022 A2 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Feb. 18.26707 TT                                  Rudenko
q   1.7352866           (2000.0)            P               Q
z  -0.0001839      Peri.   88.36710     +0.01740202     +0.99011789
 +/-0.0000004      Node   171.57948     -0.09144890     -0.13701520
e   1.0003192      Incl.  108.14706     +0.99565771     -0.02988973
From 812 observations 2022 Jan. 9-2023 Jan. 25, mean residual 0".5.
1/a(orig) = -0.000049 AU**-1, 1/a(fut) = -0.000066 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2022 A2 (PANSTARRS)                                                Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2023-Feb-01  19 39   +58 37    1.750   1.674     77M    Dra    8.8    38    0
2023-Feb-06  20 19   +57 56    1.743   1.720     74M    Cyg    8.9    35    0
2023-Feb-11  20 54   +56 50    1.738   1.775     71M    Cep    8.9    32    0
2023-Feb-16  21 25   +55 26    1.736   1.837     68M    Cep    9.0    29    0
2023-Feb-21  21 51   +53 55    1.736   1.905     64M    Cyg    9.0    27    0
2023-Feb-26  22 14   +52 22    1.738   1.977     61M    Lac    9.1    25    0
2023-Mar-03  22 34   +50 51    1.743   2.050     58M    Lac    9.2    23    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  7.6 + 5 log d + 13.6 log r [Through T-220 days]
m1 = -0.2 + 5 log d + 29.4 log r [Between T-220 and T-80 days]
m1 =  3.5 + 5 log d + 17.3 log r [After T-80 days, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T          Dia  DC  LENG  PA
   2022A2  2023 01 27.53  S  9.0 TK 12.5B    30   4.5  5           ICQ xx HER02 Carl Hergenrother
   2022A2  2023 01 22.85  S  8.9 TK 20.3T10  77   6    3/          ICQ XX GON05 Juan Jose Gonzalez Suarez
   2022A2  2023 01 18.75  S  9.4 TI 29.8L 4  66   4.3  4           ICQ XX HAR11 Christian Harder
   2022A2  2023 01 17.75  S  9.0 TI 29.8L 4  66   3.5  4           ICQ XX HAR11 Christian Harder
   2022A2  2023 01 15.71  S  8.9 TK  7.0B 6  16   2.5  3           ICQ XX PIL01 Uwe Pilz
   2022A2  2023 01 11.77  S  9.2 TI 25.2L 4  68   3.5  3/          ICQ XX HAR11 Christian Harder
   2022A2  2023 01 03.22  S  9.4 TI 25.2L 4  68   5    4           ICQ XX HAR11 Christian Harder
   2022A2  2023 01 03.22  S  9.5 TK 20.3T10  77   5    3/          ICQ XX GON05 Juan Jose Gonzalez Suarez
```

The Pan-STARRS survey discovered C/2022 A2 (PANSTARRS) at 19-20th magnitude with the Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii back at the start of 2022 on January 10. At discovery, the comet was 4.9 au from the Sun and 4.6 au from Earth but, quite surprisingly for an apparently dynamically new long-period comet, has rapidly brightened to around 8-9th magnitude in January.

The comet was well observed by visual observers in January with all finding it between magnitude 8.9 and 9.5 (aperture corrected to 8.6 to 9.2). Coma sizes ranged from 2.5’ to 6’ with it being loosely to moderately condensed at DCs of 3.5 to 5.

A2 should start the month close to its peak brightness between magnitude 8.5 and 9.0. It made a rather distant close approach to Earth last month on the 17th at 1.61 au. Perihelion is this month on the 18th at 1.74 au from the Sun. A slow fade should commence in February as the comet moves away from the Earth but we’re only talking a few tenths of a magnitude so A2 may still be around magnitude 9.1 at the end of the month.

Like last month, C/2022 A2 is a northern object observable in both the evening and morning sky, though higher up in the morning as it moves through Draco (Feb 1-2), Cygnus (2-8), Cepheus (8-16), Cygnus (16-23), and Lacerta (23-28). Its northern location means it remains limited to northern hemisphere observers this month.

Figure 5 – Efrain Morales Rivera (Aguadilla, Puerto Rico) imaged C/2022 A2 (PANSTARRS) on 2023 January 12 with 0.3-m SCT at f/6.3 and ZWO ASI 183 MM Pro camera + Luminance filter.

C/2022 U2 (ATLAS)

Discovered 2022 October 25 by the Asteroid Terrestrial-Impact Last Alert System (ATLAS)
Dynamically old long period comet

Orbit (from Minor Planet Center, MPEC 2023-B154)

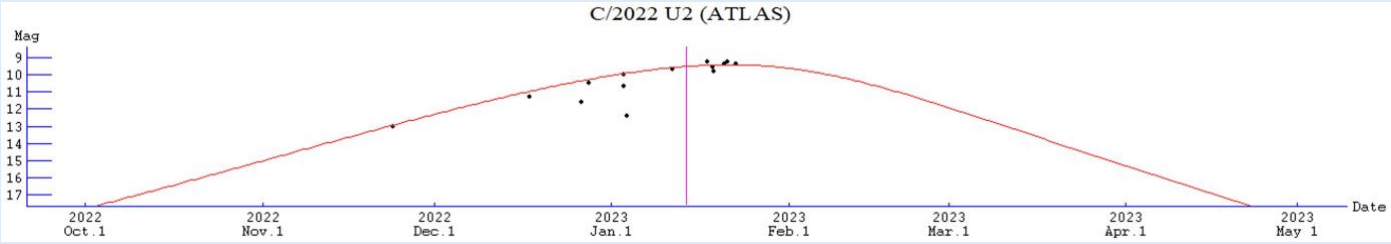
```
    C/2022 U2 (ATLAS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Jan. 14.22161 TT                                  Rudenko
q   1.3280308           (2000.0)            P               Q
z  +0.0104396      Peri.  147.90970     -0.18795052     -0.76578597
 +/-0.0000108      Node   304.47605     +0.66684604     +0.36023801
e   0.9861359      Incl.   48.24952     +0.72110399     -0.53272922
From 545 observations 2022 Oct. 25-2023 Jan. 25, mean residual 0".5.
1/a(orig) = +0.011633 AU**-1, 1/a(fut) = +0.010154 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2022 U2 (ATLAS)                                                  Max El
                                                                    (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag   40N  40S
2023-Feb-01  04 36  +52 00    1.353    0.566    118E    Per    9.6    78    0
2023-Feb-06  04 58  +43 43    1.370    0.584    119E    Aur    9.9    86    5
2023-Feb-11  05 15  +35 52    1.389    0.616    118E    Aur   10.2    86   13
2023-Feb-16  05 30  +28 49    1.413    0.661    116E    Aur   10.6    79   20
2023-Feb-21  05 42  +22 41    1.439    0.717    114E    Tau   11.1    73   26
2023-Feb-26  05 53  +17 28    1.469    0.782    111E    Ori   11.6    67   32
2023-Mar-03  06 03  +13 04    1.501    0.854    108E    Ori   12.1    63   36
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  6.2 + 5 log d + 35.6 log r
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T         Dia  DC  LENG  PA
   2022U2  2023 01 22.84  S  9.7 TK 20.3T10  77   6    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
   2022U2  2023 01 21.42  S  9.7 TK 12.5B    30   6    1            ICQ xx HER02 Carl Hergenrother
   2022U2  2023 01 18.76  S 10.0 TI 29.8L 4  66   3.3  2            ICQ XX HAR11 Christian Harder
   2022U2  2023 01 17.76  S  9.7 TI 29.8L 4  66   4.3  2            ICQ XX HAR11 Christian Harder
   2022U2  2023 01 11.76  S 10.0 TI 25.2L 4  68   3.5  2            ICQ XX HAR11 Christian Harder
   2022U2  2023 01 03.83  S 12.9 HS 32.0L 5 144                     ICQ XX PIL01 Uwe Pilz
   2022U2  2023 01 03.24  S 11.0 TI 25.2L 4  92   2.5  2            ICQ XX HAR11 Christian Harder
   2022U2  2023 01 03.24  S 10.3 TK 20.3T10  77   8    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

The "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) search program found C/2022 U2 (ATLAS) at 19th magnitude on 2022 October 25 at a far northern declination of +69 deg. C/2022 U2 (ATLAS) is a dynamically old long-period comet last at perihelion ~800 years ago.

After a rapid bout of brightening, C/2022 U2 peaked around magnitude 9.7 in late January. This was around the time of its perihelion on 2023 January 14 at 1.33 au and closest approach to Earth on January 28 at 0.56 au.

Multiple visual observers monitored the comet in January and found it to possess a diffuse (DC = 1-2.5) coma up to 8’ in diameter.

After spending the last month as a northern circumpolar object, U2 is heading south in February. As a result, it will remain well placed high in the evening sky for northern observers as it moves through Perseus (Feb 1-4), Auriga (4-16), Taurus (16-24), Orion (24-25), Taurus (25-26), Orion (26-28) and southern hemisphere observers will be able to pick it up early in the month. If the comet fades as rapidly as it brightens, then it may fade from magnitude 9.6 to ~12.0 by the end of the month. If it fades slower than it brightened, it may run brighter than the above prediction.

C/2022 U2 provides a few nice photo opportunities in February:

Feb 06 C/2022 E3 (ZTF) and C/2022 U2 (ATLAS) are within ~20’ of each other

Feb 11-12 C/2022 U2 (ATLAS) passes close to the Flaming Star Nebula (IC 405), bright emission nebula IC 410, and 7th mag open star cluster NGC 1893

Feb 16-17 C/2022 U2 (ATLAS) moves along the western edge of the large 40,000-year old supernova remnant Simeis 147. Simeis 147, also known as the Spaghetti Nebula, has a few cometary connections. It was discovered by Grigory Shajn, the discoverer of C/1925 F1 (Shajn-Comas Solá). In 1949, his wife, Pelageya F. Shajn, was the discoverer of 61P/Shajn-Schaldach. On 1986 November 1, William Sorrells was imaging Simeis 147 when he discovered long period comet C/1986 V1 (Sorrells) at 12th magnitude. Sorrells would eventually peak at magnitude 8.5-9.0.

Figure 6 – Tenho Tuomi imaged C/2022 U2 (ATLAS) on 2023 January 3 with a 0.3-m f/5 newtoniain. The composite consists of 18x60s color exposures.

96P/Machholz

Discovered visually on 1986 May 12 by Donald Machholz

Orbit (from Minor Planet Center, MPEC 2017-T14)

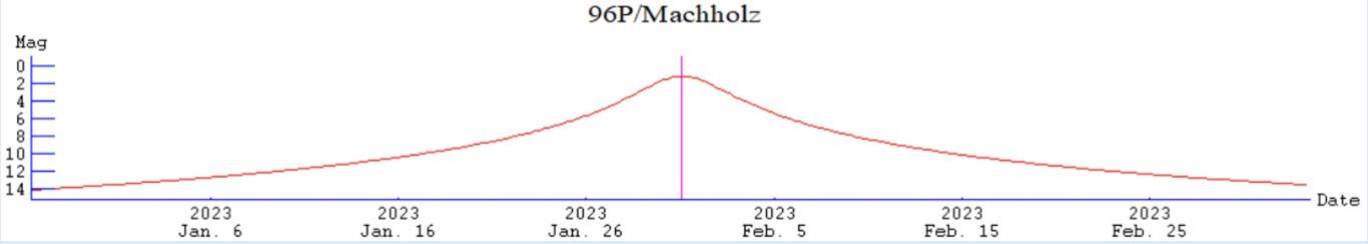
```
  96P/Machholz
Epoch 2023 Jan. 16.0 TT = JDT 2459960.5
T 2023 Jan. 31.08465 TT                                  MPCW
q   0.1164254            (2000.0)            P              Q
n   0.18680100     Peri.   14.74858     -0.20313326     -0.50076303
a   3.0307487      Node    93.95410     +0.79107878     -0.59032451
e   0.9615853      Incl.   57.50295     +0.57700195     +0.63305083
P   5.28
From 925 observations 2007 Apr. 9-2017 Aug. 19, mean residual 0".6.
     Nongravitational parameters A1 = -0.01, A2 = -0.0002.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
96P/Machholz                                                        Max El
                                                                     (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2023-Feb-01  20 54   -12 25    0.125    0.890     4M    Aqr    1.6      0    0
2023-Feb-06  20 21   -07 05    0.283    1.025    16M    Aql    6.2      0    0
2023-Feb-11  20 12   -06 26    0.442    1.157    22M    Aql    8.8      3    0
2023-Feb-16  20 10   -06 29    0.583    1.261    26M    Aql   10.4      6    0
2023-Feb-21  20 10   -06 42    0.711    1.345    30M    Aql   11.6      8    2
2023-Feb-26  20 12   -06 56    0.829    1.411    35M    Aql   12.5     10    7
2023-Mar-03  20 14   -07 10    0.940    1.464    39M    Aql   13.2     12   12
```

Comet Magnitude Formula (from Seiichi Yoshida)

```
m1 = 12.7 + 5 log d + 12.0 log r
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des   YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
               (UT)                    T         Dia  DC  LENG  PA
None.
```

Which comet was the brightest in January? Most folks would say C/2022 E3 (ZTF) and they would be correct for comets visible from Earth. If you were in space and equipped with a coronagraph to block out the Sun, you would have seen 96P/Machholz only a few degrees from the Sun and shining at magnitude 0 to 2. Luckily, we have a few such instruments always pointing at the Sun on the SOHO and STEREO-A spacecraft.

With a small perihelion distance of 0.116 au, 96P is never visually observable from the ground at perihelion. Though it may have been observed by imaging extraordinaire Nicolas Lefaudeux at perihelion (see his image posted at Spaceweather.com).

Between January 29 and February 2, 96P was visible in the SOHO LASCO C3 field-of-view and for a shorter period in the STEREO-A COR field-of-view. In the past, a number of faint secondaries were detected at previous perihelia. This time at least 4 secondaries have been detected (see Karl Battams' Twitter post from Jan 30, quick

note, Karl's Twitter channel is definitely a go to for all things comets, especially those very close to the Sun in SOHO and STEREO data). My own quick analysis of the SOHO C3 images found 3 secondaries. It is currently unknown whether these secondaries are surviving from perihelion to perihelion or new. None have been observed by ground-based telescopes when 96P is much further from the Sun.

With 96P now past its January 31 perihelion and exiting the SOHO C3 FOV, we'll need to wait a few weeks before the it comes within view of Earth-based observers. Northerners will get the first shot at 96P as it rises above the eastern morning horizon before the start of astronomical twilight by the middle of February though it should have faded to about 8-9th magnitude by then and will be fighting a bright Moon. Southern hemisphere observers will need to wait till late February when the comet will be even fainter at 11-12th magnitude.

96P was discovered in 1986 by former ALPO Comets Section Coordinator Donald Machholz. It was one of Dan's 12 visual comet discoveries. 96P/Machholz is an interesting comet. Its composition is depleted in both carbon and cyanogen, being one of only two comets showing this trait, the other being another visual discovery, long-period comet C/1988 Y1 (Yanaka). While some have surmised that this suggests an interstellar origin (i.e., not from our Solar System), it could just mean that 96P and Yanaka formed in a different region of the early Solar System from the bulk of the other comets, or have become depleted due to repeated close approaches to the Sun.

96P is also a part of a much larger group of comets, asteroids, and meteor showers. It appears that 96P, near-Earth asteroid 2033 EH1 (which may have been observed as a comet in 1490), the Kracht and Marsden group of small sunskirting SOHO comets, and the Quadrantid, Southern delta-Aquariid, and Daytime Arietid meteor showers are all related. 96P and its brethren may have been breaking up for thousands of years which may be a common occurrence, especially for objects that routinely get extremely close to the Sun.

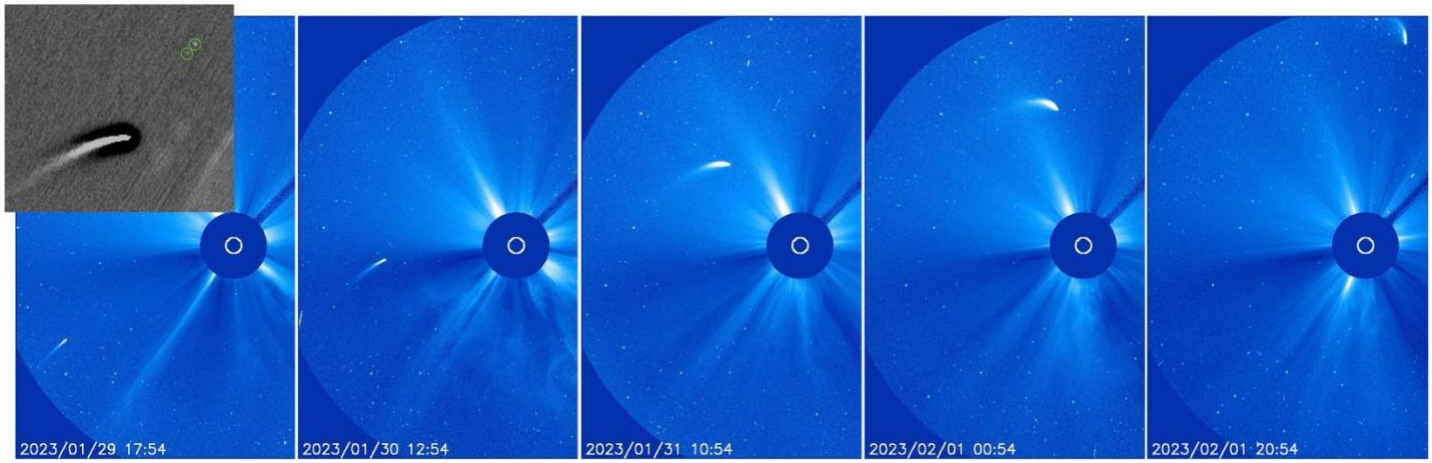


Figure 7 –96P/Machholz passes through perihelion only a few degrees and 0.11 au from the Sun on January 31. Images were taken by the LASCO C3 instrument on the SOHO spacecraft. The upper left image is a co-added processed image C3 image showing 2 small secondary nuclei on January 31 at ~01:00 UT. Credit: ESA/NASA/SOHO/LASCO.

Comets Between Magnitude 10 and 12

29P/Schwassmann-Wachmann

Discovered 1927 November 15 by Arnold Schwassmann and Arno Arthur Wachmann at the Hamburg Observatory in Bergedorf, Germany
Centaur comet with orbital period of ~14.9 years

Orbit (from Minor Planet Center, MPEC 2023-B154)

```
  29P/Schwassmann-Wachmann
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2019 Apr. 22.08411 TT                                  Rudenko
q   5.7776656            (2000.0)            P              Q
n   0.06626537     Peri.   51.08587     +0.99049654     -0.06693879
a   6.0479982      Node   312.39746     -0.00102451     +0.86995714
e   0.0446979      Incl.    9.36345     +0.13753380     +0.48856297
P  14.9
From 15331 observations 2018 June 18-2023 Jan. 26, mean residual 0".6.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
29P/Schwassmann-Wachmann                                                Max El
                                                                         (deg)
    Date      R.A.   Decl.     r       d    Elong  Const  Mag    40N   40S
2023-Feb-01  06 22  +29 06   6.067   5.252   142E   Aur  11-13    79    21
2023-Feb-06  06 20  +29 01   6.069   5.304   137E   Aur  11-13    79    21
2023-Feb-11  06 19  +28 54   6.070   5.362   132E   Aur  11-13    79    21
2023-Feb-16  06 17  +28 48   6.072   5.425   127E   Aur  11-13    79    21
2023-Feb-21  06 17  +28 41   6.073   5.493   121E   Aur  11-13    79    21
2023-Feb-26  06 16  +28 35   6.075   5.565   116E   Aur  11-13    79    21
2023-Mar-03  06 16  +28 28   6.077   5.639   111E   Aur  11-13    78    21
```

Comet Magnitude Formula

```
None, due to frequent outbursts.
```

Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T          Dia  DC  LENG  PA
 29        2023 01 22.86  S 11.0 TK 20.3T10  77   3.5  1/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 29        2023 01 18.78  S 11.2 TI 29.8L 4 108   2    1            ICQ XX HAR11 Christian Harder
 29        2023 01 12.97  M 12.7 AQ 30.0L 5 101   1    5            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2023 01 11.78  S 10.8 TI 25.2L 4  92   2.5  1            ICQ XX HAR11 Christian Harder
 29        2023 01 03.84  S 12.0 TK 32.0L 5 144        7            ICQ XX PIL01 Uwe Pilz
 29        2023 01 03.26  S 11.1 TK 20.3T10 100   3    1/           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

29P/Schwassmann-Wachmann (formerly S-W 1) was discovered photographically on 1927 November 15 by the German observing team of Arnold Schwassmann and Arno Arthur Wachmann. The Schwassmann-Wachmann duo discovered 4 comets together, three short-period comets (29P/Schwassmann-Wachmann, 31P/Schwassmann-Wachmann, and 73P/Schwassmann-Wachmann) and a long-period comet shared with American visual observer extraordinaire Leslie Peltier [C/1930 D1 (Peltier-Schwassmann-Wachmann)].

29P is an enigmatic comet. Its nucleus is one of the largest known for an active comet with a recent study using Spitzer infrared data placing its size at 64.6 +/- 6.2 km. Combining the Spitzer diameter with an assumed cometary nucleus albedo of 0.04 yields an absolute magnitude of ~10.1. If 29P were to be completely inactive, its nucleus would still be currently observable at a magnitude of ~18.0. The large size of 29P's nucleus was recently confirmed during an occultation visible across the southwest USA on December 19 when two chords were observed consistent with a nuclear size of ~60 km.

29P experiences outbursts multiple times per year with the largest resulting in a peak brightness of 10th magnitude though the majority of outbursts are much fainter. The constant outbursts are especially odd since the

comet's orbit lies just outside the orbit of Jupiter and is nearly circular (e=0.04), meaning the comet does not experience large variations in solar heating like most comets. Richard Miles (Director of the British Astronomical Society's Asteroids and Remote Planets Section) has published a series of papers on 29P and its outbursts and found that as many as 6 active areas are producing outbursts on a nucleus with a rotation period of ~57-58 days.

Back in September, October, and November of 2021, a number of large outbursts were observed resulting in 29P reaching 10th magnitude, which is about as bright as it ever gets. Recently two large outbursts were detected on November 22 and 27 with another small to moderate outbursts on December 26, January 12, 19 and 29. As a result, 29P is once again a nice visual object for large aperture visual observers. J. J. Gonzalez, Jose Guilherme de Souza Aguiar, Christian Harder, and Uwe Pilz observed 29P multiple times in January and found the comet mainly between magnitude 10.8 and 12.7. The large scatter in estimated brightness likely being due to the comet's large diffuse coma from the recent outbursts.

If you observe 29P, please consider contributing to two pro-am programs spearheading the effort to better understand this amazing object: the British Astronomical Society's (BAA) Mission 29P monitoring program coordinated by Richard Miles. (https://britastro.org/node/18562 & https://britastro.org/node/25120) and the University of Maryland's 29P Observation campaign (https://wirtanen.astro.umd.edu/29P/29P_obs.shtml).

Figure 8 – Denis Buczynski caught 29P on 2023 January 13 at the start of one its recent small outbursts.

81P/Wild

Discovered photographically on 1978 January 6 by Paul Wild at Zimmerwald, Switzerland

Orbit (from Minor Planet Center, MPEC 2023-B154)

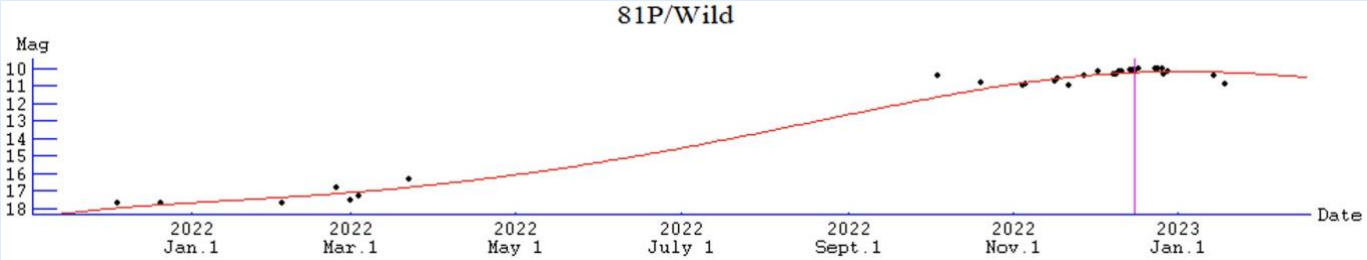
```
  81P/Wild
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Dec. 15.61721 TT                                  Rudenko
q   1.5984259            (2000.0)            P              Q
n   0.15352235     Peri.   41.62770     -0.99847760     -0.03885658
a   3.4542597      Node   136.09801     +0.02219095     -0.93275763
e   0.5372595      Incl.    3.23648     +0.05049791     -0.35840392
P   6.42
From 2043 observations 2014 Oct. 18-2023 Jan. 26, mean residual 0".7.
     Nongravitational parameters A1 = +0.04, A2 = -0.0361.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
81P/Wild                                                          Max El
                                                                   (deg)
    Date       R.A.    Decl.     r       d     Elong  Const  Mag   40N  40S
2023-Feb-01  15 53   -17 10   1.666   1.686    71M    Lib   10.3    29   36
2023-Feb-06  16 05   -17 38   1.680   1.661    73M    Sco   10.4    29   39
2023-Feb-11  16 16   -18 01   1.696   1.635    76M    Sco   10.4    28   43
2023-Feb-16  16 27   -18 20   1.713   1.609    78M    Oph   10.5    28   46
2023-Feb-21  16 38   -18 36   1.730   1.582    81M    Oph   10.5    28   49
2023-Feb-26  16 48   -18 47   1.749   1.556    83M    Oph   10.6    28   53
2023-Mar-03  16 58   -18 55   1.769   1.529    86M    Oph   10.7    28   56
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  4.3 + 5 log d + 22.0 log r
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
               (UT)                      T         Dia  DC  LENG  PA
 81        2023 01 31.24  S 11.2 TK 20.3T10  77   6    2           ICQ XX GON05 Juan Jose Gonzalez Suarez
 81        2023 01 18.27  M 11.7 AQ 30.0L 5 101   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

Paul Wild discovered 81P/Wild (formerly Wild 2) on photographic plates obtained on 1978 January 6 taken with the 0.4-m Schmidt telescope at Zimmerwald, Switzerland. 81P is best known as the target of the Stardust mission which not only obtained close-up imaging in 2004 but also collected a sample of cometary particles and returned them to Earth in 2006. Perihelion was on 2022 December 15 at 1.60 au when the comet was also a distant 1.94 au from Earth. 2023 will see the comet move towards a close approach to Earth on 2023 May 18 at 1.22 au.

81P is a morning object in Libra (Feb 1-4), Scorpius (4-13), and Ophiuchus (13-28). It was observed visually in January by Juan Jose Gonzalez Suarez and Jose Guilherme de Souza Aguiar at magnitude 11.2-11.7 (aperture corrected mag of 10.9-11.0). 81P should fade slightly in February from around magnitude 10.3 to 10.6 though the January observations suggest it may be ~0.5 magnitudes fainter than the prediction above.

C/2019 L3 (ATLAS)

Discovered 2019 June 10 by the ATLAS survey with one of their 0.5-m f/2 Schmidt

Orbit (from Minor Planet Center, MPEC 2023-B154)

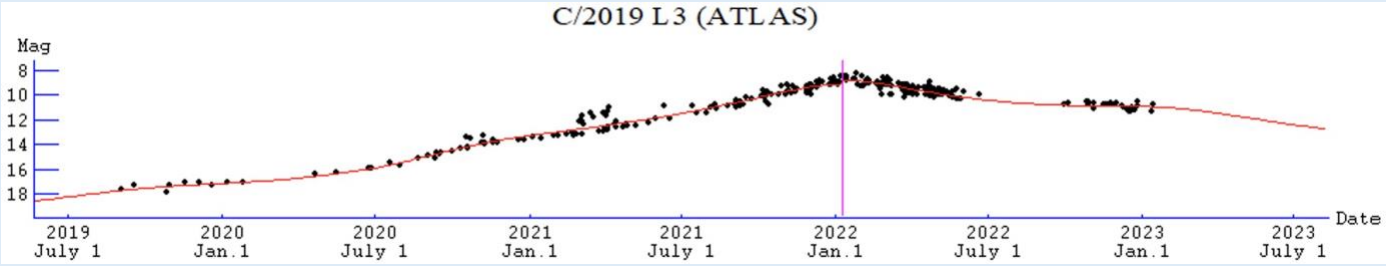
```
    C/2019 L3 (ATLAS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Jan.  9.64934 TT                                  Rudenko
q   3.5544190           (2000.0)            P               Q
z  -0.0005753      Peri.  171.61734     -0.26040763     -0.66641985
 +/-0.0000001      Node   290.77988     +0.83684017     +0.20510083
e   1.0020449      Incl.   48.35090     +0.48154584     -0.71681115
From 5908 observations 2019 June 10-2023 Jan. 26, mean residual 0".4.
1/a(orig) = +0.000039 AU**-1, 1/a(fut) = -0.000717 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2019 L3 (ATLAS)                                                    Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2023-Feb-01  09 37   -34 28    4.935   4.275    127M   Ant   11.0     15   85
2023-Feb-06  09 33   -34 47    4.964   4.282    129M   Ant   11.0     15   85
2023-Feb-11  09 30   -35 01    4.993   4.293    130E   Ant   11.1     15   85
2023-Feb-16  09 26   -35 10    5.022   4.310    131E   Pyx   11.1     15   85
2023-Feb-21  09 22   -35 14    5.052   4.333    132E   Pyx   11.1     15   85
2023-Feb-26  09 19   -35 14    5.081   4.361    132E   Pyx   11.1     15   85
2023-Mar-03  09 16   -35 09    5.111   4.395    131E   Pyx   11.2     15   85
```

Comet Magnitude Formula and Lightcurve (from ALPO and COBS data)

```
m1 =  2.5 + 5 log d + 12.1 log r [Until T-550 days]
m1 = -4.9 + 5 log d + 21.7 log r [Between T-550 and T+0 days]
m1 =  2.3 + 5 log d +  8.0 log r [Since T+0 days]
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD    Mag  SC APER FL POW   COMA     TAIL     ICQ CODE Observer Name
              (UT)                    T          Dia  DC  LENG  PA
   2019L3  2023 01 13.02  M 11.7 AQ 30.0L 5 101   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

C/2019 L3 (ATLAS) just keeps hanging on. We are over a year past its 2022 January 9 perihelion which occurred at 3.55 au from the Sun. At that time the comet reached a peak magnitude of ~8.5 to 9.0. Before perihelion, L3 experienced a rapid rate of brightening. Since perihelion, it has faded a slow though normal rate of 8.0 log r. That combined with the comet's large perihelion distance is the reason for its slow apparent fading.

Jose Guilherme de Souza Aguiar found L3 visually on January 13 at magnitude 11.7 (aperture corrected to 11.3) with a slightly condensed (DC = 3) coma with a small diameter of 1'. This month, the comet is visible from both hemispheres though low in the south for northerners as it moves through the southern constellation of Antilia (Feb 1-15) and Pyxis (15-28) near opposition.

C/2019 U5 (PANSTARRS)

Discovered 2019 October 22 with the Pan-STARRS1 1.8-m on Haleakala

Orbit (from Minor Planet Center, MPEC 2023-B154)

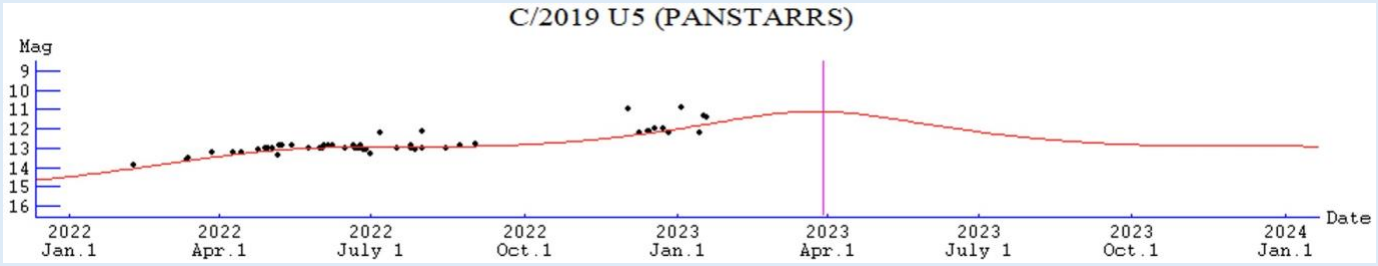
```
    C/2019 U5 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Mar. 29.84927 TT                                  Rudenko
q   3.6241910           (2000.0)            P               Q
z  -0.0004129      Peri.  181.49717     -0.99907961     +0.00774350
 +/-0.0000003      Node     2.63726     -0.02311546     +0.73134215
e   1.0014963      Incl.  113.52062     -0.03613326     -0.68196678
From 3084 observations 2019 Oct. 11-2023 Jan. 26, mean residual 0".4.
1/a(orig) = +0.000083 AU**-1, 1/a(fut) = -0.000098 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2019 U5 (PANSTARRS)                                                  Max El
                                                                        (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2023-Feb-01  13 34   +01 16   3.660   3.208    109M   Vir   11.6     51   44
2023-Feb-06  13 29   +00 57   3.654   3.115    115M   Vir   11.5     51   47
2023-Feb-11  13 23   +00 38   3.649   3.027    122M   Vir   11.4     50   49
2023-Feb-16  13 17   +00 21   3.644   2.944    128M   Vir   11.4     50   50
2023-Feb-21  13 09   +00 05   3.639   2.869    135M   Vir   11.3     50   50
2023-Feb-26  13 01   -00 10   3.636   2.802    142M   Vir   11.2     50   50
2023-Mar-03  12 52   -00 24   3.632   2.744    149M   Vir   11.2     49   51
```

Comet Magnitude Formula and Lightcurve (from ALPO and COBS data)

```
m1 =  3.4 + 5 log d + 10.0 log r
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD    Mag  SC APER FL POW   COMA     TAIL     ICQ CODE Observer Name
              (UT)                      T         Dia  DC  LENG  PA
   2019U5  2023 01 18.26  M 11.8 AQ 30.0L 5 122   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2023 01 17.24  M 11.7 AQ 30.0L 5 101   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2023 01 03.25  S 11.2 TK 20.3T10  77   4    2           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

C/2019 U5 (PANSTARRS) was discovered by the Pan-STARRS survey on 2019 October 22. At that time the comet was 21st magnitude and 10.4 au from the Sun, or a little further than the orbit of Saturn. U5 will be closer when it arrives at perihelion next month on March 29 though still at a distant 3.62 au. Around that time, the comet may reach its brightest though only a few tenths of magnitude brighter than it currently is.

In January, both Juan Jose Gonzalez Suarez and Jose Guilherme de Souza Aguiar observed U5. They found the comet between magnitude 11.2 and 11.8 (aperture corrected to magnitude 10.9 to 11.4) with a coma between 1' and 4' in diameter and rather diffuse with a DC of 2-3. This month C/2019 U5 is a morning object approaching opposition in Virgo. It should continue to slowly brighten as its distance to the Sun and Earth decreases.

C/2020 K1 (PANSTARRS)

Discovered 2020 May 17 by the Pan-STARRS survey with their Pan-STARRS2 1.8-m reflector at Haleakala on Maui
Dynamically old long period comet with ~174,000-year orbital period

Orbit (from Minor Planet Center, MPEC 2023-B154)

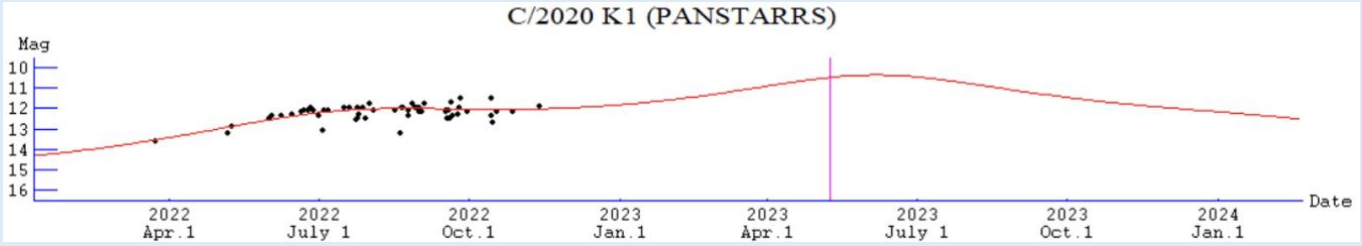
```
    C/2020 K1 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 May  9.07765 TT                                  Rudenko
q   3.0732766           (2000.0)            P              Q
z  -0.0000033      Peri.  213.98424     +0.06618017     -0.03767449
 +/-0.0000006      Node    94.35493     -0.53600734     +0.84152069
e   1.0000101      Incl.   89.66942     -0.84161530     -0.53890960
From 2772 observations 2020 Apr. 17-2022 Nov. 27, mean residual 0".4.
1/a(orig) = +0.000247 AU**-1, 1/a(fut) = +0.000978 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2020 K1 (PANSTARRS)                                                Max El
                                                                      (deg)
    Date       R.A.    Decl.     r       d     Elong  Const  Mag    40N  40S
2023-Feb-01  18 59   -30 25   3.217   4.038    29M    Sgr   11.6     0   10
2023-Feb-06  19 05   -31 19   3.203   3.979    33M    Sgr   11.5     0   14
2023-Feb-11  19 11   -32 14   3.190   3.915    37M    Sgr   11.5     0   18
2023-Feb-16  19 17   -33 13   3.177   3.848    41M    Sgr   11.4     0   23
2023-Feb-21  19 23   -34 13   3.165   3.777    45M    Sgr   11.4     0   27
2023-Feb-26  19 29   -35 17   3.154   3.704    49M    Sgr   11.3     0   32
2023-Mar-03  19 35   -36 24   3.143   3.627    53M    Sgr   11.3     0   36
```

Comet Magnitude Formula and Lightcurve (from ALPO and COBS data)

```
m1 =  4.5 + 5 log d +  8.0 log r
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD    Mag  SC APER FL POW   COMA     TAIL     ICQ CODE Observer Name
               (UT)                    T         Dia  DC  LENG  PA
None.
```

C/2020 K1 (PANSTARRS) was discovered by Pan-STARRS on 2020 May 17. At that time the comet was 20th magnitude and 9.5 au from the Sun. Like C/2019 U5, we are still a few months out from a distant perihelion, in K1's case, on 2023 May 9 at 3.07 au. It should peak at magnitude 10-11 in May and June of this year.

Not much new to report about this one. The last observation was reported to COBS by Thomas Lehmann on 2022 November 12 when he imaged the comet at magnitude 13.4 with a 1.4' coma and 1.3' long tail. The last observation in the Minor Planet Center archives was from November 27 with Ken-ichi Kadota found the comet at magnitude 13.2. Visual observations in the preceding months found the comet at least a magnitude brighter.

The reason for the recent lack of observations is due to the comet being in solar conjunction. This month sees K1 finally pull far enough from the Sun to be observed, at least from the southern hemisphere, in Sagittarius around magnitude ~11.5.