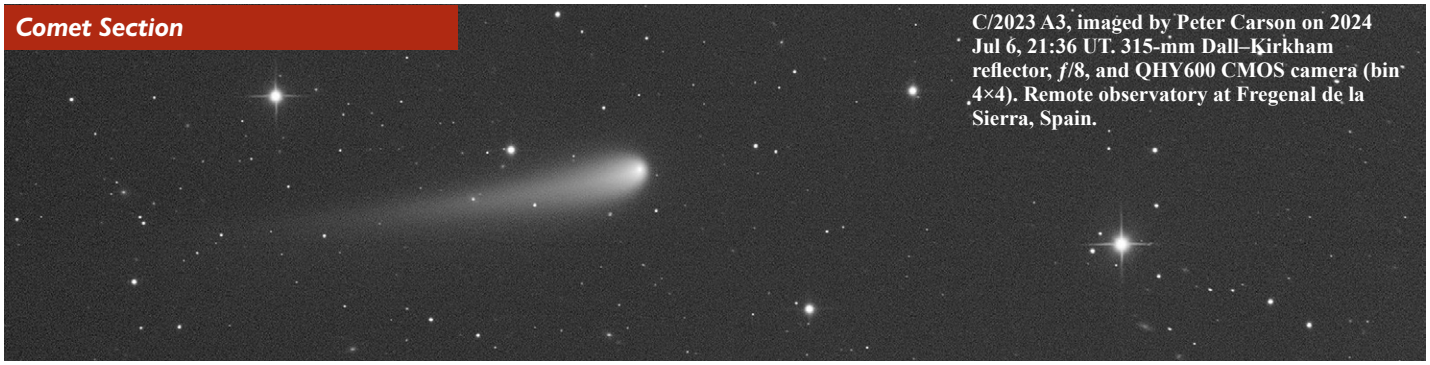
Comet Section



C/2023 A3, imaged by Peter Carson on 2024 Jul 6, 21:36 UT. 315-mm Dall–Kirkham reflector, *f*/8, and QHY600 CMOS camera (bin 4×4). Remote observatory at Fregenal de la Sierra, Spain.

The near-nucleus light curve of comet C/2023 A3 (Tsuchinshan–ATLAS)

Nick James
Director

This comet, announced on *Central Bureau for Astronomical Telegrams* (*CBAT*) 5228,[1] has generated a lot of interest because it may become a bright object after perihelion in 2024 October, when it moves into the western evening sky. It was detected by the Asteroid Terrestrial-impact Last Alert System (ATLAS) 0.5-m, *f*/2 Schmidt reflector telescope at Sutherland, South Africa, on 2023 Feb 22. At the time, it was an 18th-magnitude, apparently asteroidal object in Serpens. It was placed on the Possible Comet Confirmation Page (PCCP) as object A10SVYR and a number of observers reported it to be cometary. The Minor Planet Center (MPC) linked it to a previous object that had been reported by the Purple Mountain Observatory XuYi Observation Station in China on 2023 Jan 9, hence the name Tsuchinshan–ATLAS.

At discovery, the comet was over 7 astronomical units (au) from the Sun, but it will come to a perihelion distance of only 0.39 au on Sep 27. At that time, it will be too close to the Sun for observation, but its elongation will grow rapidly, and it should be observable low in the western evening sky from mid-October onwards. Its orbital eccentricity is slightly greater than one, implying that the comet is dynamically new, i.e., this is its first visit to the inner solar system.

The magnitude of a comet depends on the size of the photometric aperture used for measurement. The total magnitude, which is the magnitude normally quoted for a comet, is measured in an aperture which is large enough to fit the entire coma. Since the coma fades away gradually, this aperture can vary due to sky conditions, instrument, and processing, and so it is difficult to get consistent results between observers.

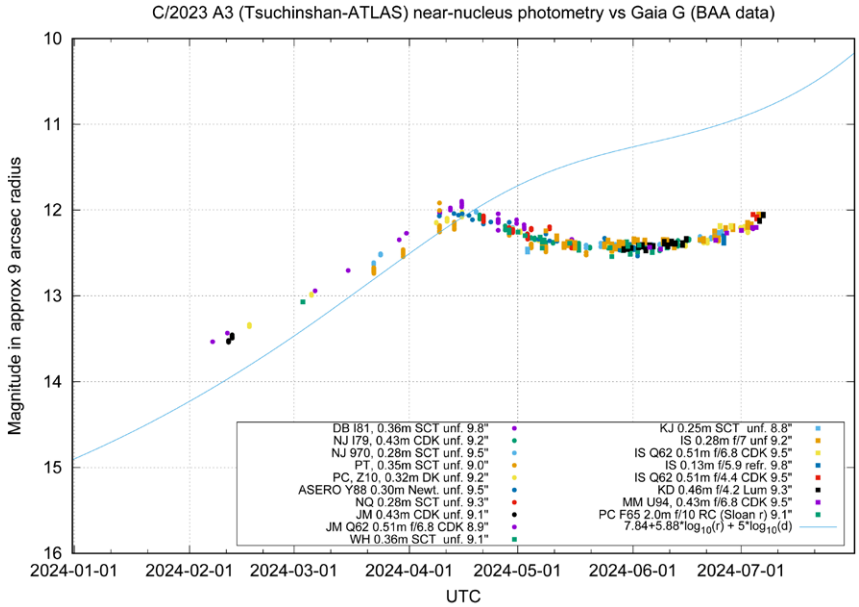
In addition to measuring total magnitudes, the Comet Section has a programme to measure the near-nucleus magnitude of C/2023 A3. This magnitude does not necessarily reflect the overall activity of the comet, but it is a way of getting consistent photometry from many observers to look for short-term variations. This was used very successfully to detect outbursts from Comet 12P/Pons–Brooks.[2] We have adopted a standard radius of 9 arcsec and unfiltered/*Gaia* G photometry. This allows astrometry and photometry to be performed as part of the same programme. The resulting light curve up to early July is shown below.

The comet had a sudden break from its rapidly rising trend in mid-April. Part of the reason for the enhancement in brightness at that time is the very low phase angle. The comet appears to be quite dusty, so this had a significant effect on the brightness of the inner coma. As the phase angle increased, the comet apparently faded. The standstill detected in the near-nucleus photometry is reflected in the total magnitude estimates through June and early July although the effect is not as prominent due to the noisy data. This is characteristic of many dynamically new comets.

At present (2024 July), the total magnitude of C/2023 A3 is around 10 and the current predicted magnitude when the comet emerges from solar conjunction in October is around 2, although this still has significant error bars. There may also be a significant brightening around Oct 10 due to forward scattering.

The comet has now become difficult to observe from the northern hemisphere, but Peter Carson got an excellent image (above) on Jul 6, using his remote telescope in Spain.

1 **bit.ly/4f6uXxe**
2 James N., 'A major outburst of comet 12P/Pons–Brooks', *J. Br. Astron. Assoc.*, **133**(5), 282–283 (2023)



Near-nucleus magnitude from BAA observations. Observers: DB – Denis Buczynski, NJ – Nick James, PT – Peter Tickner, PC – Peter Carson, ASERO – Astronomical Society of Edinburgh / Mark Phillips, NQ – Nick Quinn, JM – Jas Madhavan, WH – Wayne Hawley, KJ – Kevin Johnson, IS – Ian Sharp, KD – Kent DeGroff, MM – Martin Mobberley.