Comet, Asteroid and Meteor Section

CAMNotes 2025 No.4 October to December

COMETS

Comet C/2025 R2 (SWAN) was discovered on 10 September after it passed around the Sun and emerged from the Sun's glare, passing perihelion two days later on 12 September. It was given the provisional designation SWAN25B, before being designated Comet C/2025 R2 (SWAN) as announced on CBET 5606 (CBAT, D. W. E. Green, 2025 September 15).

Orbital elements (based on CBET 5606) are as follows for those who wish to prepare their own ephemerides.

T	= 2025 Sept.12.36877 TT
e	= 1.000
q	= 0.5028255 A
i	= 4.46794°
peri.	= 307.16312°
node	= 336.00754° (2000.0)

The comet makes a close approach to Earth on 19 October, at distance 0.26 AU, when it may be a 6th magnitude object in the constellation of Scutum.

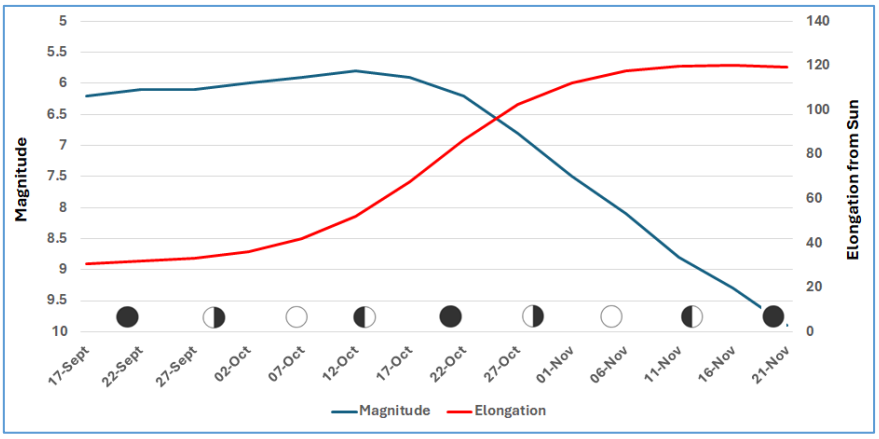

Figure 1 predicted magnitude and elongation from the Sun of comet C/2025 R2 (SWAN).

The predicted magnitude (from CBET 5606) and elongation from the Sun is shown in Figure 1. Note that the magnitudes are predicted assuming power-law parameters H = 9.0 and 2.5n = 8 using the standard equation for comet brightness:

$$m1 = H + 5 \log \Delta + 2.5n \log r$$

where m1 is the total magnitude of the coma, H is the absolute magnitude at r = Δ = 1 AU, Δ is the distance of the comet from Earth, and r is the distance of the comet from the Sun. Note the actual magnitude of the comet may differ considerably from that predicted.

The comet is predicted to brighten slightly during the second half of September. On the evening of 20 September, it is located just 1° from comet C/2025 K1 (ATLAS), though it will be much brighter than the latter. As shown by the phases in Figure 1, the Moon will not interfere and reaches New Moon on the 21st. During the evenings of 1 and 2 October the comet is located 1° from the bright naked eye double star $\alpha^{1,2}$ Librae (Zubenelgenubi), which should aid locating the comet in binoculars.

Figure 2 path of comet C/2025 R2 from 14-20 October.

From 10 October onwards the comet passes through regions in Ophiuchus, Serpens and Scutum rich in deep sky objects, affording interesting views for astro-imagers. On 14 October it is located 2.2° from the three globular clusters M9/NGC 6356/NGC 6342. The following night it will be easy to locate using binoculars close to the third magnitude star xi (55) Serpentis.

Figure 3 location of comet C/2025 R2 (SWAN) on 17 October 2025 near M16.

A fine opportunity arises to image the comet on the evening of 17 October, when it will be located close to the Eagle Nebula (Messier 16). The comet might still be a 6th magnitude object at that time, and with the waning Moon in the morning sky, conditions favour observations under dark skies.

Comet C/2025 K1 (ATLAS) is at perihelion on 8 October, when it may reach 10th magnitude. However, after perihelion it will be a difficult object low in the morning sky. On the evening of 20 September, it will be located just 1° from comet C/2025 R2 (SWAN) and will likely be around magnitude 11 at the time.

24P/Schaumasse reaches perihelion on 8 January 2026. It may be visible during December as a magnitude 8-9 object crossing the constellation Leo.

METEOR SHOWERS

The Orionids (ORI) are favourable for observation, with maximum coinciding with the time of New Moon. Each year the Earth crosses the debris left behind by comet

1P/Halley on two occasions, the first in May resulting in the eta Aquariids, and then again in October resulting in the Orionids. The latter usually provides a reliable shower of fast meteors with zenithal hourly rate (ZHR) about 20 per hour and peaking about October 21 this year. However this date can vary by as much as a couple of days either side, and the maximum is quite broad, often showing several sub-maxima. Therefore observation for several mornings centred on the predicted peak is recommended. The Orionids appear to radiate from about RA 06h20, Decl. +16° on the night of maximum. However the radiant will appear to drift eastwards by about one degree each day, due to the motion of the Earth in its orbit by about the same amount (see the diagram below).

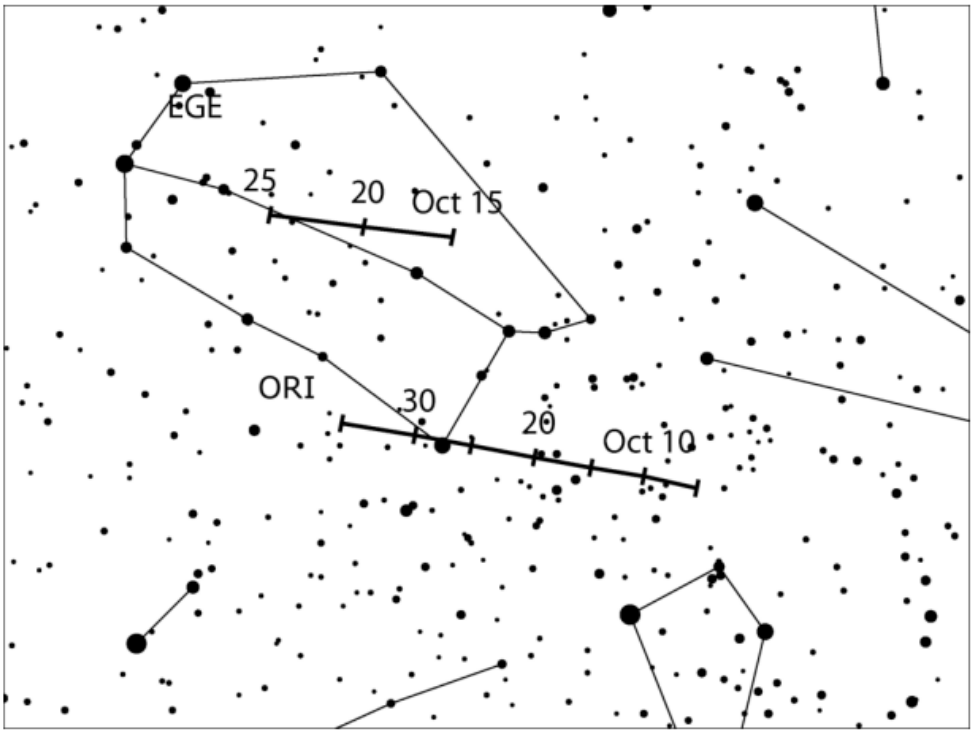

Figure 4 Position of the Orionid radiant, credit IMO Meteor Shower Calendar 2025

The radiant rises around 11pm local time but needs to rise to an altitude of about 25° or more for observations to be of value. Observations are recommended from 1am until dawn, when the radiant will be highest in the sky, about 48° up.

Orionid meteors enter the atmosphere at 66 km/sec, and so appear fast-moving. Like their sister shower the eta Aquariids, brighter Orionids have a tendency to leave persistent trains. Observations should ideally be carried out for one-hour sessions, noting the start and end times, faintest star visible to the naked eye at start and end of watch, and recording the number of Orionids, and sporadics (meteors not associated with any known shower) separately. Note also that there might be activity from the epsilon-Geminids (EGE), which radiate from nearby. They are also fast-moving meteors, but the rate seldom exceeds 2-3 per hour even at their peak around 18 October.

The Leonids (LEO) reach their peak on the morning of November 17 or 18. Debris left behind by comet 55P/Tempel-Tuttle, they are well known for their outbursts coinciding with the return of the comet to perihelion every 33 years. The comet was last at that point in its orbit in 1998 and was accompanied by several years of storm activity from the Leonids. No significant Leonid activity is expected in 2025, but nevertheless, the shower should be observed to help model the particle flux ahead of the comet towards its next perihelion in May 2031. Observations can be conducted in the hour or so before dawn on the mornings of 17 and 18 November.

The alpha Monocerotids (AMO) is another meteor stream which shows occasional outbursts. Previous outbursts occurred in 1925, 1935, 1985 and 1995, which might seem to imply a ten-year periodicity, but then a further outburst occurred in 2019. No outburst is expected this year, but nevertheless observations are useful to characterise any baseline activity that might be present outside of outburst years. The radiant is at RA 07h48, Decl. +01°, peaks on November 21/22, and the meteors enter the atmosphere at 65 km/sec and are fast-moving.

The Geminids (GEM), despite being a northern hemisphere shower, remain the most active shower annually also from our locations. The activity generally peaks during the night of December 13/14, and conditions this year are good with the crescent Moon only rising around 01h40 local time on the morning of maximum. Observations can begin from about 11pm local time and can continue until dawn, when the radiant is at its highest. Best rates should be in the hour or so before dawn on December 14. The meteor stream is mass-sorted, so the Earth encounters larger particles as the shower progresses, so while rates on the morning of December 15 are likely to be lower, the average Geminid may be slightly brighter. Most of the known parent bodies of meteor showers are comets, but the parent body of the Geminids is an asteroid, 3200 Phaethon. The asteroid may be a dormant comet, but it may be that dust continues to be left behind, lifted off the loose surface of the asteroid, as has been observed with another asteroid, 101955 Bennu. The Geminids are medium speed, 35 km/s, mainly white, but to me often display a sparkling appearance with yellowish core. They show little tendency to leave persistent trains, but the sight of very bright, graceful, sparkling Geminids is a sight to behold and will reward those who put in the effort to observe after midnight. Note that at the same time as the Geminids, there may be minor activity from the Monocerotids (not the same as the alpha Monocerotids referred to above) and sigma Hydrids. Take care not to include these in your Geminid counts. The Geminid radiant is close to the bright star Castor in Gemini, and any meteors which cannot be traced back to that point should not be counted as Geminids.

ASTEROIDS

There are no particularly close approaches of asteroids during the last quarter.

On 14 October, asteroid 35552 (1998 FE115) occults the magnitude 5.6 star HIP 100926 between 22h08-22h10 UT. The combined magnitude of star and asteroid is

4.3 and the occultation for those on the centre line is expected to last up to 1.5 seconds, during which time the magnitude drop will be 13 magnitudes (the star will disappear. The path of predicted visibility is shown in Figures 5 and 6 below. For observers in the Gauteng area the star will be 14° above the horizon at predicted time of disappearance.

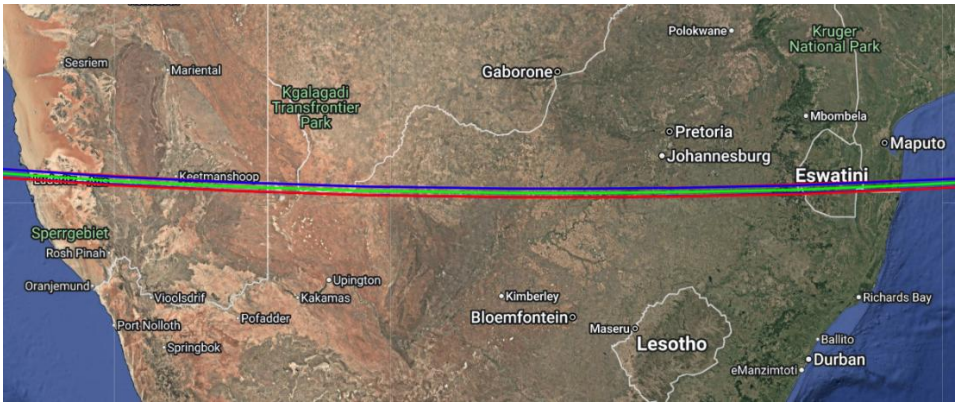

Figure 5, path of occultation on 14 October, from west to east.

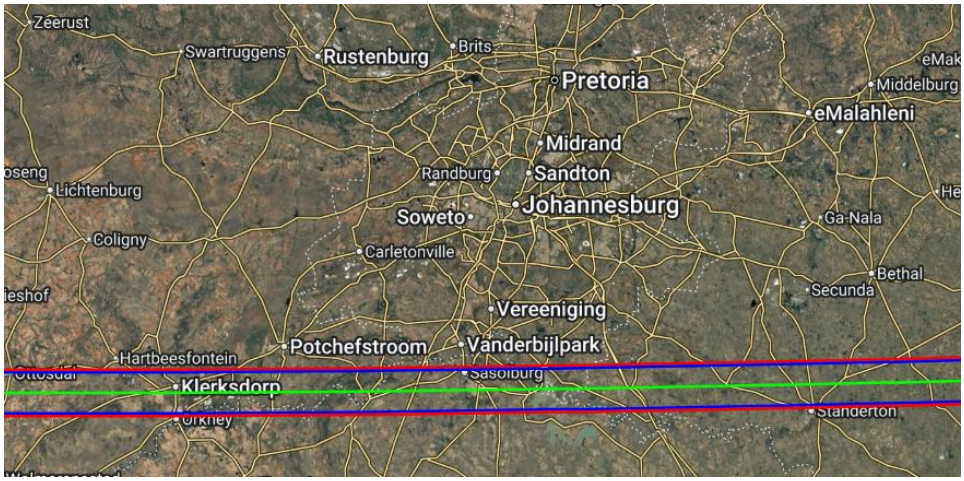

Figure 6, path of occultation across southern Gauteng, green is the predicted centre line, red lines are the northern and southern limits.

Prospective observers who would like to participate in these observations are welcome to contact me for further information.

If you do observe or image any of these events, I will be pleased to receive any reports or images for analysis.

Clear skies,

Tim Cooper

Director, Comet, Asteroid and Meteor Section.

Acknowledgements
Star maps were drawn using Stellarium 0.20.1, Copyright © 2000-2020 Stellarium Developers. Meteor shower data is from the International Meteor Organization, 2025 Meteor Shower Calendar edited by Juergen Rendtel, with additional information from Atlas of Earth's Meteor Showers by Peter Jenniskens. Close approach data for asteroids is from the ESA NEO Coordination Centre (NEOCC), website at https://neo.ssa.esa.int/close-approaches. Asteroid occultation data is from Occult Watcher ver 5.4.0.1. Map data for occultation events is copyright AfriGIS (Pty) Ltd, Google Imagery 2025 NASA.