

# PATROCLUS AND MENOETIUS MUTUAL EVENTS: SUPPORT FOR THE NASA LUCY MISSION TO THE TROJAN ASTEROIDS

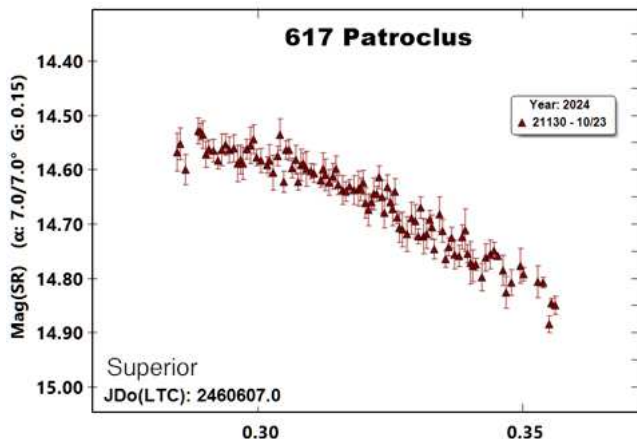
Nick Sioulas  
NOAK Observatory (L02)  
Stavraki Ioannina, GREECE  
nsioulas@hotmail.com

(Received: 2024 October 27)

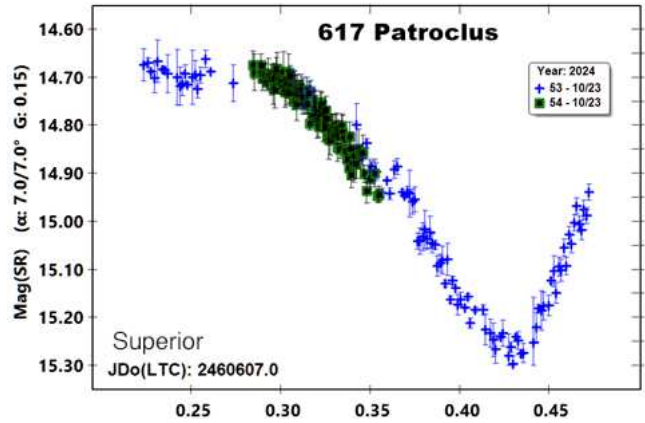
Observations of the Patroclus and Menoetius mutual events are reported in support of the NASA Lucy Mission to the trojan asteroids. This report covers a superior event observed on 2024 October 23 UT.

Following the predictions provided by Brozovic et al. (2024) and a Call for Observations in support of the NASA Lucy Mission (Binzel, 2024), we performed lightcurve measurements of the Patroclus-Menoetius binary system to detect mutual events between these two components. All observations were performed at the NOAK Observatory, Ioannina Greece (MPC-International Astronomical Union code L02), using a 0.25-m Newtonian Skywatcher optical tube operating at  $f/4.7$  at 2024-10-23. The optical tube is mounted on NEQ6 Skywatcher robotic mount and equipped with ATIK 460exm CCD camera. It is a high Quantum Efficiency CCD. No filters used for better signal to noise. Exposure time for all the images was 10 seconds. The camera was binned at  $2 \times 2$ . The image scale after  $2 \times 2$  binning was 1.57 arcsec/pixel and the field of view  $35.9' \times 28.7'$ . In these fields, the asteroid and five comparison stars were measured for differential photometry.

All images were reduced in the standard manner using nightly flatfield files as well as dark-current and bias images. They were made available to Brian Warner, who was managing a collaboration of observers from around the world. The images were measured using *MPO Canopus* v12 (Warner, 2024) using Pan-STARRS  $r$  magnitudes for the comparison stars. After measuring the more than 450 images, the data were placed in  $3 \times 5$  bins, meaning a maximum of three images per bin with no image more than five minutes apart. The raw plot shows the results of the analysis.



The data were then combined with those from Alessandro Nastasi, another collaborator in Warner's group, who observed on the same date but whose run continued further into the event. In this case, the data were binned  $3 \times 1$ , three per bin no more than 1 minute apart, which avoided making the Nastasi data too sparse. There is close agreement between the two data sets but with a small difference in the descent slope. A more extended data set from NOAK may have shown a better match.



## Acknowledgements

Thanks to Brian Warner for measuring the images and producing the plots included here. Acknowledgement is given also to Alessandro Nastasi, Galhassin Robotic Telescope and Wide-field Mufara Telescope, GAL Hassin - Centro Internazionale per le Scienze Astronomiche Isnello, Italy, for the data referenced in this paper.

## References

- Binzel, R.P. (2024). "Call for Observations of the Patroclus and Menoetius mutual events: Support for the Nasa Lucy Mission to the Trojan Asteroids." *Minor Planet Bulletin* **51**, 212.
- Brozovic, M.; Jacobson, R.A.; Park, R.S.; Descamps, P.; Berthier, J.; Pinila-Alonso, N.; Popescu, M.; Licandro, J. (2024). "Orbit of the Patroclus-Menoetius Binary System and Predictions for the 2024/2025 Mutual Events Season." *Astron. J.* **167**, 104. 12 pp.
- Warner, B.D. (2024). MPO Software, *MPO Canopus* v12.0.6.1. Bdw Publishing. <https://bdwpublishing.com>