

A New Double Star Discovered During an Asteroid Occultation of UCAC4 339-186983

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Abstract

On June 8, 2023, (22001) 2001 DY49 occulted UCAC4 339-186983 as observed from Kuriwa Observatory (KO), cited in the Blue Mountains, west of Sydney, Australia. Two separate extinctions of the star were observed consistent with the star being a double star of magnitudes 11.7 and 12.3, separated by 51.1 mas at PA 50.6 deg. The star is a hitherto unknown double star.

1. Introduction

The observation of asteroid occultations can yield information about the asteroid; size and shape as well as astrometry that ties the asteroid's orbit to the star at event epoch. The observation can also yield information about the star – in this case it's double star nature that has not been observed before.

2. Circumstances

Fig.1 shows the circumstances of the observation. The prediction is a computation based on the orbit, supplied by JPL Horizons and Gaia DR3 star coordinates. The path of the asteroid's shadow passed across the South Pacific Ocean, the northern tip of New Zealand, across the Tasman Sea, and across Australia. The star and asteroid were observed to be at 19 degrees altitude and 104 degrees azimuth from the observing site.

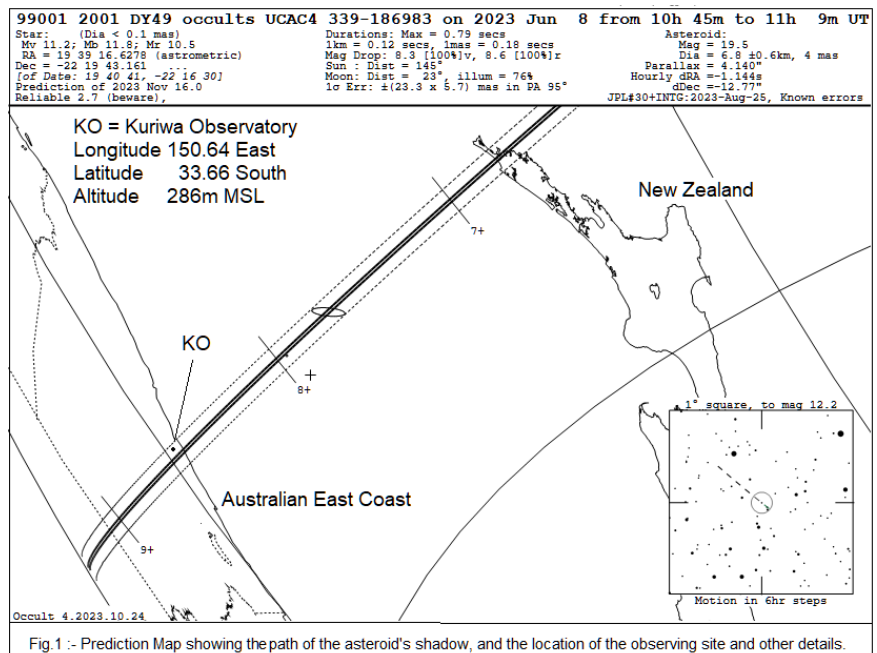
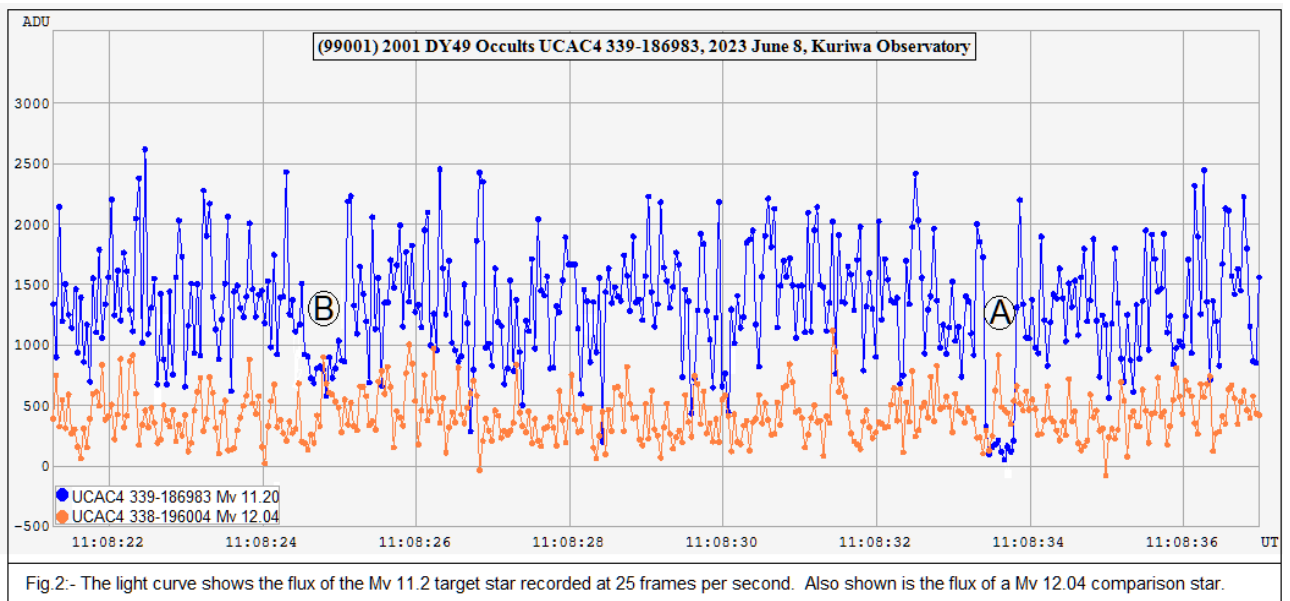


Fig.1 :- Prediction Map showing the path of the asteroid's shadow, and the location of the observing site and other details.

3. The Observation

A 30cm Schmidt Cassegrain telescope equipped with a video camera operating at 25 frames per second, with GPS time inserted on every frame was used to record the observation. Fig. 2 shows the light curve recorded for the target star + asteroid, as well as a comparison star.



The fainter B star was occulted first for a duration of 0.70 seconds. The extinction of light was shallower than expected because the brighter A star remained in view. 8.3 seconds later the brighter A component was occulted for a duration of 0.38 seconds. The extinction of light was shallower than expected because the fainter B star remained in view. The event times are listed in Table 1.

Table 1. Event times

Event	Time – UTC	± (sec)
d1	11:08:24.3	0.1
r1	11:08:25.1	0.1
D2	11:08:33.39	0.04
R2	11:08:33.77	0.04

4. Reduction of Observation

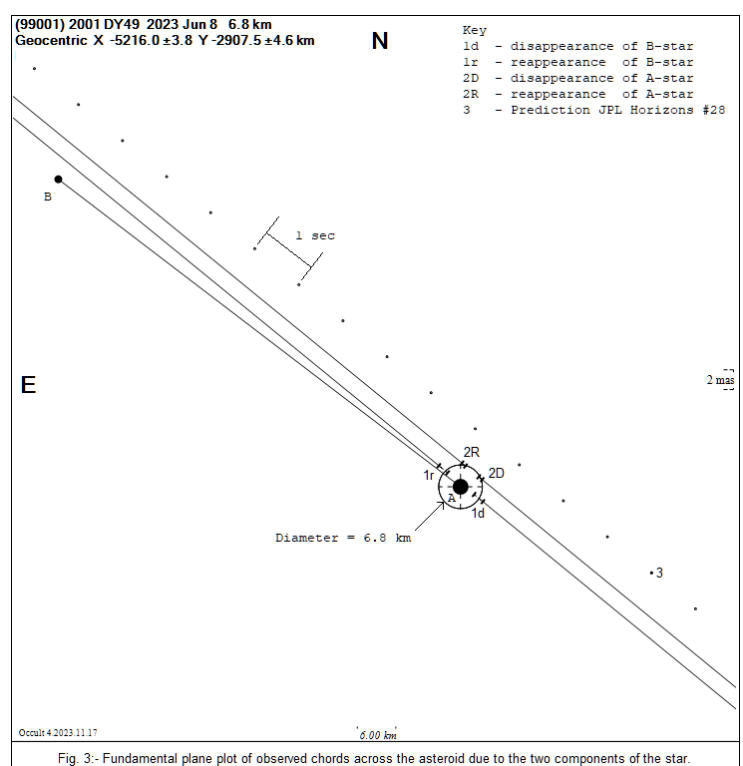
The circumstances and observed times were reduced and plotted on the fundamental plane using Occult4 software as shown on Fig.3.

5. Double Star Characteristics

Star	UCAC4 339-186983
Coordinates (J2000)	19h 39m 16.6278s, -22° 19m 43.161s
Mag. A	11.8 +/- 0.1 (V)
Mag. B	12.1 +/- 0.1 (V)
Separation	5.1 +/- 0.1 mas
Position Angle	50.6° +/- 2.8°
Observation Epoch	2023.4356

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- The asteroid's orbit was supplied by JPL Horizons - Solar System Dynamics – Small Body Orbit database. <https://ssd.jpl.nasa.gov>
- David Herald for is help and guidance.