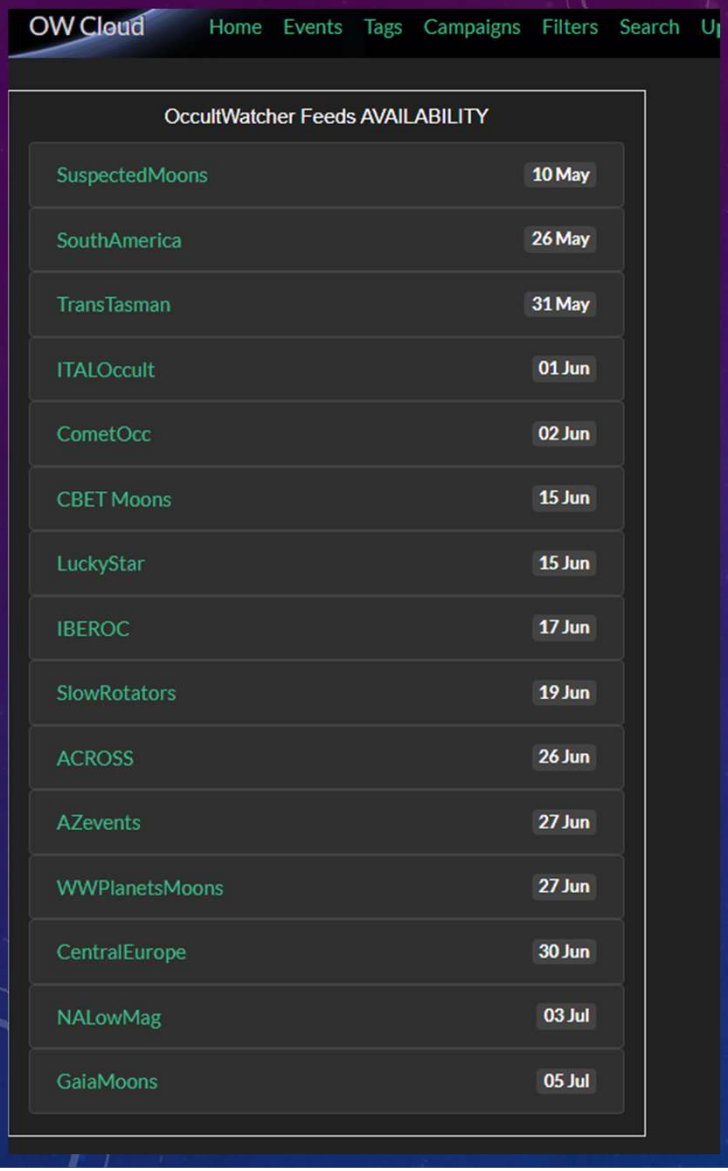
UPCOMING OCCULTATIONS AND CAMPAIGNS

THINGS TO PUT IN THE CALENDAR

TTSO19 – 12 MAY 2025

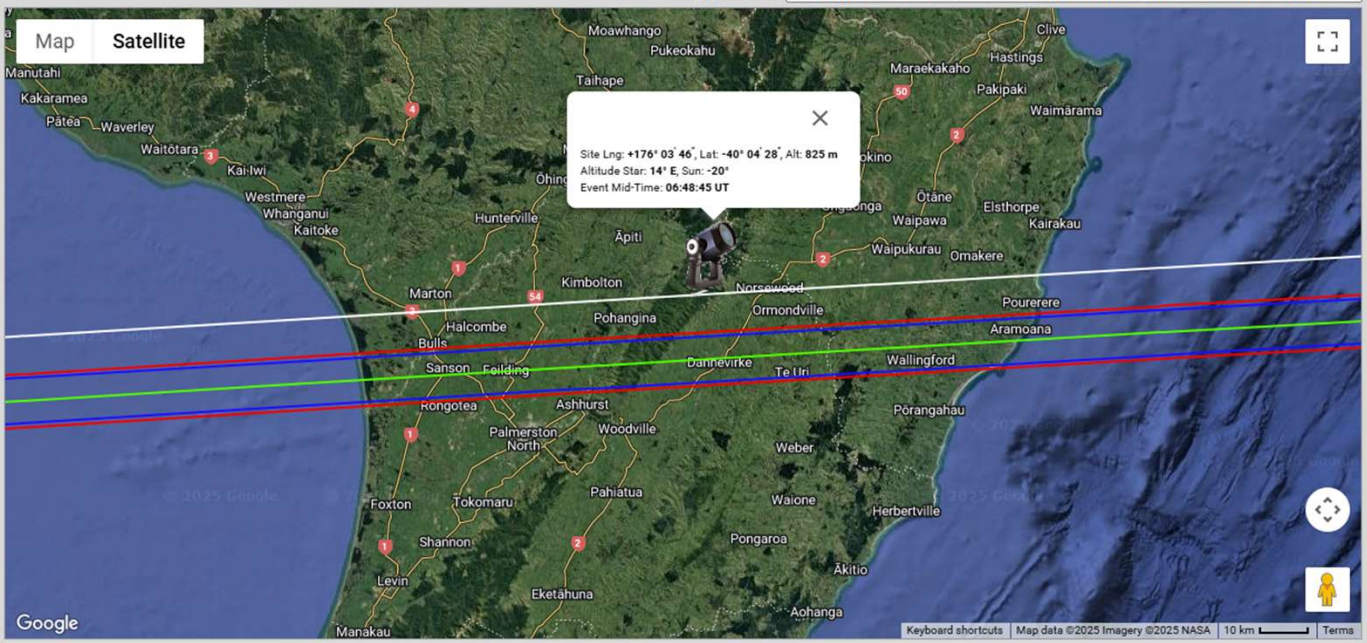


OCCULTWATCHER CLOUD FEEDS

A new option here is CBET Moons targeting objects that have had CBET's issued confirming binary nature.

OW Cloud (33956) 2000 NN3 occults UCAC4 470-050809 on 21 May 2025 Dark Theme Welcome, Stephen Kerr

Change prediction: [default] Horizons/GaiaDR3, last upd: 03 May, 06:11 by OWC, orbit date: 09 Apr 2025 (JPL#54)



Distance: 9.75 km (fp) right | Altitude: 825 m | Site name: Q70 | Method: Video | Timing: GPS | Show site to others: Exact chord (no location) | Comittment: Low or inexperienced | Cancel | Submit

Tagged as: CBET Moons [web page]

Please report observations to peter@hazelbrookobservatory.com and dave4gee@yahoo.com.au

Prediction

- Last Updated: 03/May/25, 06:11 UT
- Computed By: OWC
- Data Sources: Horizons/GaiaDR3
- Orbit Date: 09 Apr 2025 (JPL#54)
- Error (path widths): 0.088
- Error in time: 0.1 sec
- Err. Ellipse: 0.0012" x 0.0003"
- Err. Ellipse PA: 108°
- Err. Basis: Known errors
- OWC Id: 2432404

Event

- From: 06:37:01 UT
- To: 06:49:07 UT
- Combined Mag: 11.37
- Max Duration: 0.5 sec
- Mag Drop (V): 5.94
- Mag Drop (R): 5.61
- Shadow Width: 9.4 km
- Moon Phase: 41% sunlit
- Solar Elong.: 153°
- Moon Elong.: 118°

Target Star

- Name: UCAC4 470-050809
- V mag: 11.97
- Constellation: Virgo
- R mag: 11.38
- Diameter:
- B mag: 12.39
- RUWE: 1.05
- Flags:
- Gaia SourceId: 1155053492012924928
- Gaia Flags:
- RA [ICRS]: $14^h\,59^m\,30^s.2681$
- RA [aprnt]: $15^h\,00^m\,48^s.0736$
- Dec [ICRS]: +03° 51' 41".250
- Dec [aprnt]: +03° 45' 31".557

Object

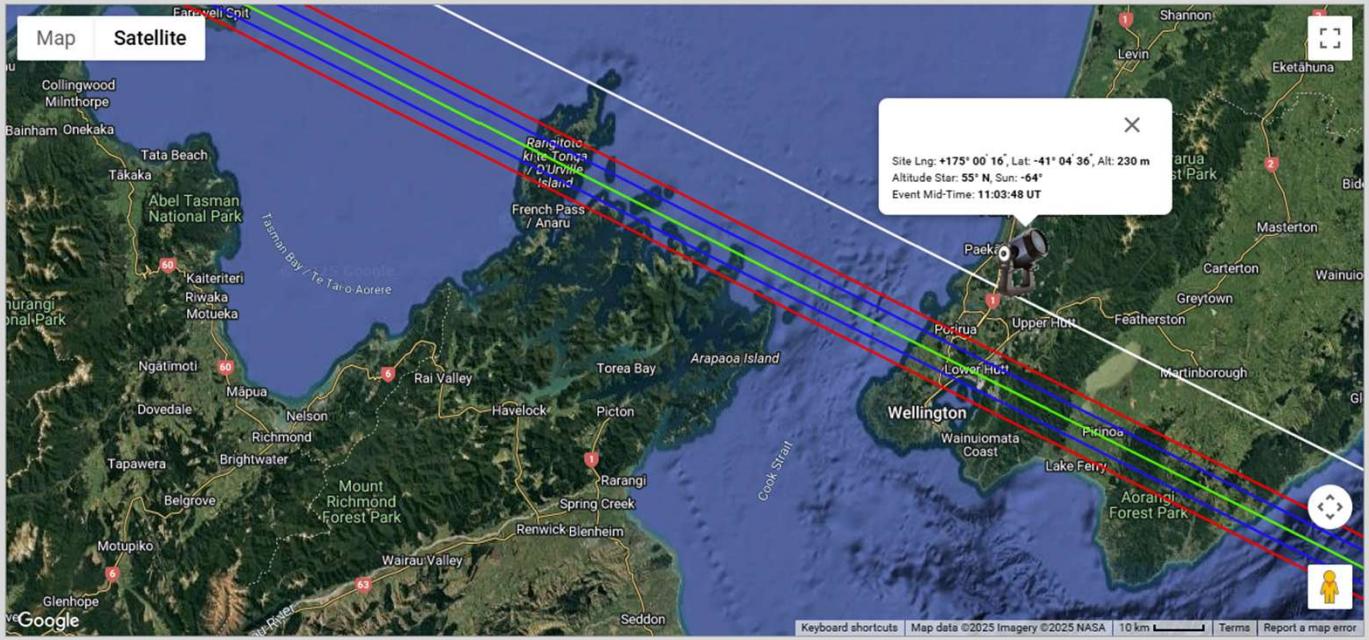
- Name: (33956) 2000 NN3
- Class: Main-belt Asteroid
- Diameter: 6.8 ± 0.8 km (Occult)
- Diameter (augm): 4.67 mas
- Distance: 2.0079 au
- Mag: 17.8 ⚠
- Motion RA: -31.32 "/hr
- Motion Dec: 1.48 "/hr
- Moons: 0
- Rings: 0

OW Cloud

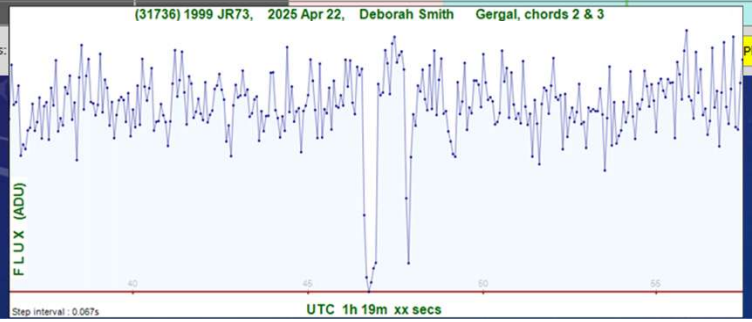
(31736) 1999 JR73 occults UCAC4 414-060236 on 21 May 2025

Dark Theme | Welcome, Stephen Kerr

Change prediction: [default] Horizons/GaiaDR3, last upd: 27 Apr, 12:33 by OWC, orbit date: 09 Apr 2025 (JPL#46)



Distance: 14.83 km (fp) right | Altitude: 230 m | Site name: Q70 | Method: Video | Timing: GPS | Show site to others: Exact chord (no location) | Comittment: Low or inexperienced | Cancel | Submit



Tagged as:

Please report observations to peter@hazelbrookobservatory.com and dave4gee@yahoo.com.au

Prediction

Last Updated: 27/Apr/25, 12:33 UT	Computed By: OWC
Data Sources: Horizons/GaiaDR3	Orbit Date: 09 Apr 2025 (JPL#46)
Error (path widths): 0.419	Error in time: 0.7 sec
Err. Ellipse: 0.0057" x 0.0004"	Err. Ellipse PA: 98°
Err. Basis: Known errors	OWC Id: 2413310

Event

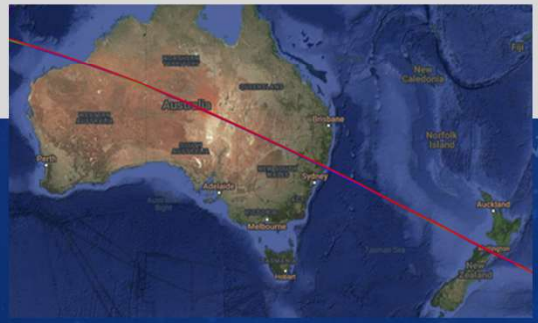
From: 10:57:41 UT	To: 11:11:23 UT
Combined Mag: 11.20	Max Duration: 0.4 sec
Mag Drop (V): 7.20	Mag Drop (R): 6.74
Shadow Width: 6.2 km	Moon Phase: 39% sunlit
Solar Elong.: 164°	Moon Elong.: 114°

Target Star

Name: UCAC4 414-060236	V mag: 11.67
Constellation: Libra	R mag: 11.20
Diameter:	B mag: 11.97
RUWE: 0.95	Flags:
Gaia SourceId: 6322067653554261120	Gaia Flags:
RA [ICRS]: $15^h\ 16^m\ 45^s.2533$	RA [aprnt]: $15^h\ 18^m\ 07^s.9262$
Dec [ICRS]: -07° 16' 51".966	Dec [aprnt]: -07° 22' 34".831

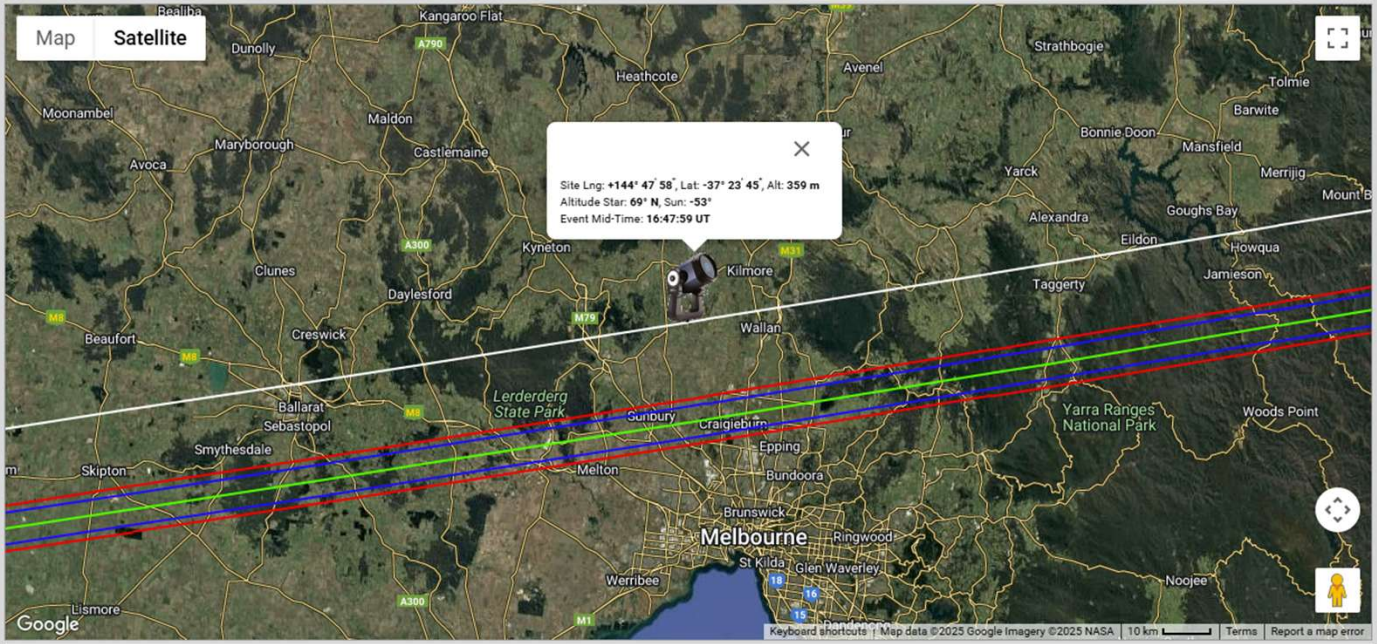
Object

Name: (31736) 1999 JR73	Class: Main-belt Asteroid
Diameter: 5.1 ± 0.6 km (Occult)	Diameter (augm): 3.29 mas
Distance: 2.1359 au	Mag: 18.8 ⚠
Motion RA: -27.82 °/hr	Motion Dec: 10.88 °/hr
Moons: 0	Rings: 0



OW Cloud (43188) Zouxiaoduan occults TYC 6287-00838-1 on 25 May 2025 Dark Theme Welcome, Stephen Kerr

Change prediction: [default] Horizons/GaiaDR3, last upd: 26 Apr, 17:01 by OWC, orbit date: 12 Feb 2025 (JPL#39)



Distance: 20.24 km (fp) right | Altitude: 359 m | Site name: Q70 | Method: Video | Timing: GPS | Show site to others: Exact chord (no location) | Comittment: Low or inexperienced | Cancel | Submit

Tagged as: TransTasman

Prediction

- Last Updated: 26/Apr/25, 17:01 UT
- Computed By: OWC
- Data Sources: Horizons/GaiaDR3
- Orbit Date: 12 Feb 2025 (JPL#39)
- Error (path widths): 0.226
- Error in time: 1.7 sec
- Err. Ellipse: 0.0047" x 0.0006"
- Err. Ellipse PA: 89°
- Err. Basis: Known errors
- OWC Id: 2405024

Event

- From: 16:17:01 UT
- To: 17:09:28 UT
- Combined Mag: 5.93
- Max Duration: 1.7 sec
- Mag Drop (V): 12.02
- Mag Drop (R): 12.31
- Shadow Width: 6.7 km
- Moon Phase: 3% sunlit
- Solar Elong.: 137°
- Moon Elong.: 117°

Target Star

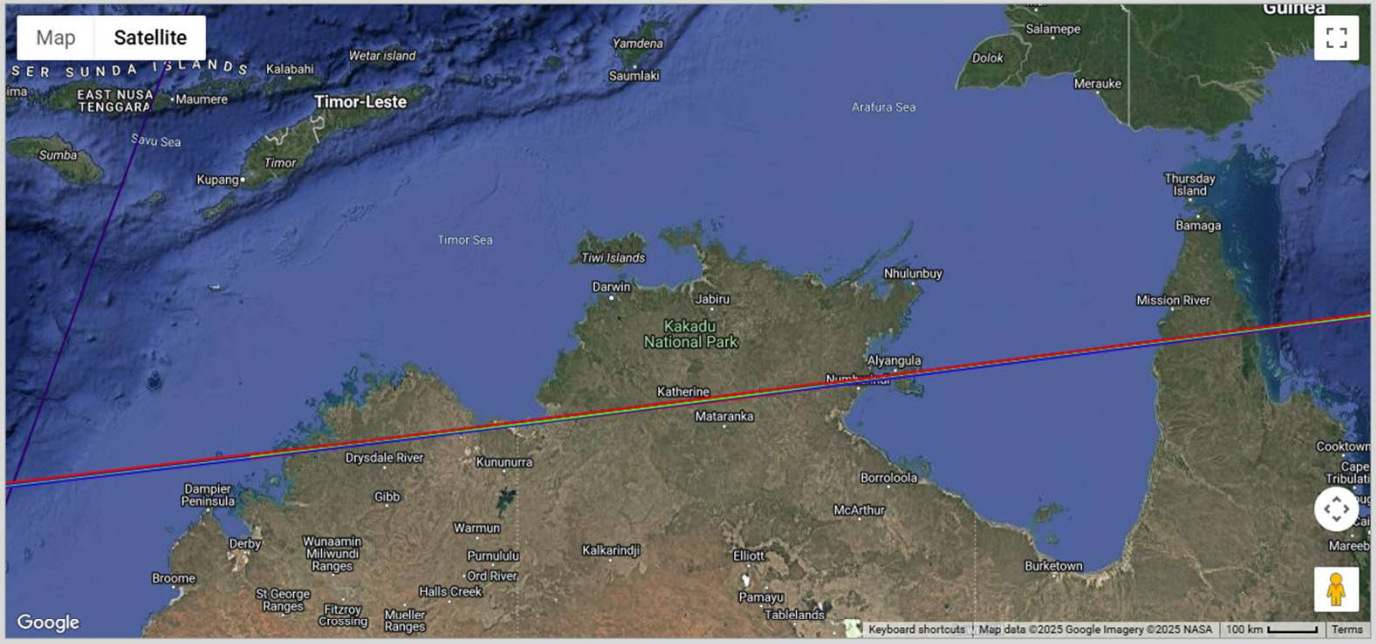
- Name: TYC 6287-00838-1
- V mag: 7.08
- Constellation: Sagittarius
- R mag: 5.93
- Diameter:
- B mag: 8.44
- RUWE: 1.05
- Flags:
- Gaia SourceId: 4087862499832500864
- Gaia Flags:
- RA [ICRS]: $19^h\ 10^m\ 04^s.2417$
- RA [aprnt]: $19^h\ 11^m\ 33^s.6551$
- Dec [ICRS]: -17° 30' 21".931
- Dec [aprnt]: -17° 27' 54".734

Object

- Name: (43188) Zouxiaoduan
- Class: Main-belt Asteroid
- Diameter: 6.4 ± 0.6 km (Occult)
- Diameter (augm): 4.64 mas
- Distance: 1.9032 au
- Mag: 19.1
- Motion RA: -9.83 "/hr
- Motion Dec: -2.04 "/hr
- Moons: 0
- Rings: 0

OW Cloud (33956) 2000 NN3 occults UCAC4 470-050580 on 30 May 2025 Dark Theme Welcome, Stephen Kerr

Change prediction: [default] Horizons/GaiaDR3, last upd: 03 May, 06:11 by OWC, orbit date: 09 Apr 2025 (JPL#54)



Tagged as: CBET Moons [web page]

Please report observations to peter@hazelbrookobservatory.com and dave4gee@yahoo.com.au

Prediction

- Last Updated: 03/May/25, 06:11 UT
- Computed By: OWC
- Data Sources: Horizons/GaiaDR3
- Orbit Date: 09 Apr 2025 (JPL#54)
- Error (path widths): 0.117
- Error in time: 0.2 sec
- Err. Ellipse: 0.0012" x 0.0003"
- Err. Ellipse PA: 108°
- Err. Basis: Known errors
- OWC Id: 2432408

Event

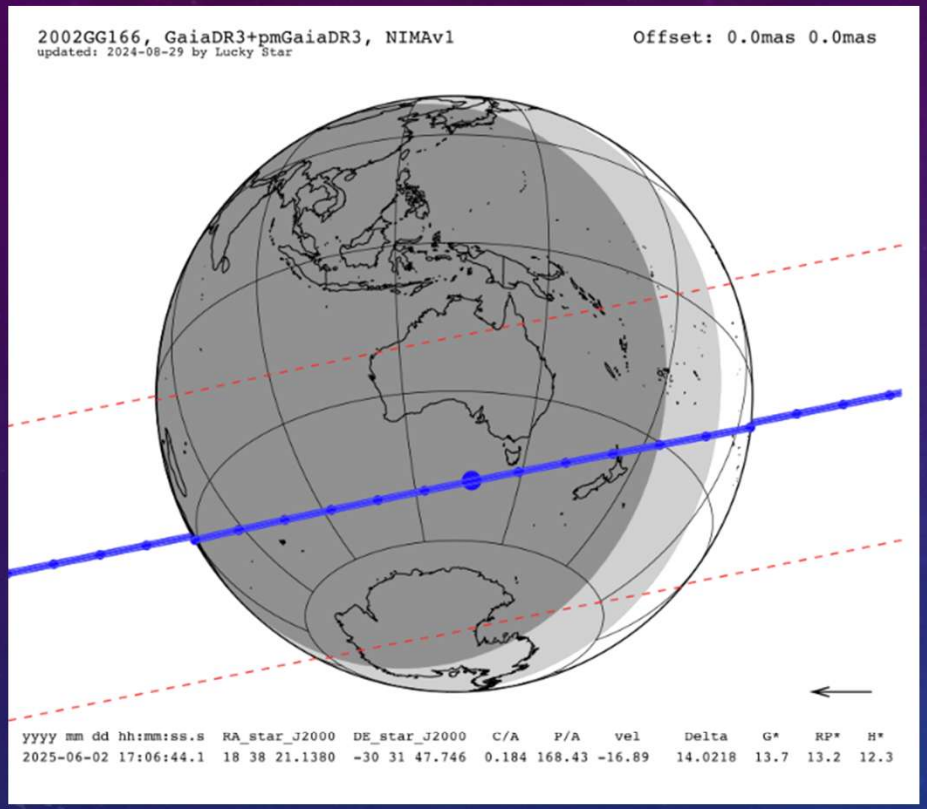
- From: 10:19:09 UT
- To: 10:37:37 UT
- Combined Mag: 11.99
- Max Duration: 0.6 sec
- Mag Drop (V): 5.50
- Mag Drop (R): 5.08
- Shadow Width: 7.0 km
- Moon Phase: 15% sunlit
- Solar Elong.: 145°
- Moon Elong.: 103°

Target Star

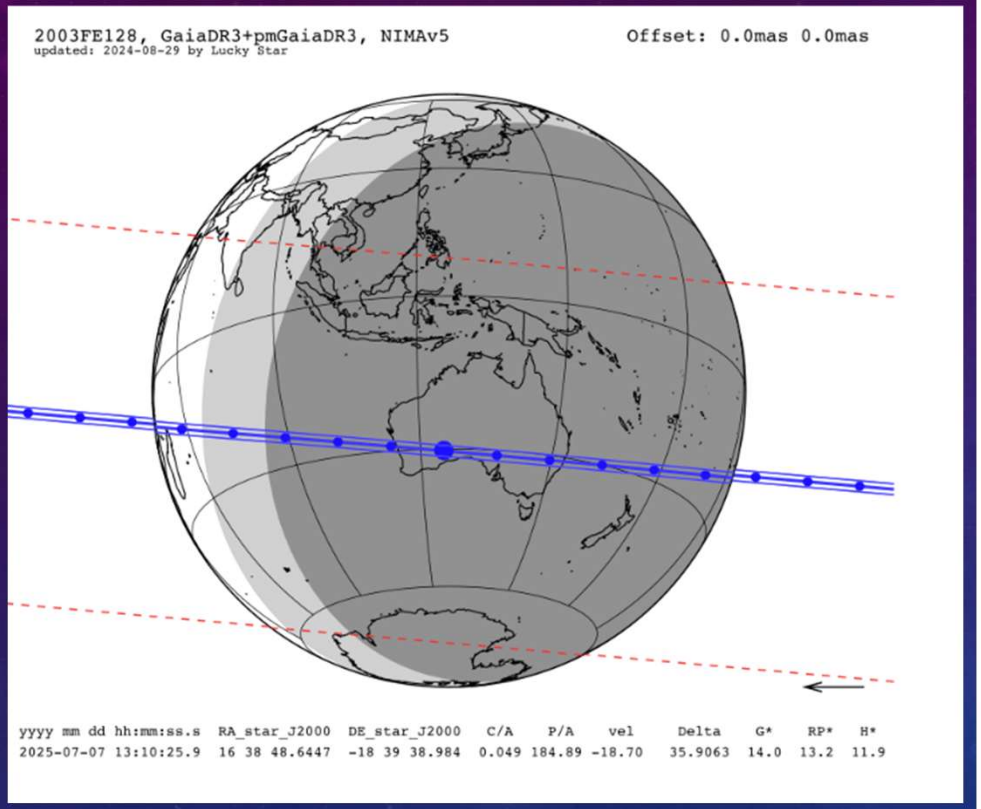
- Name: UCAC4 470-050580
- V mag: 12.50
- Constellation: Virgo
- R mag: 12.00
- Diameter:
- B mag: 12.83
- RUWE: 1.30
- Flags:
- Gaia SourceId: 1157681844495139456
- Gaia Flags:
- RA [ICRS]: $14^h\,52^m\,17^s.7493$
- RA [aprnt]: $14^h\,53^m\,35^s.6572$
- Dec [ICRS]: +03° 48' 58".058
- Dec [aprnt]: +03° 42' 38".451

Object

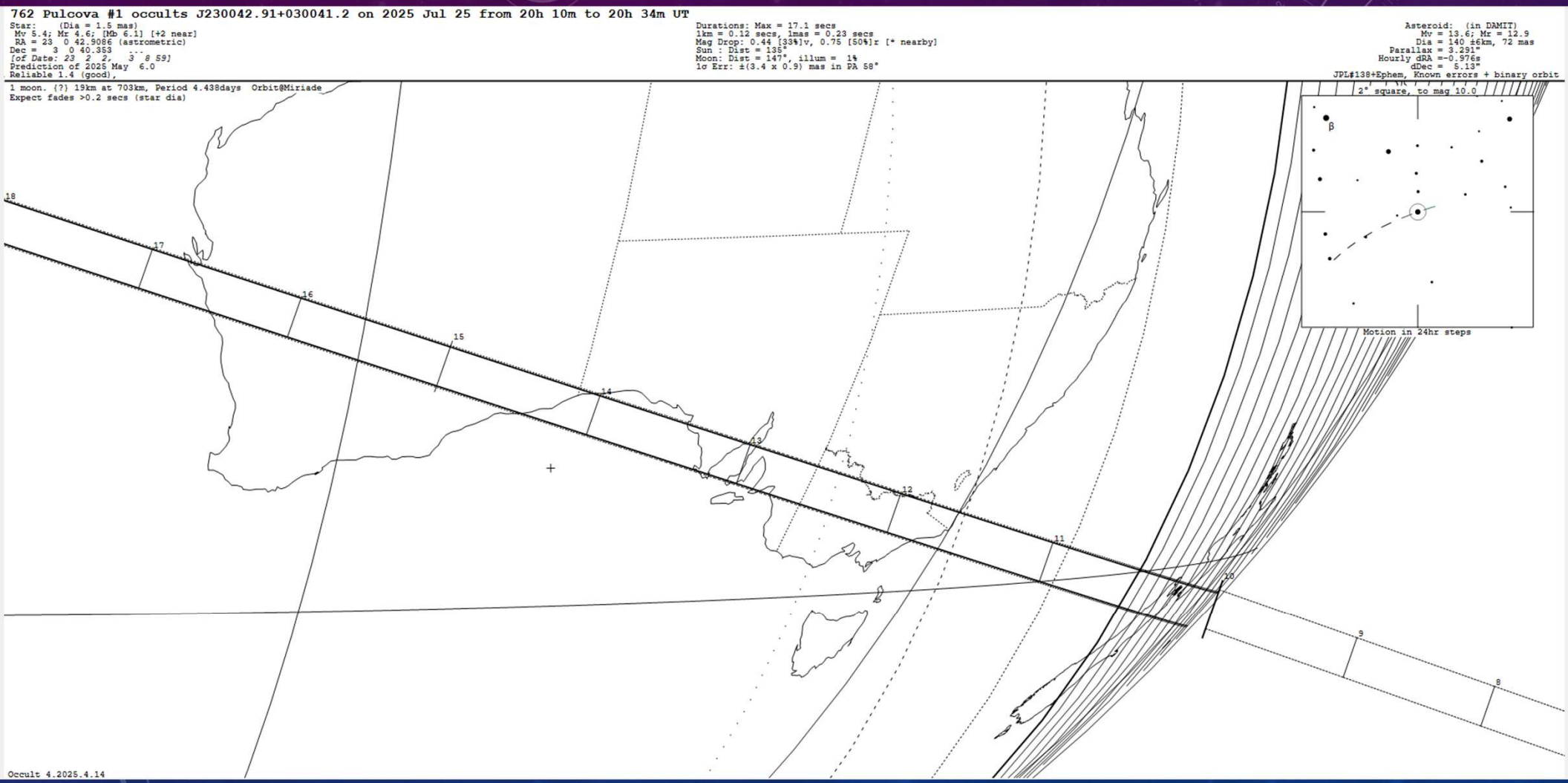
- Name: (33956) 2000 NN3
- Class: Main-belt Asteroid
- Diameter: 6.8 ± 0.8 km (Occult)
- Diameter (augm): 4.60 mas
- Distance: 2.0401 au
- Mag: 17.9 ⚠
- Motion RA: -27.18 "/hr
- Motion Dec: -3.06 "/hr
- Moons: 0
- Rings: 0



Date	Mon. 2 Jun. 2025 17:06:44
Star position (ICRF)	18 38 21.1380 -30 31 47.746
C/A	0.184 arcsec
P/A	168.43 °
velocity	-16.89 km/s
Geocentric distance Δ	14.0218 au
G mag*	13.7
J mag*	13.2
H mag*	12.3
Magnitude drop	6.2
Uncertainty in time	771.3 sec
Uncertainty in C/A	298.4 mas
Uncertainty in projected distance	3034.2 km
Probability of occultation on centrality	1.5%
Maximum duration	6.9 sec
Moon distance to the object	121.2°
Fraction of illuminated Moon	45.7 %
Solar elongation	152.8°



Date	Mon. 7 Jul. 2025 13:10:25
Star position (ICRF)	16 38 48.6447 -18 39 38.984
C/A	0.049 arcsec
P/A	184.89 °
velocity	-18.70 km/s
Geocentric distance Δ	35.9063 au
G mag*	14.0
J mag*	13.2
H mag*	11.9
Magnitude drop	8.1
Uncertainty in time	384.4 sec
Uncertainty in C/A	153.8 mas
Uncertainty in projected distance	4005.5 km
Probability of occultation on centrality	2.4%
Maximum duration	12.6 sec
Moon distance to the object	9.1°
Fraction of illuminated Moon	89.2 %
Solar elongation	145.3°


762 Pulcova #1 occults J230042.91+030041.2 on 2025 Jul 25 from 20h 10m to 20h 34m UT
Star: (Dia = 1.5 mas)
Mv 5.4; Mr 4.6; [Mb 6.1] [+2 near]
RA = 23 0 42.9086 (astrometric)
Dec = 3 0 40.353 ...
[of Date: 23 2 2. 3 8 59]
Prediction of 2025 May 6.0
Reliable 1.4 (good),
Durations: Max = 17.1 secs
1km = 0.12 secs, 1mas = 0.23 secs
Mag Drop: 0.44 [33%]v, 0.75 [50%]r [* nearby]
Sun : Dist = 135°
Moon: Dist = 147°, illum = 1%
1σ Err: ±(3.4 x 0.9) mas in PA 58°
Asteroid: (in DAMIT)
Mv = 13.6; Mr = 12.9
Dia = 140 ±6km, 72 mas
Parallax = 3.291"
Hourly dRA =-0.976s
dDec = 5.13"
JPL#138+Ephem, Known errors + binary orbit
1 moon. (?) 19km at 703km, Period 4.438days Orbit@Miriade
Expect fades >0.2 secs (star dia)
2° square, to mag 10.0
β
Motion in 24hr steps
18
17
16
15
14
13
12
11
10
9
8
Occult 4.2025.4.14

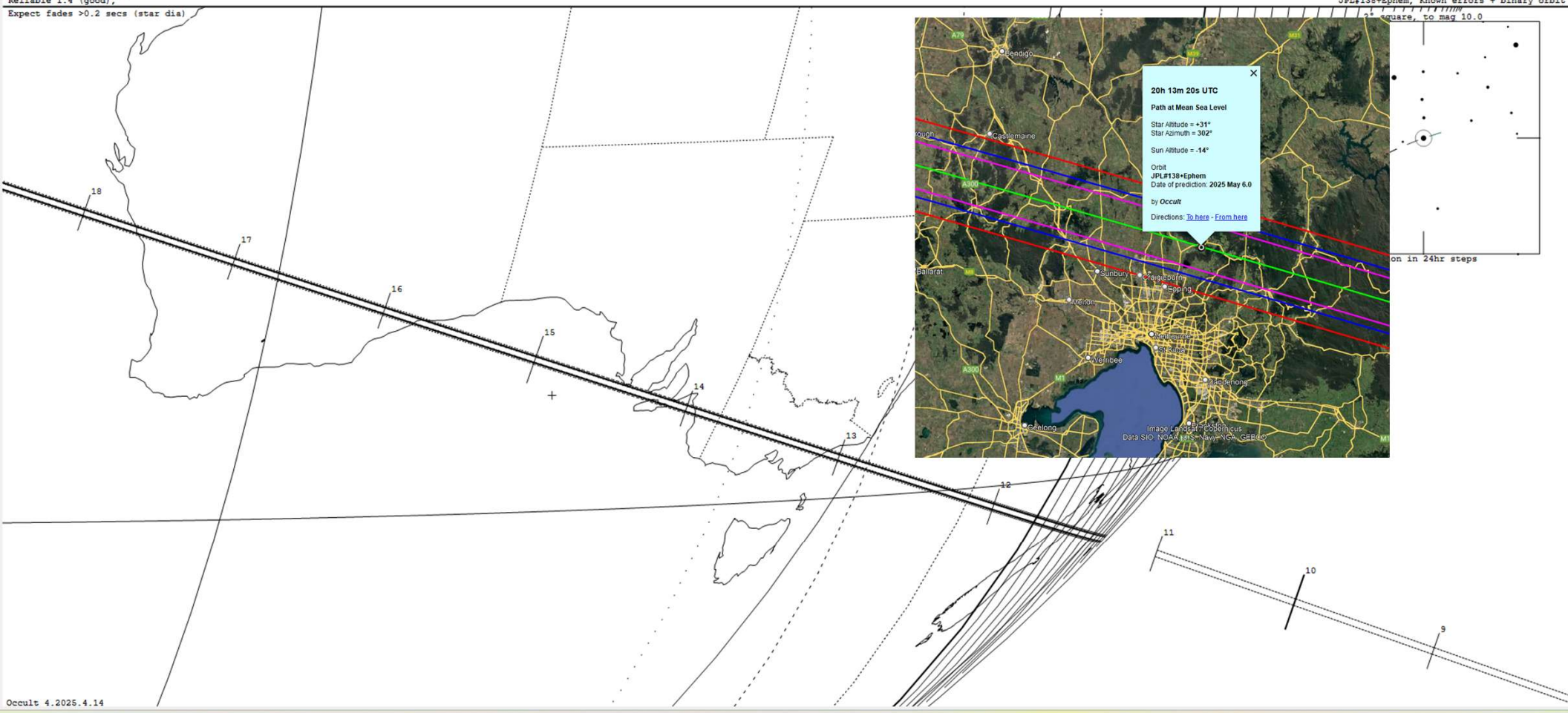
762 S2000-762-1 #1 occults J230042.91+030041.2 on 2025 Jul 25 from 20h 10m to 20h 33m UT

Star: (Dia = 1.5 mas)
Mv 5.4; Mr 4.6; [Mb 6.1] [+2 near]
RA = 23 0 42.9086 (astrometric)
Dec = 3 0 40.353 ...
[of Date: 23 2 2, 3 8 59]
Prediction of 2025 May 6.0
Reliable 1.4 (good),

Durations: Max = 2.7 secs
1km = 0.14 secs, 1mas = 0.23 secs
Mag Drop: 0.44 [33%]v, 0.75 [50%]r [* nearby]
Sun : Dist = 135°
Moon: Dist = 147°, illum = 1%
1σ Err: ±(3.4 x 0.9) mas in PA 58°

Asteroid: (in DAMIT)
Mv = 13.6; Mr = 12.9
Dia = 20 ±8km, 10 mas
Parallax = 3.291"
Hourly dRA =-0.976s
dDec = 5.13"
JPL#138+Ephem, Known errors + binary orbit

Expect fades >0.2 secs (star dia)



on in 24hr steps

Occult 4.2025.4.14

https://www.hou.usra.edu/meetings/acm2023/eposter/2059.pdf

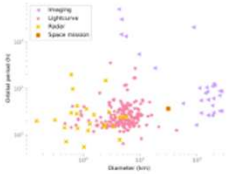
Dynamics of Asteroid (762) Pulcova and Its Pulcamoon

K. Minker,[1] B. Carry,[1] F. Vachier,[2] J. Berthier[2]

1) Université Côte d'Azur, Observatoire de la Côte d'Azur, CNRS, Laboratoire Lagrange (kate.minker@oca.eu)
2) IMCCE, Observatoire de Paris, PSL Research University, CNRS, Sorbonne Universités, UPMC Univ Paris 06, Univ. Lille, France.

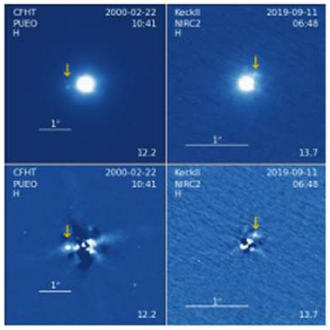
Asteroids with Satellites

From the discovery of tiny Dactyl orbiting Ida in 1993 to the DART impact on Dimorphos last September, asteroid satellites have proven time and time again to be essential objects to understand the physical and dynamical properties of the entire asteroid population. Notably, dynamical characterization of multiple asteroid systems provides one of the only reliable ways in which to determine the mass and density of the primary body from ground based observations. Over 400 binary and multiple systems have been identified today, primarily through photometry, radar, and direct imaging. In recent years, ever increasing temporal baselines and improved adaptive optics technology have allowed for unprecedented improvements in the characterization of the dynamics and internal structure of binary systems through ground based observations.



Identifying Pulcamoon

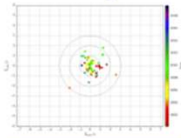
Pulcova's satellite S/2000 (762) 1, affectionately known as Pulcamoon, was the second asteroid satellite discovered by ground based direct imaging, following the discovery of Petit Prince orbiting (45) Eugenia in 1998.



The system has been observed numerous times since the discovery of the satellite with large ground based telescopes from CFHT, Keck, VLT and Gemini observatories. We applied halo reduction algorithms [7] to this archive data in

Orbit Determination

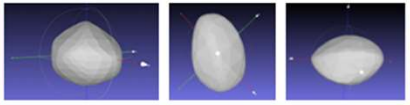
Genoid Algorithm



We use the Genoid algorithm [5] to test potential orbital solutions for the Pulcova system. The algorithm works by randomly generating solutions based on variable physical parameters and orbital elements. The parameters of the best solutions are then randomly combined in successive generations until convergence on a well fitting solution has been achieved.

The current best solution is a Keplerian solution with 14.5 mas residuals (shown above).

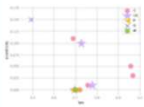
Keplerian or Complicated?



Shape model of (762) Pulcova computed from 45 lightcurves and sparse photometry (above). Model was calculated using the methods of [4]. Examples of model fit to lightcurves are shown below.

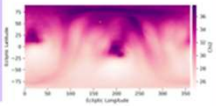
Internal Structure

Recent studies [1,2,3] have defined the orbits of several multiple asteroid systems to unprecedented precisions. Through comparison with shape models of these asteroids, information about the internal structure of the asteroid can be inferred. A non-spherical asteroid with a homogeneous internal structure should not have a satellite with a Keplerian orbit, as precession of the longitude of the ascending node or argument of periapsis should be noticeable over time.

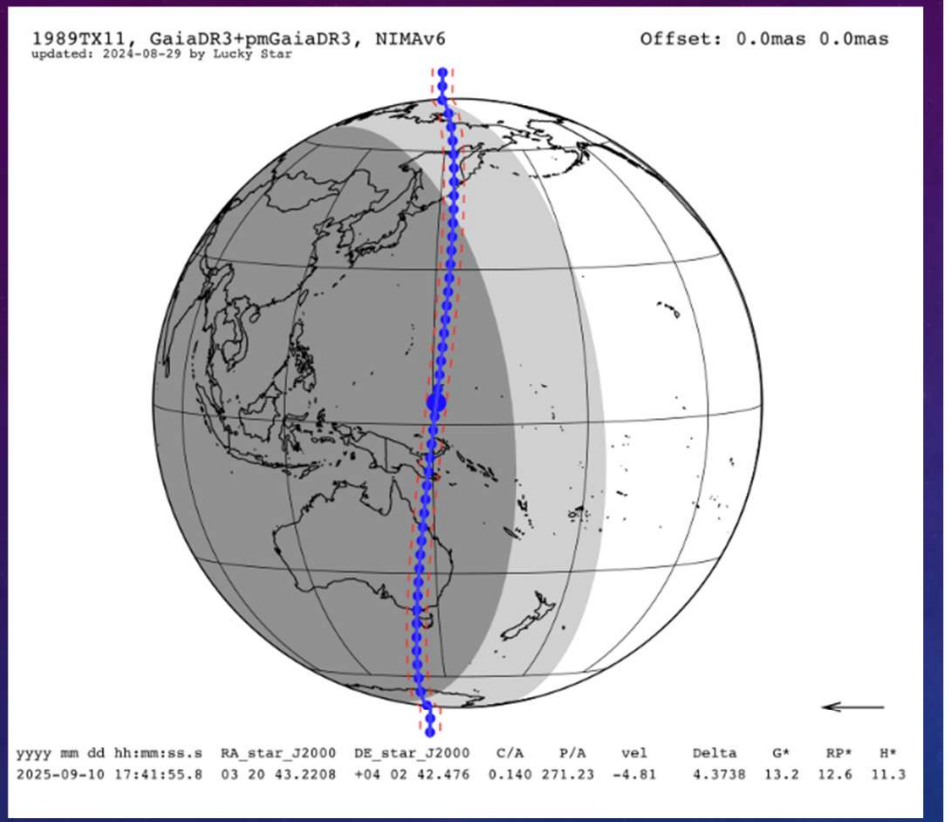


Although large multiple asteroid systems remain to be fully understood, we can see two distinct populations emerging in the dynamical space, those where the eccentricity of the outermost satellite is strongly correlated to the shape of the primary, and those with circular keplerian orbits.

The spin pole orientation of Pulcova remains ambiguous, and small changes in this value will affect a multipole model of Pulcamoon's motion substantially.



External forces from the



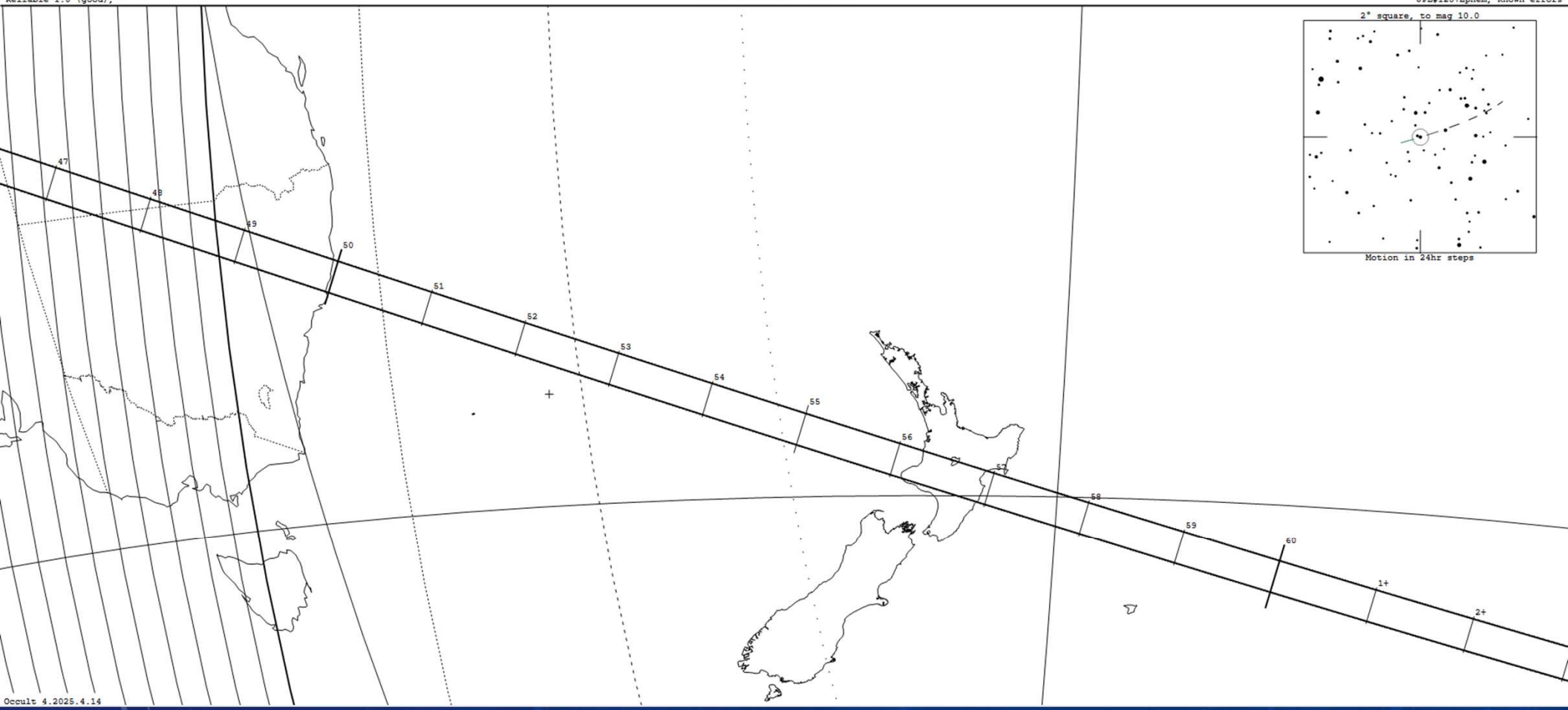
Date	Wed. 10 Sep. 2025 17:41:55
Star position (ICRF)	03 20 43.2208 +04 02 42.476
C/A	0.140 arcsec
P/A	271.23 °
velocity	-4.81 km/s
Geocentric distance Δ	4.3738 au
G mag*	13.2
J mag*	12.6
H mag*	11.3
Magnitude drop	4.2
Uncertainty in time	23.8 sec
Uncertainty in C/A	61.3 mas
Uncertainty in projected distance	194.4 km
Probability of occultation on centrality	6.2%
Maximum duration	6.2 sec
Moon distance to the object	26.8°
Fraction of illuminated Moon	88.1 %
Solar elongation	118.1°

230 Athamantis occults UCAC4 388-093758 on 2025 Sep 3 from 7h 37m to 8h 10m UT

Star: (Dia = 0.1 mas)
Mv 8.0; Mr 7.1; [Mb 8.8]
RA = 18 19 43.5345 (astrometric)
Dec = -12 30 47.649
[of Date: 18 21 11, -12 30 7]
Prediction of 2025 May 6.0
Reliable 1.0 (good),

Durations: Max = 18.8 secs
1km = 0.17 secs, 1mas = 0.21 secs
Mag Drop: 3.6 [96%]v
Sun : Dist = 113°
Moon: Dist = 19°, illum = 78%
1σ Err: ±(3.0 x 1.0) mas in PA 76°

Asteroid: (in DAMIT)
Mag = 11.5
Dia = 112 ±6km, 88 mas
Parallax = 5.012"
Hourly dRA = 1.101s
dDec = -4.88"
JPL#125+Ephem, Known errors



Occult 4.2025.4.14

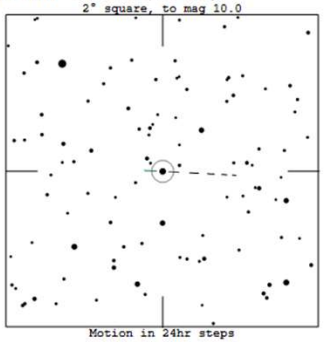
2541 Edebono occults HIP 89731 on 2025 Sep 6 from 8h 17m to 8h 52m UT

Star: (Dia = 0.3 mas)
Mv 6.1; Mr 5.3; [Mb 6.8]
RA = 18 18 41.7568 (astrometric)
Dec = -25 36 18.174 ...
[of Date: 18 20 18, -25 35 44]
Prediction of 2025 May 6.0
Reliable 1.0 (good),

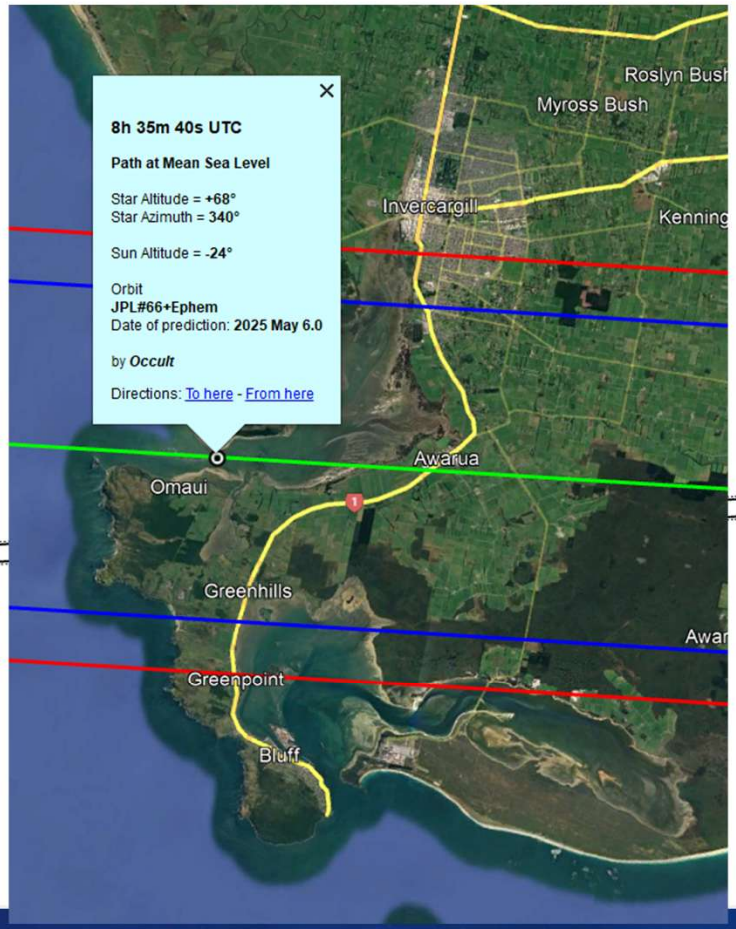
Durations: Max = 1.93 secs
1km = 0.19 secs, 1mas = 0.32 secs
Mag Drop: 11.3 [100%]v, 11.2 [100%]r
Sun : Dist = 110°
Moon: Dist = 51°, illum = 97%
1σ Err: ±(2.6 x 0.8) mas in PA 100°

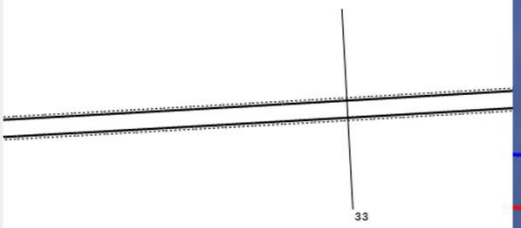
Asteroid:
Mv = 17.4; Mr = 16.5
Dia = 10 ±1km, 6 mas
Parallax = 3.510"
Hourly dRA = 0.832s
dDec = 0.61"
JPL#66+Ephem, Known errors

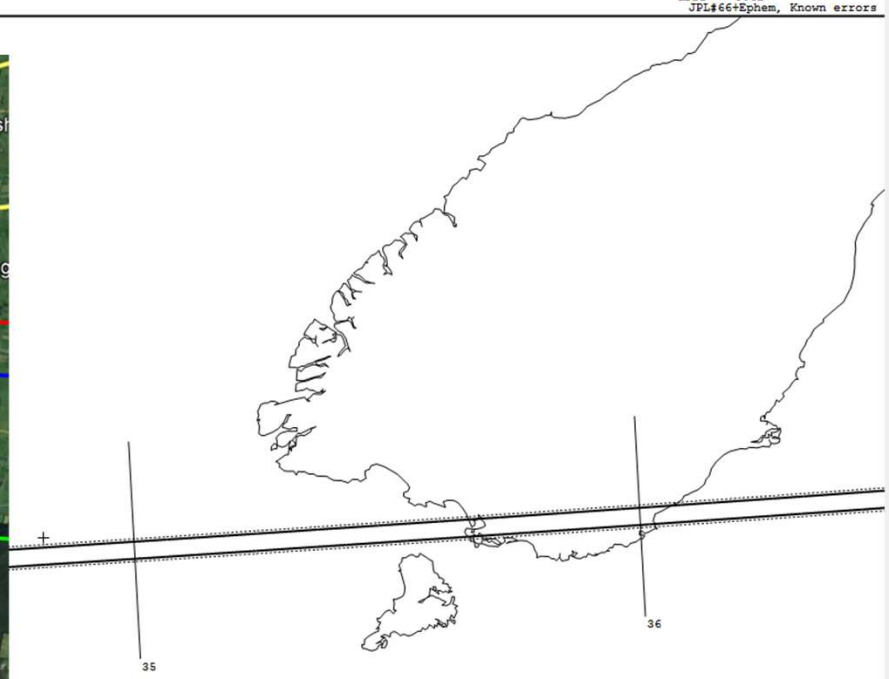
Expect fades >0.07 secs (star dia)
2° square, to mag 10.0



Motion in 24hr steps







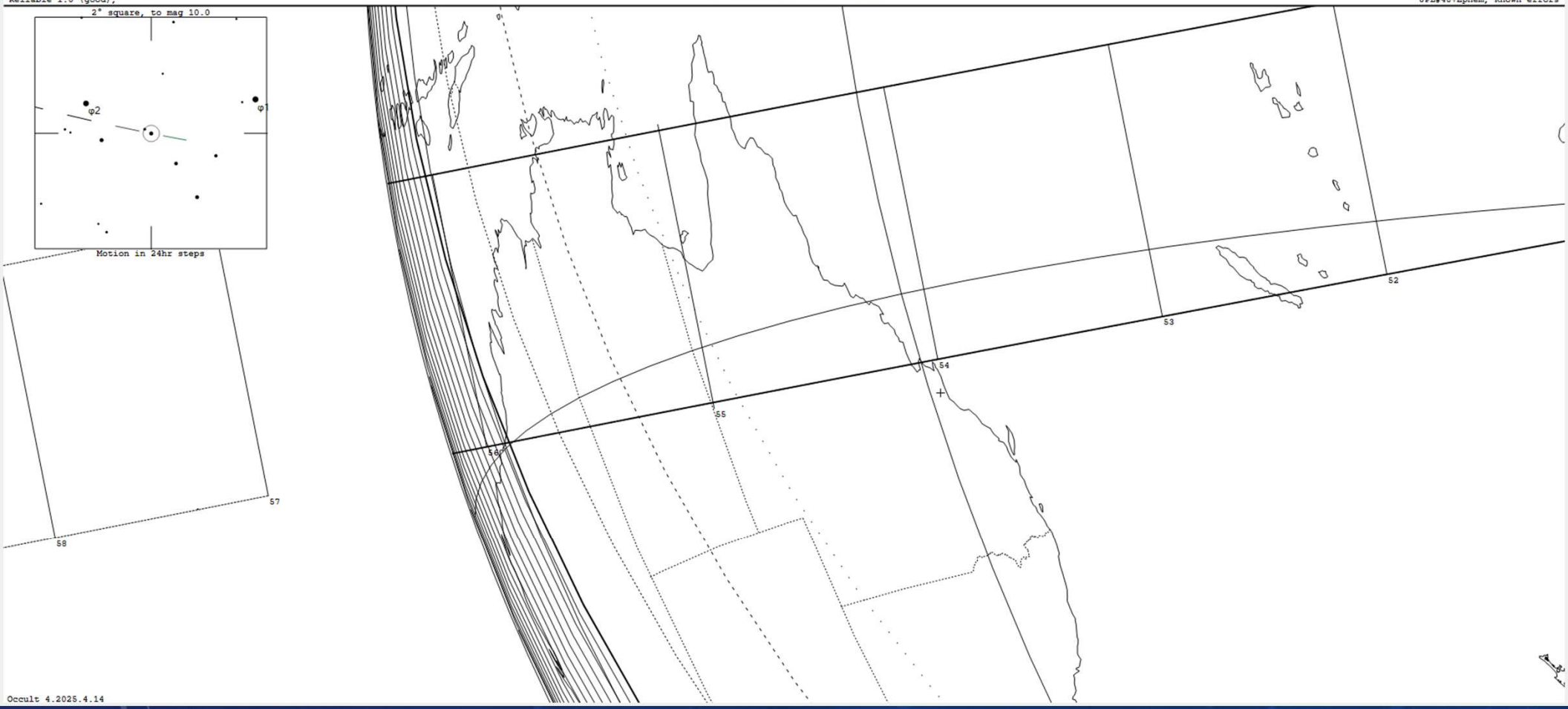
Occult 4.2025.4.14

1 Ceres occults HIP 3725 on 2025 Oct 14 from 9h 38m to 9h 57m UT

Star: (Dia = 0.1 mas)
Mv 7.3; Mr 6.5; [Mb 8.0]
RA = 0 47 50.3335 (astrometric)
Dec = -10 54 14.688 ...
[of Date: 0 49 10, -10 45 40]
Prediction of 2025 May 6.0
Reliable 1.0 (good),

Durations: Max = 76.6 secs
1km = 0.081 secs, 1mas = 0.12 secs
Mag Drop: 1.0 [59%]v
Sun : Dist = 159°
Moon: Dist = 113°, illum = 43%
1σ Err: ±(0.3 x 0.3) mas in PA 133°

Asteroid: (in DAMIT, ISAM)
Mag = 7.7
Dia = 952 ±0km, 664 mas
Parallax = 4.447"
Hourly dRA =-2.075s
dDec = -6.07"
JPL#48+Ephem, Known errors

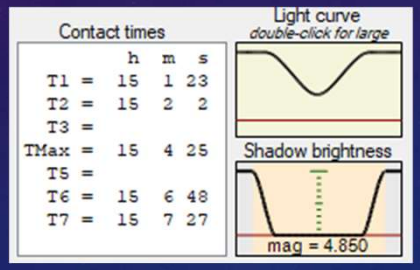


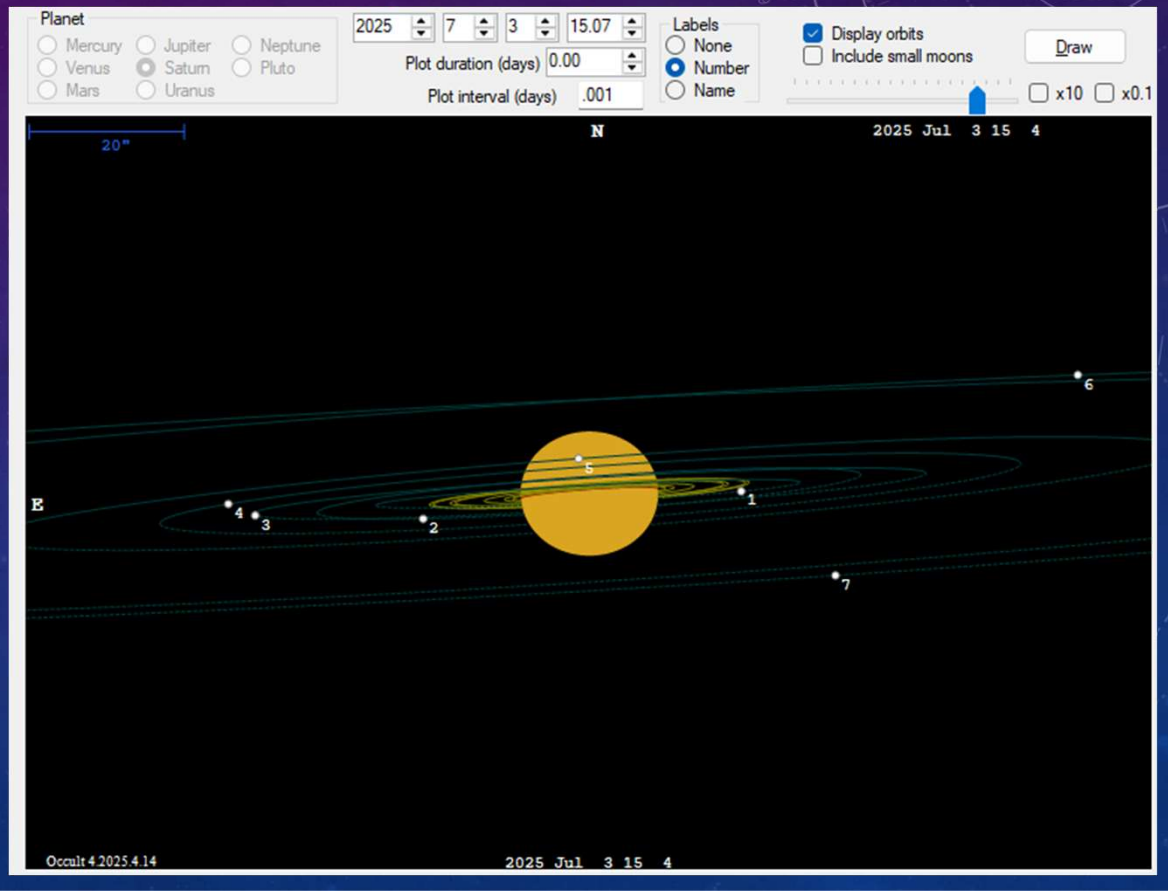
Occult 4.2025.4.14

SATURNIAN MUTUAL EVENTS

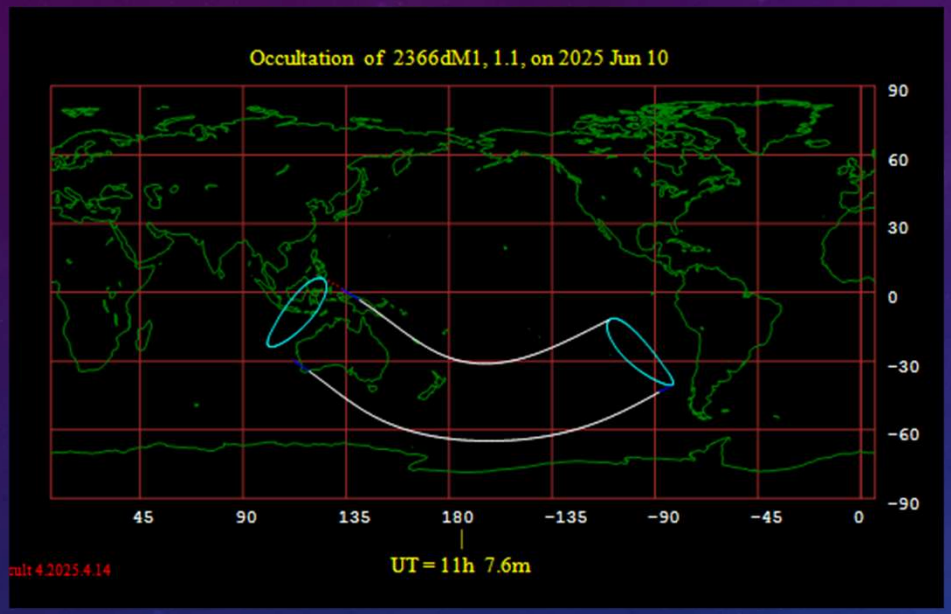
Dione eclipses Tethys – both 10th magnitude

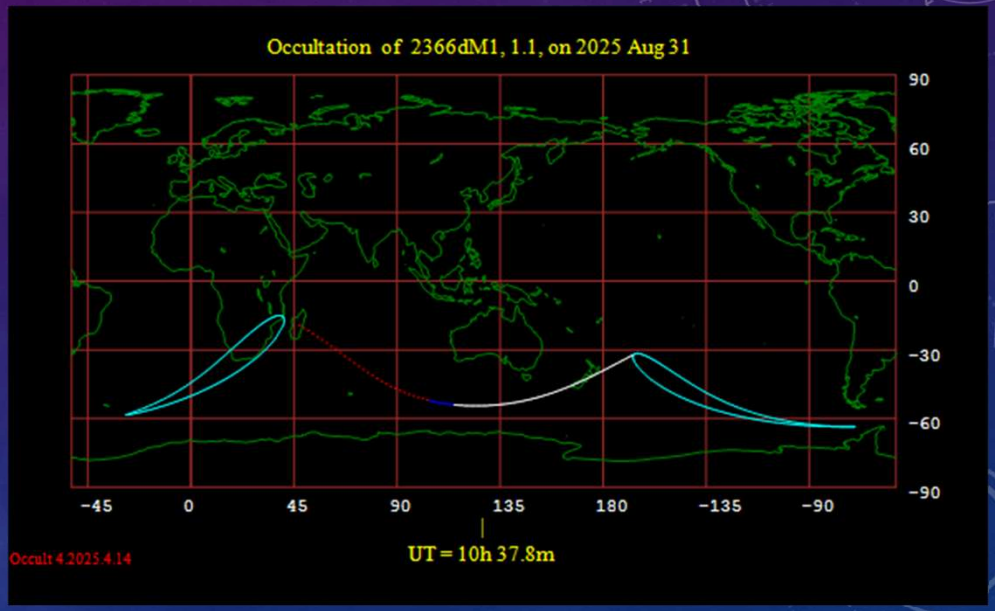
Year	M	D	h	m	s	Event Type	Ph	Dur	dMag	%Ill	Sep	PA	MinD	Alt
2025	7	3	15	4	25	(IV) ecl (III)	P	363	1.1	38.0	43.2	94	0.050	34





OCCULTATIONS OF ANTARES



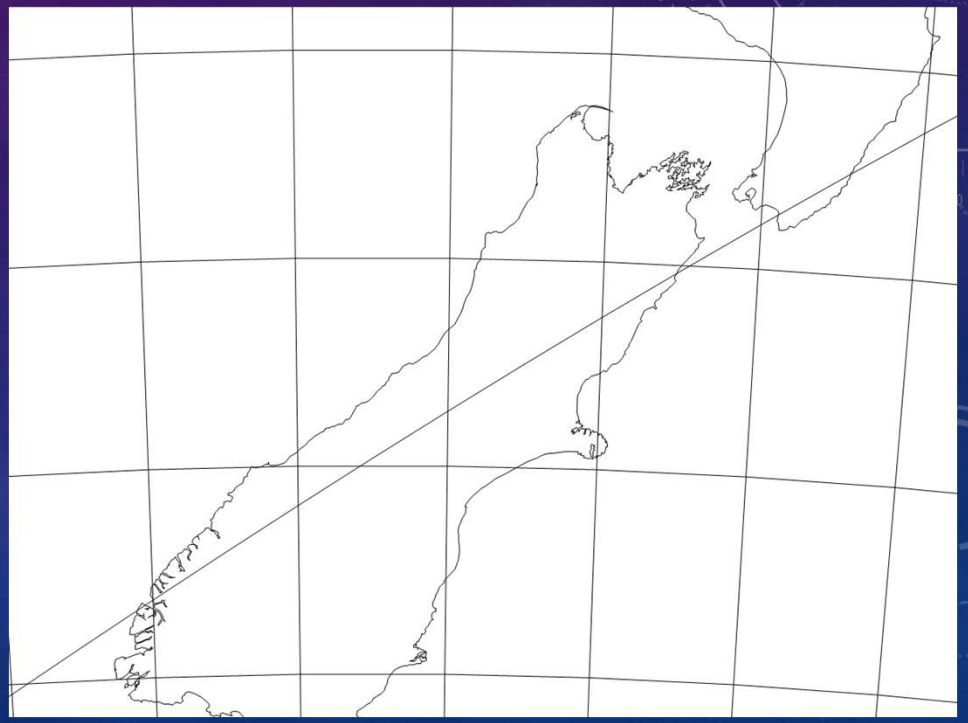


ANTARES OCCULTATION – 2025 AUGUST 31

Occultation seen from the southeastern half of the South Island and far southern tip off the North Island. Graze is on a bright limb.

Moon is just past first quarter.

For Wellington, the event is a miss at 12:01 UTC with the moon at an altitude of 19 degrees.




QUESTIONS