

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-31T19:29:48.620  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3377581011930633856  
 2Mass ID (if available) : 06212830+2335009

ICRS Star Coord at Epoch: 06h 21m 28.30781s +23:35:00.87030s

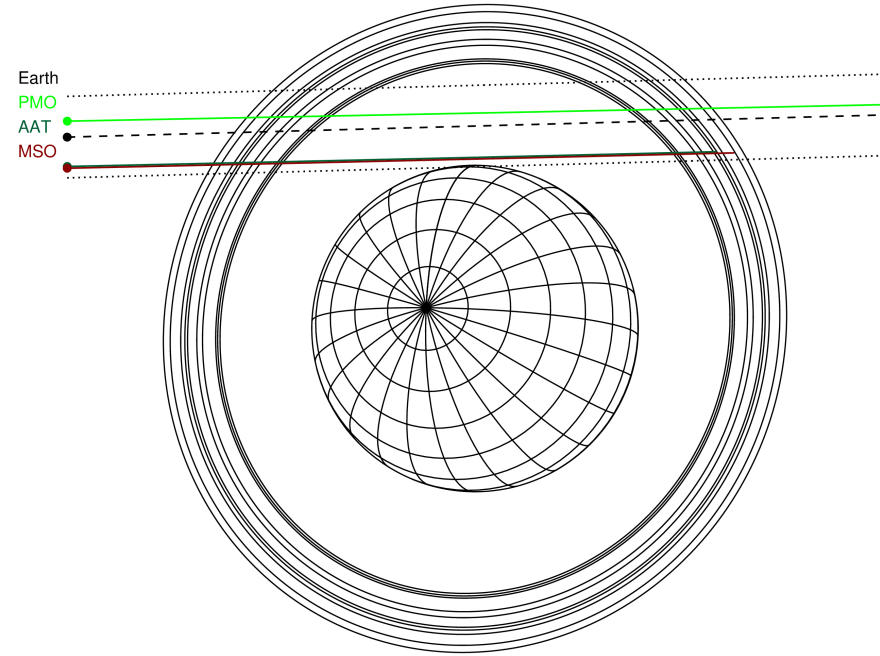
RUWE (>1.4 is poor) : 1.19  
 K magnitude : 10.567  
 G magnitude : 13.993  
 RP magnitude : 13.024  
 BP magnitude : 14.959  
 DUPflag : 0  
 Distance (au) : 19.406  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.75  
 Sun-Target sep (deg) : 63.33  
 Sun-Moon sep (deg) : 138.69  
 B (ring opening deg) : 71.03  
 PA of pole (deg) : 66.96

| #  | a(km)   | ring    |
|----|---------|---------|
| 1  | 41837.2 | 6       |
| 2  | 42235.0 | 5       |
| 3  | 42571.2 | 4       |
| 4  | 44718.5 | alpha   |
| 5  | 45661.1 | beta    |
| 6  | 47176.1 | eta     |
| 7  | 47626.3 | gamma   |
| 8  | 48300.3 | delta   |
| 9  | 50026.7 | lambda  |
| 10 | 51149.4 | epsilon |



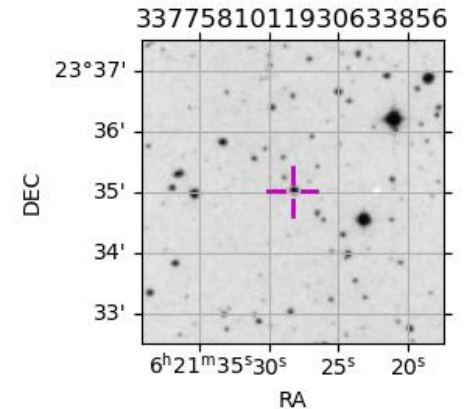
2033-08-31T19:29:48.6200 ex: 06 21 28.3078 s: +23 35 00.870 C/A 2.256° PA 181.56 deg v\_sky +19.75 km/s D 19.41 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2033-08-31T19:29:48 K10.57 G13.99 XRgt



Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

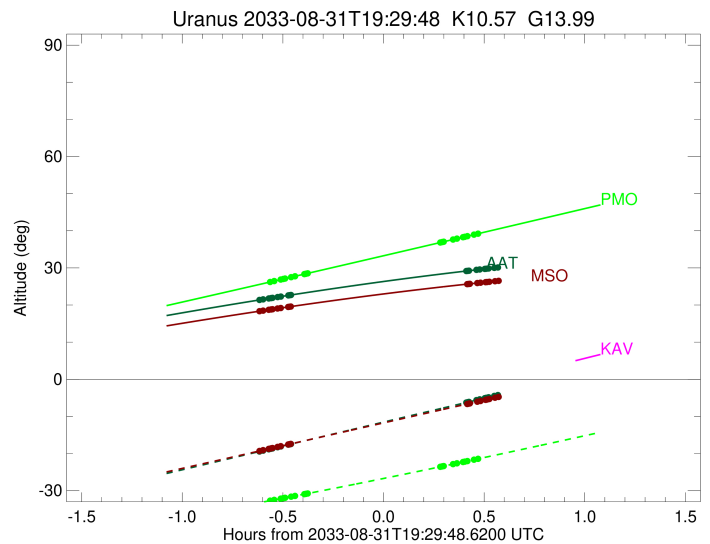
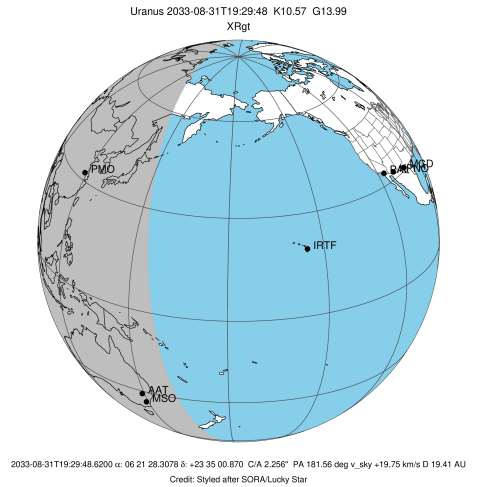
| Obs  | Location              | lat   | Elon  | Rings I | Planet | Rings E | Observed Events Interval    | OEncode |
|------|-----------------------|-------|-------|---------|--------|---------|-----------------------------|---------|
| PIC  | Pic du Midi           | 42.9  | 0.1   |         |        |         |                             | PnnRnn  |
| PAL  | Palomar Mt (200")     | 33.4  | 243.1 |         |        |         |                             | PnnRnn  |
| PMO  | Purple Mtn Obs. Nanki | 32.1  | 118.8 | +++++   |        | +++++   | AUG 31 18:55 - AUG 31 19:58 | PnnRie  |
| KPNO | Kitt Peak Natl Obs    | 32.0  | 248.4 |         |        |         |                             | PnnRnn  |
| MCD  | McDonald Obs. 2.7m    | 30.7  | 256.0 |         |        |         |                             | PnnRnn  |
| TEN  | Teide Obs./Tenerife   | 28.3  | 343.5 |         |        |         |                             | PnnRnn  |
| IRTF | Mauna Kea/IRTF        | 19.8  | 204.5 |         |        |         |                             | PnnRnn  |
| KAV  | Kavalur Observatory   | 12.6  | 78.8  |         |        |         |                             | PnnRnn  |
| RIO  | Rio de Janeiro        | -22.9 | 316.8 |         |        |         |                             | PnnRnn  |
| ESO  | European Southern Obs | -29.3 | 289.3 |         |        |         |                             | PnnRnn  |
| AAT  | Siding Spring (AAT)   | -31.3 | 149.1 | +++++   |        | +++++   | AUG 31 18:52 - AUG 31 20:00 | PnnRie  |
| SAAO | So. Afr. Astro. Obs.  | -32.4 | 20.8  |         |        |         |                             | PnnRnn  |
| MSO  | Mt. Stromlo Observato | -35.3 | 149.0 | +++++   |        | +++++   | AUG 31 18:52 - AUG 31 20:01 | PnnRie  |



3377581011930633856

DEC: 23°37', 36', 35', 34', 33'  
 RA: 6h21m35s30s, 25s, 20s

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-31T19:25:48.500  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 3377581011930633856  
 2Mass ID (if available) : 06212830+2335009  
 ICRS Star Coord at Epoch: 06h 21m 28.30781s +23:35:00.87030s  
 RUWE (>1.4 is poor) : 1.19  
 K magnitude : 10.567  
 G magnitude : 13.993  
 RP magnitude : 13.024  
 BP magnitude : 14.959  
 DUPflag : 0  
 Distance (au) : 19.406  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.75  
 Sun-Target sep (deg) : 63.33  
 Sun-Moon sep (deg) : 138.51  
 B (ring opening deg) : 71.03  
 PA of pole (deg) : 66.96  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.396  
 C/A sky separation (km) : 33724.8  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

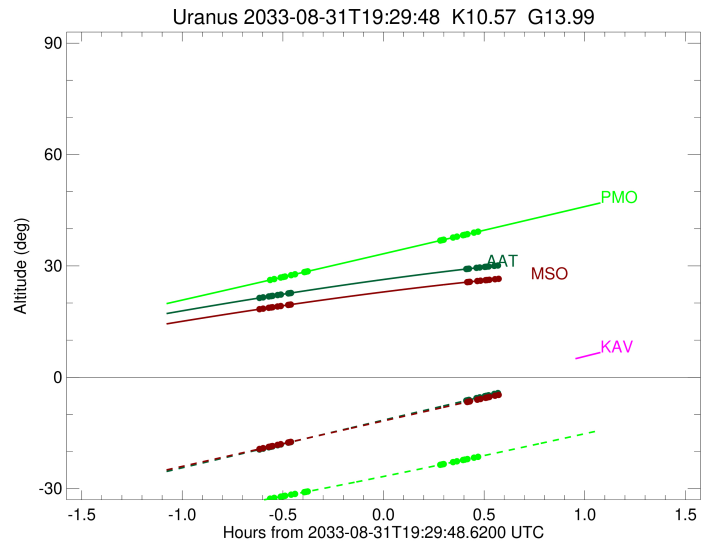
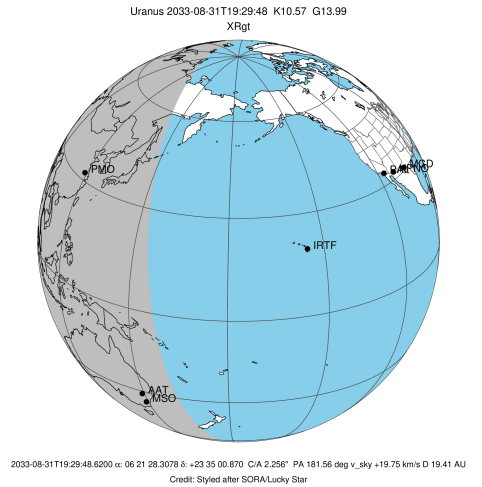


| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I   | 2033-08-31T18:55:45.662 |    | 26.15 | -32.74  | 51386.87 | -15.51 |         |              |
| lambda  | I   | 2033-08-31T18:57:14.838 |    | 26.46 | -32.49  | 50026.71 | -15.08 |         |              |
| delta   | I   | 2033-08-31T18:59:11.146 |    | 26.86 | -32.16  | 48300.35 | -14.60 |         |              |
| gamma   | I   | 2033-08-31T18:59:57.376 |    | 27.02 | -32.03  | 47630.28 | -14.39 |         |              |
| eta     | I   | 2033-08-31T19:00:29.098 |    | 27.13 | -31.94  | 47176.12 | -14.24 |         |              |
| beta    | I   | 2033-08-31T19:02:16.603 |    | 27.51 | -31.63  | 45674.00 | -13.71 |         |              |
| alpha   | I   | 2033-08-31T19:03:27.653 |    | 27.75 | -31.42  | 44708.85 | -13.32 |         |              |
| 4       | I   | 2033-08-31T19:06:17.514 |    | 28.34 | -30.93  | 42537.05 | -12.32 |         |              |
| 5       | I   | 2033-08-31T19:06:42.094 |    | 28.43 | -30.86  | 42219.01 | -12.19 |         |              |
| 6       | I   | 2033-08-31T19:07:10.708 |    | 28.53 | -30.78  | 41871.38 | -11.96 |         |              |

No planet occultations

|         |   |                         |  |       |        |          |       |  |  |
|---------|---|-------------------------|--|-------|--------|----------|-------|--|--|
| 6       | E | 2033-08-31T19:46:41.940 |  | 36.83 | -23.58 | 41824.27 | 11.91 |  |  |
| 5       | E | 2033-08-31T19:47:21.840 |  | 36.97 | -23.46 | 42305.39 | 12.15 |  |  |
| 4       | E | 2033-08-31T19:47:40.631 |  | 37.03 | -23.40 | 42533.09 | 12.27 |  |  |
| alpha   | E | 2033-08-31T19:50:29.034 |  | 37.63 | -22.87 | 44684.89 | 13.26 |  |  |
| beta    | E | 2033-08-31T19:51:40.513 |  | 37.88 | -22.64 | 45647.22 | 13.65 |  |  |
| eta     | E | 2033-08-31T19:53:30.437 |  | 38.27 | -22.29 | 47176.12 | 14.17 |  |  |
| gamma   | E | 2033-08-31T19:54:02.287 |  | 38.38 | -22.19 | 47629.83 | 14.32 |  |  |
| delta   | E | 2033-08-31T19:54:48.788 |  | 38.54 | -22.04 | 48300.35 | 14.52 |  |  |
| lambda  | E | 2033-08-31T19:56:45.725 |  | 38.96 | -21.67 | 50026.71 | 15.00 |  |  |
| epsilon | E | 2033-08-31T19:58:19.094 |  | 39.29 | -21.37 | 51443.30 | 15.42 |  |  |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-31T19:27:24.630  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 3377581011930633856  
 2Mass ID (if available) : 06212830+2335009  
 ICRS Star Coord at Epoch: 06h 21m 28.30781s +23:35:00.87030s  
 RUWE (>1.4 is poor) : 1.19  
 K magnitude : 10.567  
 G magnitude : 13.993  
 RP magnitude : 13.024  
 BP magnitude : 14.959  
 DUPflag : 0  
 Distance (au) : 19.406  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.75  
 Sun-Target sep (deg) : 63.33  
 Sun-Moon sep (deg) : 138.59  
 B (ring opening deg) : 71.03  
 PA of pole (deg) : 66.96  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.903  
 C/A sky separation (km) : 26787.8  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itrff93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

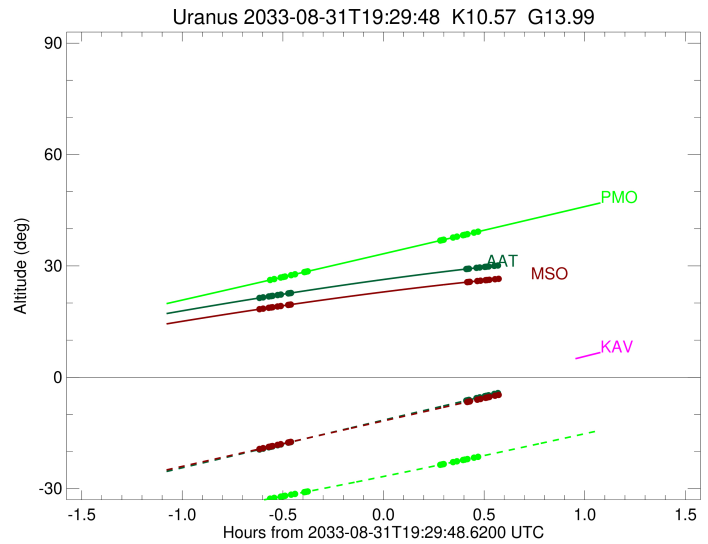
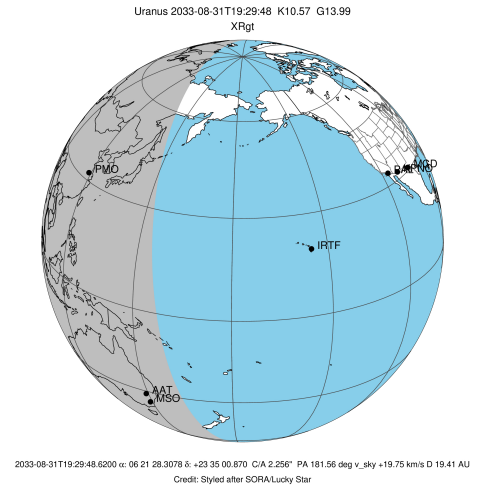


| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I   | 2033-08-31T18:52:40.736 |    | 21.34 | -19.49  | 51326.86 | -17.42 |         |              |
| lambda  | I   | 2033-08-31T18:53:56.088 |    | 21.53 | -19.22  | 50026.71 | -17.16 |         |              |
| delta   | I   | 2033-08-31T18:55:37.428 |    | 21.77 | -18.86  | 48300.35 | -16.90 |         |              |
| gamma   | I   | 2033-08-31T18:56:17.246 |    | 21.86 | -18.72  | 47629.53 | -16.79 |         |              |
| eta     | I   | 2033-08-31T18:56:44.312 |    | 21.93 | -18.62  | 47176.12 | -16.71 |         |              |
| beta    | I   | 2033-08-31T18:58:14.829 |    | 22.14 | -18.30  | 45676.94 | -16.43 |         |              |
| alpha   | I   | 2033-08-31T18:59:13.324 |    | 22.28 | -18.09  | 44716.13 | -16.23 |         |              |
| 4       | I   | 2033-08-31T19:01:29.762 |    | 22.60 | -17.60  | 42545.15 | -15.73 |         |              |
| 5       | I   | 2033-08-31T19:01:50.587 |    | 22.65 | -17.53  | 42200.44 | -15.67 |         |              |
| 6       | I   | 2033-08-31T19:02:11.079 |    | 22.70 | -17.46  | 41876.59 | -15.56 |         |              |

No planet occultations

|         |   |                         |  |       |        |          |       |  |  |
|---------|---|-------------------------|--|-------|--------|----------|-------|--|--|
| 6       | E | 2033-08-31T19:54:27.545 |  | 29.15 | -6.28  | 41814.85 | 15.51 |  |  |
| 5       | E | 2033-08-31T19:54:59.358 |  | 29.21 | -6.16  | 42312.52 | 15.62 |  |  |
| 4       | E | 2033-08-31T19:55:13.987 |  | 29.24 | -6.11  | 42539.87 | 15.67 |  |  |
| alpha   | E | 2033-08-31T19:57:28.888 |  | 29.47 | -5.63  | 44686.57 | 16.17 |  |  |
| beta    | E | 2033-08-31T19:58:27.674 |  | 29.57 | -5.42  | 45644.57 | 16.37 |  |  |
| eta     | E | 2033-08-31T20:00:00.486 |  | 29.73 | -5.09  | 47176.12 | 16.64 |  |  |
| gamma   | E | 2033-08-31T20:00:27.635 |  | 29.77 | -5.00x | 47629.02 | 16.72 |  |  |
| delta   | E | 2033-08-31T20:01:07.654 |  | 29.84 | -4.86x | 48300.35 | 16.83 |  |  |
| lambda  | E | 2033-08-31T20:02:49.443 |  | 30.01 | -4.49x | 50026.71 | 17.09 |  |  |
| epsilon | E | 2033-08-31T20:04:08.956 |  | 30.14 | -4.21x | 51392.72 | 17.34 |  |  |

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-08-31T19:27:31.720  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : MSO  
 Location : Mt. Stromlo Observatory  
 Latitude (deg) : -35.32000  
 E. Longitude (deg) : 149.00833  
 Altitude (km) : 0.770  
 Gaia source ID : 3377581011930633856  
 2Mass ID (if available) : 06212830+2335009  
 ICRS Star Coord at Epoch: 06h 21m 28.30781s +23:35:00.87030s  
 RUWE (>1.4 is poor) : 1.19  
 K magnitude : 10.567  
 G magnitude : 13.993  
 RP magnitude : 13.024  
 BP magnitude : 14.959  
 DUPflag : 0  
 Distance (au) : 19.406  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.75  
 Sun-Target sep (deg) : 63.33  
 Sun-Moon sep (deg) : 138.58  
 B (ring opening deg) : 71.03  
 PA of pole (deg) : 66.96  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.885  
 C/A sky separation (km) : 26530.4  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 ura111.bsp  
 IAU\_URANUS\_for\_RINGFIT.tpc  
 vgr2.ura111.bsp  
 ura161.bsp  
 vgr2.ura161.bsp  
 peph.ura160.bsp  
 earthstns\_itrff93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



| Ring    | I/E | UTC                     | b? | alt   | alt-sun | radius   | r-dot  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|----|-------|---------|----------|--------|---------|--------------|
| epsilon | I   | 2033-08-31T18:52:41.078 |    | 18.32 | -19.35  | 51324.62 | -17.49 |         |              |
| lambda  | I   | 2033-08-31T18:53:55.965 |    | 18.49 | -19.09  | 50026.71 | -17.24 |         |              |
| delta   | I   | 2033-08-31T18:55:36.820 |    | 18.71 | -18.75  | 48300.35 | -16.99 |         |              |
| gamma   | I   | 2033-08-31T18:56:16.438 |    | 18.80 | -18.62  | 47629.50 | -16.88 |         |              |
| eta     | I   | 2033-08-31T18:56:43.360 |    | 18.86 | -18.52  | 47176.12 | -16.80 |         |              |
| beta    | I   | 2033-08-31T18:58:13.369 |    | 19.06 | -18.22  | 45677.02 | -16.53 |         |              |
| alpha   | I   | 2033-08-31T18:59:11.503 |    | 19.19 | -18.02  | 44716.39 | -16.33 |         |              |
| 4       | I   | 2033-08-31T19:01:27.040 |    | 19.49 | -17.56  | 42545.45 | -15.84 |         |              |
| 5       | I   | 2033-08-31T19:01:47.773 |    | 19.54 | -17.49  | 42199.85 | -15.79 |         |              |
| 6       | I   | 2033-08-31T19:02:08.065 |    | 19.58 | -17.42  | 41876.72 | -15.67 |         |              |

No planet occultations

|         |   |                         |  |       |        |          |       |  |  |
|---------|---|-------------------------|--|-------|--------|----------|-------|--|--|
| 6       | E | 2033-08-31T19:54:43.577 |  | 25.63 | -6.67  | 41814.57 | 15.62 |  |  |
| 5       | E | 2033-08-31T19:55:15.179 |  | 25.68 | -6.56  | 42312.68 | 15.73 |  |  |
| 4       | E | 2033-08-31T19:55:29.704 |  | 25.70 | -6.51  | 42540.12 | 15.79 |  |  |
| alpha   | E | 2033-08-31T19:57:43.693 |  | 25.92 | -6.06  | 44686.65 | 16.27 |  |  |
| beta    | E | 2033-08-31T19:58:42.108 |  | 26.01 | -5.86  | 45644.49 | 16.47 |  |  |
| eta     | E | 2033-08-31T20:00:14.399 |  | 26.15 | -5.55  | 47176.12 | 16.73 |  |  |
| gamma   | E | 2033-08-31T20:00:41.400 |  | 26.20 | -5.45  | 47628.99 | 16.81 |  |  |
| delta   | E | 2033-08-31T20:01:21.212 |  | 26.26 | -5.32  | 48300.35 | 16.92 |  |  |
| lambda  | E | 2033-08-31T20:03:02.499 |  | 26.41 | -4.98x | 50026.71 | 17.17 |  |  |
| epsilon | E | 2033-08-31T20:04:21.540 |  | 26.53 | -4.71x | 51390.84 | 17.41 |  |  |