

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-05T16:38:21.660
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3404399096963109632
 2Mass ID (if available) : 05392157+2330139

ICRS Star Coord at Epoch: 05h 39m 21.57494s +23:30:13.43642s

RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.614
 G magnitude : 17.556
 RP magnitude : 16.420
 BP magnitude : 18.934
 DUPflag : 0
 Distance (au) : 18.125
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.74
 Sun-Target sep (deg) : 167.62
 Sun-Moon sep (deg) : 61.83
 B (ring opening deg) : 79.06
 PA of pole (deg) : 41.78

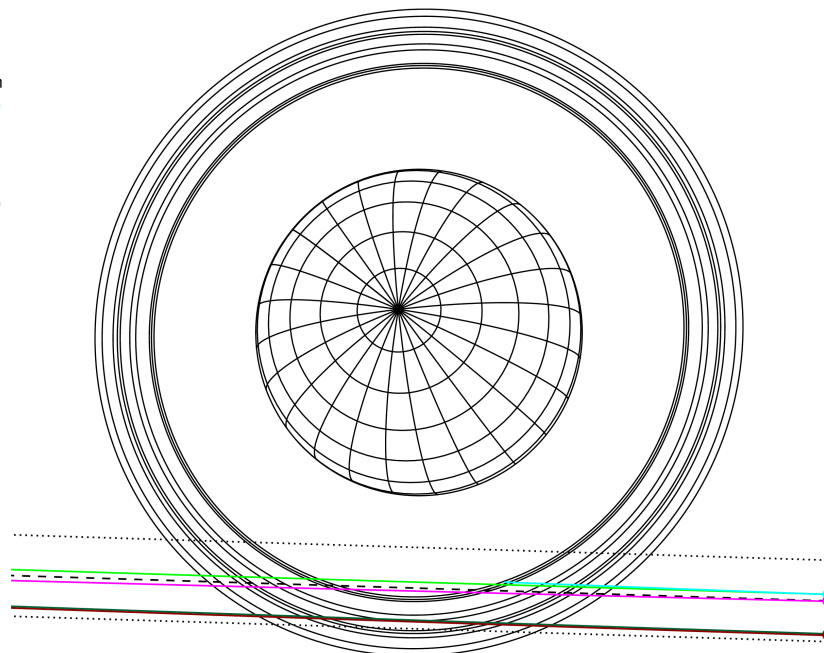
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2031-12-05T16:38:21.6600 ra: 05 39 21.5749 s: +23 30 13.436 C/A 3.038° PA 358.22 deg v_sky -22.74 km/s D 18.13 AU
 Credit: Styled after SORA/Lucky Star

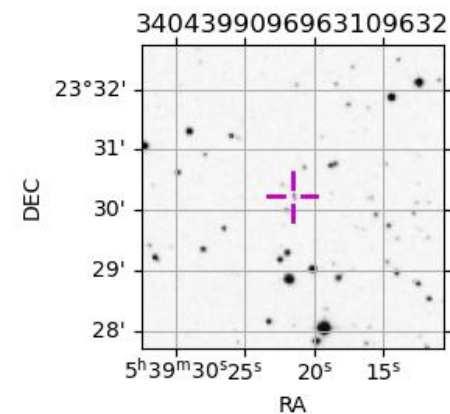
Uranus 2031-12-05T16:38:21 K13.61 G17.56 XRgt

Earth
 PMO
 IRTF
 KAV
 AAT
 MSO



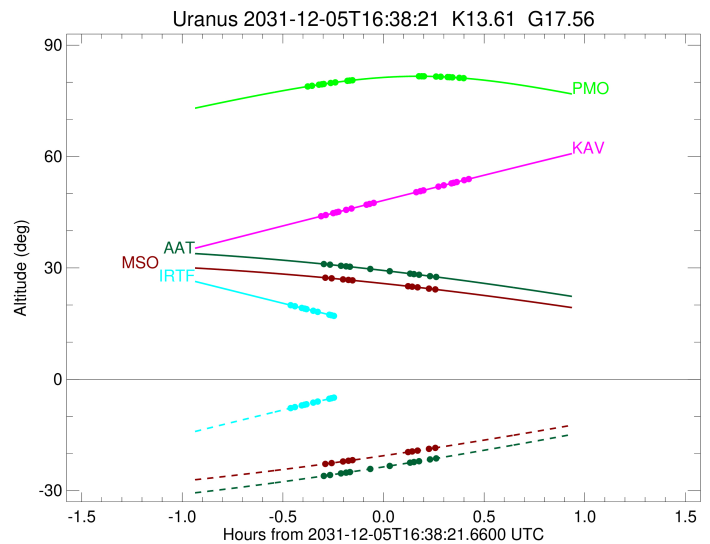
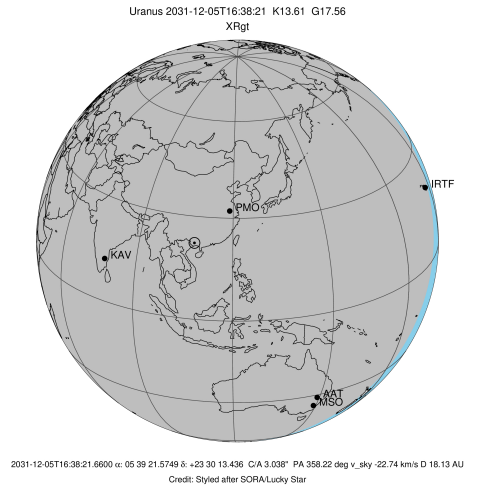
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
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	+++++		+++++	DEC 05 16:15 - DEC 05 17:02	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	+++++			DEC 05 16:10 - DEC 05 16:23	PnnRin
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	DEC 05 16:19 - DEC 05 17:03	PnnRie
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	+++++		+++++	DEC 05 16:19 - DEC 05 16:54	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++		+++++	DEC 05 16:20 - DEC 05 16:54	PnnRie



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-05T16:38:29.940
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       : 3404399096963109632
2Mass ID (if available) : 05392157+2330139
ICRS Star Coord at Epoch: 05h 39m 21.57494s +23:30:13.43642s
RUWE (>1.4 is poor) : 0.95
K magnitude           : 13.614
G magnitude           : 17.556
RP magnitude          : 16.420
BP magnitude          : 18.934
DUPflag              : 0
Distance (au)         : 18.125
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -22.74
Sun-Target sep (deg) : 167.62
Sun-Moon sep (deg)   : 62.65
B (ring opening deg) : 79.06
PA of pole (deg)     : 41.78
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.974
C/A sky separation (km) : 39090.6
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural111.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itrff93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



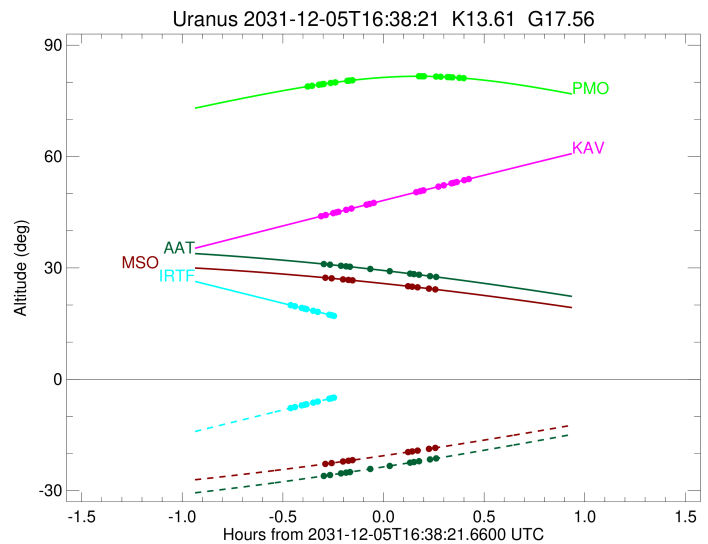
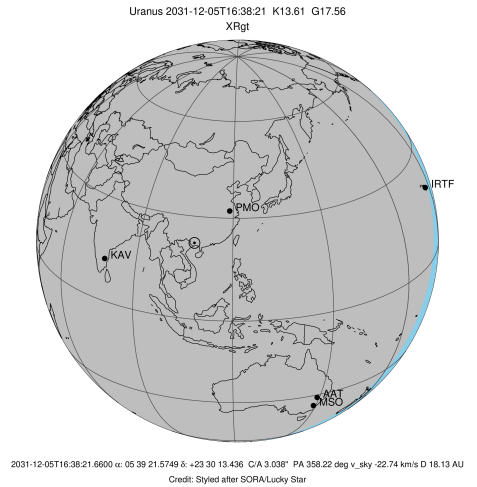
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-05T16:15:20.502		78.81	-79.51	51545.39	-15.02		
lambda	I	2031-12-05T16:17:04.078		79.06	-79.34	50026.71	-14.32		
delta	I	2031-12-05T16:19:08.403		79.35	-79.12	48300.35	-13.43		
gamma	I	2031-12-05T16:19:59.493		79.47	-79.03	47623.96	-13.04		
eta	I	2031-12-05T16:20:34.199		79.54	-78.96	47176.12	-12.76		
beta	I	2031-12-05T16:22:36.390		79.81	-78.73	45678.41	-11.72		
alpha	I	2031-12-05T16:23:57.786		79.97	-78.56	44751.88	-10.98		
4	I	2031-12-05T16:27:41.352		80.40	-78.08	42546.85	-8.67		
5	I	2031-12-05T16:28:28.050		80.49	-77.98	42158.03	-8.19		
6	I	2031-12-05T16:29:06.471		80.55	-77.89	41842.61	-7.75		

No planet occultations

6	E	2031-12-05T16:48:58.340		81.62	-74.76	41867.89	7.75		
5	E	2031-12-05T16:49:38.472		81.62	-74.65	42191.84	8.19		
4	E	2031-12-05T16:50:18.007		81.62	-74.53	42527.22	8.67		
alpha	E	2031-12-05T16:54:03.001		81.54	-73.87	44742.12	10.99		
beta	E	2031-12-05T16:55:23.878		81.50	-73.63	45660.73	11.73		
eta	E	2031-12-05T16:57:27.572		81.41	-73.25	47176.12	12.77		
gamma	E	2031-12-05T16:58:02.038		81.38	-73.15	47620.97	13.04		
delta	E	2031-12-05T16:58:53.341		81.33	-72.99	48300.35	13.44		
lambda	E	2031-12-05T17:00:57.622		81.20	-72.61	50026.71	14.33		
epsilon	E	2031-12-05T17:02:25.002		81.10	-72.34	51303.87	15.03		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-05T16:34:10.930
Event type          : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code       : IRTF
Location            : Mauna Kea/IRTF
Latitude (deg)      : 19.82622
E. Longitude (deg)  : 204.52800
Altitude (km)       : 4.168
Gaia source ID      : 3404399096963109632
2Mass ID (if available) : 05392157+2330139
ICRS Star Coord at Epoch: 05h 39m 21.57494s +23:30:13.43642s
RUWE (>1.4 is poor) : 0.95
K magnitude         : 13.614
G magnitude         : 17.556
RP magnitude        : 16.420
BP magnitude        : 18.934
DUPflag            : 0
Distance (au)       : 18.125
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -22.74
Sun-Target sep (deg) : 167.62
Sun-Moon sep (deg)  : 61.63
B (ring opening deg) : 79.06
PA of pole (deg)    : 41.78
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.933
C/A sky separation (km) : 38553.6
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural111.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```

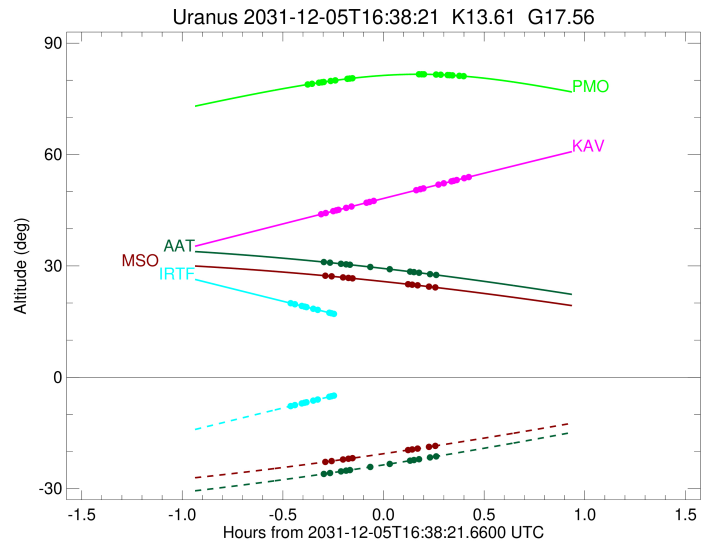
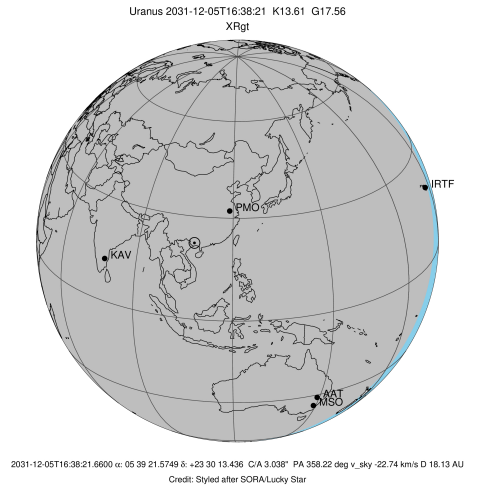


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-05T16:10:15.390		20.05	-7.86	51544.67	-15.14		
lambda	I	2031-12-05T16:11:58.002		19.67	-7.49	50026.71	-14.47		
delta	I	2031-12-05T16:14:00.774		19.21	-7.04	48300.35	-13.64		
gamma	I	2031-12-05T16:14:51.043		19.02	-6.85	47624.01	-13.27		
eta	I	2031-12-05T16:15:25.128		18.90	-6.73	47176.12	-13.01		
beta	I	2031-12-05T16:17:24.563		18.45	-6.29	45678.56	-12.04		
alpha	I	2031-12-05T16:18:43.568		18.16	-6.01	44751.77	-11.36		
4	I	2031-12-05T16:22:16.588		17.37	-5.23	42547.81	-9.27		
5	I	2031-12-05T16:23:00.273		17.21	-5.07	42157.45	-8.84		
6	I	2031-12-05T16:23:35.720		17.07	-4.94x	41841.38	-8.46		

No planet occultations

6	E	2031-12-05T16:45:51.745		12.14	-0.12x	41869.20	8.45		
5	E	2031-12-05T16:46:29.048		12.00	0.02x	42194.82	8.82		
4	E	2031-12-05T16:47:05.558		11.87	0.15x	42526.81	9.25		
alpha	E	2031-12-05T16:50:40.491		11.08	0.92x	44741.29	11.33		
beta	E	2031-12-05T16:51:59.210		10.79	1.20x	45660.10	12.01		
eta	E	2031-12-05T16:54:00.552		10.35	1.63x	47176.12	12.97		
gamma	E	2031-12-05T16:54:34.512		10.22	1.75x	47620.98	13.23		
delta	E	2031-12-05T16:55:25.169		10.04	1.93x	48300.35	13.59		
lambda	E	2031-12-05T16:57:28.354		9.59	2.37x	50026.71	14.42		
epsilon	E	2031-12-05T16:58:54.675		9.27	2.68x	51294.67	15.08		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-05T16:41:15.070
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 3404399096963109632
 2Mass ID (if available) : 05392157+2330139
 ICRS Star Coord at Epoch: 05h 39m 21.57494s +23:30:13.43642s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.614
 G magnitude : 17.556
 RP magnitude : 16.420
 BP magnitude : 18.934
 DUPflag : 0
 Distance (au) : 18.125
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -22.74
 Sun-Target sep (deg) : 167.62
 Sun-Moon sep (deg) : 62.71
 B (ring opening deg) : 79.06
 PA of pole (deg) : 41.78
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.081
 C/A sky separation (km) : 40497.4
 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



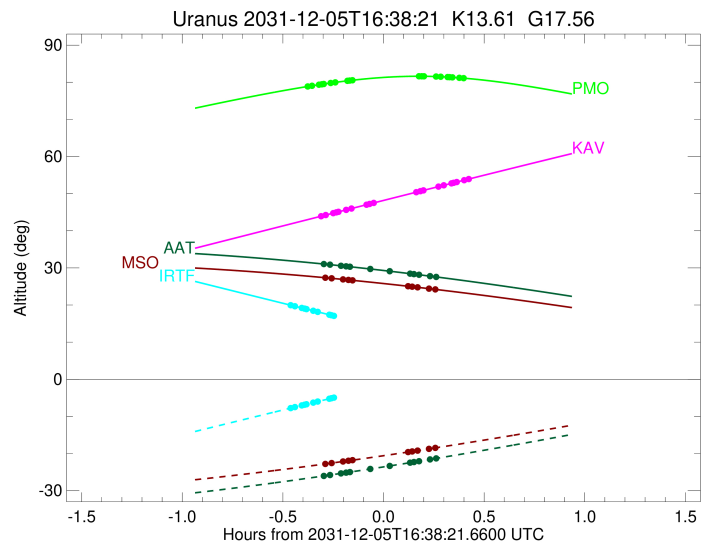
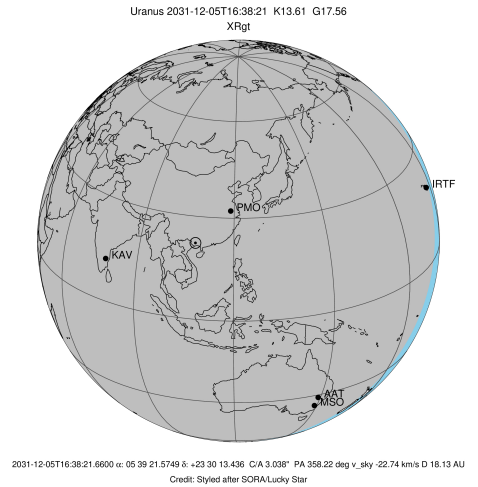
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-05T16:19:18.439		43.82	-56.20	51548.61	-14.17		
lambda	I	2031-12-05T16:21:09.010		44.24	-56.62	50026.71	-13.38		
delta	I	2031-12-05T16:23:23.077		44.75	-57.12	48300.35	-12.36		
gamma	I	2031-12-05T16:24:18.852		44.97	-57.33	47623.71	-11.90		
eta	I	2031-12-05T16:24:56.975		45.11	-57.47	47176.12	-11.58		
beta	I	2031-12-05T16:27:13.528		45.63	-57.99	45677.75	-10.34		
alpha	I	2031-12-05T16:28:46.887		45.99	-58.34	44752.21	-9.43		
4	I	2031-12-05T16:33:24.918		47.04	-59.38	42543.19	-6.37		
5	I	2031-12-05T16:34:29.151		47.29	-59.62	42160.93	-5.64		
6	I	2031-12-05T16:35:26.844		47.51	-59.84	41847.63	-4.94		

No planet occultations

6	E	2031-12-05T16:48:10.500		50.40	-62.67	41863.82	4.95		
5	E	2031-12-05T16:49:09.859		50.63	-62.89	42184.16	5.65		
4	E	2031-12-05T16:50:06.839		50.85	-63.10	42528.64	6.38		
alpha	E	2031-12-05T16:54:46.023		51.90	-64.12	44743.93	9.45		
beta	E	2031-12-05T16:56:18.719		52.25	-64.46	45662.15	10.36		
eta	E	2031-12-05T16:58:36.549		52.77	-64.97	47176.12	11.60		
gamma	E	2031-12-05T16:59:14.361		52.91	-65.10	47620.96	11.93		
delta	E	2031-12-05T17:00:10.244		53.12	-65.31	48300.35	12.39		
lambda	E	2031-12-05T17:02:23.992		53.62	-65.79	50026.71	13.41		
epsilon	E	2031-12-05T17:03:58.240		53.98	-66.13	51322.18	14.20		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-05T16:36:43.400
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      : 3404399096963109632
2Mass ID (if available) : 05392157+2330139
ICRS Star Coord at Epoch: 05h 39m 21.57494s +23:30:13.43642s
RUWE (>1.4 is poor) : 0.95
K magnitude          : 13.614
G magnitude          : 17.556
RP magnitude         : 16.420
BP magnitude         : 18.934
DUPflag             : 0
Distance (au)       : 18.125
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -22.74
Sun-Target sep (deg) : 167.62
Sun-Moon sep (deg)  : 62.04
B (ring opening deg) : 79.06
PA of pole (deg)    : 41.78
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.427
C/A sky separation (km) : 45050.7
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



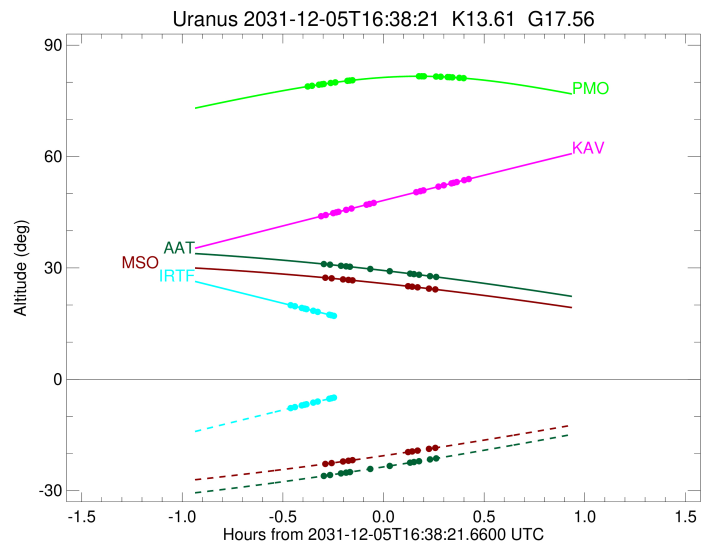
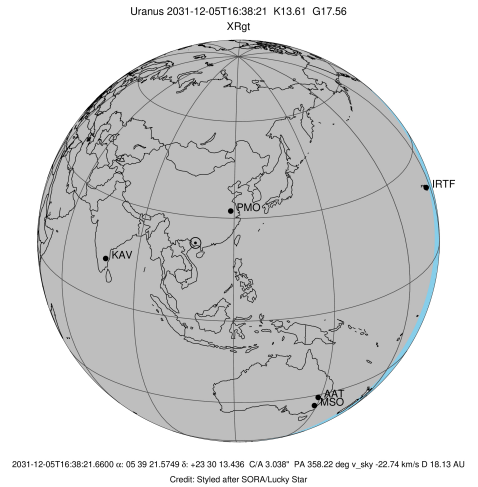
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-05T16:19:58.341		31.10	-26.12	51555.29	-10.96		
lambda	I	2031-12-05T16:22:26.252		30.87	-25.79	50026.71	-9.69		
delta	I	2031-12-05T16:25:43.044		30.57	-25.36	48300.35	-7.82		
gamma	I	2031-12-05T16:27:15.161		30.42	-25.15	47622.66	-6.88		
eta	I	2031-12-05T16:28:23.601		30.31	-25.00	47176.12	-6.16		
beta	I	2031-12-05T16:34:27.247		29.71	-24.16	45672.34	-2.03		

No planet occultations

beta	E	2031-12-05T16:40:09.666		29.12	-23.35	45669.26	2.03		
eta	E	2031-12-05T16:46:14.984		28.46	-22.47	47176.12	6.16		
gamma	E	2031-12-05T16:47:23.233		28.33	-22.31	47621.09	6.88		
delta	E	2031-12-05T16:48:55.636		28.16	-22.08	48300.35	7.82		
lambda	E	2031-12-05T16:52:12.577		27.78	-21.60	50026.71	9.68		
epsilon	E	2031-12-05T16:54:24.309		27.53	-21.27	51377.72	10.95		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-05T16:36:48.570
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      : 3404399096963109632
2Mass ID (if available) : 05392157+2330139
ICRS Star Coord at Epoch: 05h 39m 21.57494s +23:30:13.43642s
RUWE (>1.4 is poor) : 0.95
K magnitude         : 13.614
G magnitude         : 17.556
RP magnitude        : 16.420
BP magnitude        : 18.934
DUPflag            : 0
Distance (au)       : 18.125
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -22.74
Sun-Target sep (deg) : 167.62
Sun-Moon sep (deg)  : 62.00
B (ring opening deg) : 79.06
PA of pole (deg)    : 41.78
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.446
C/A sky separation (km) : 45303.9
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.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	2031-12-05T16:20:23.893		27.40	-22.88	51555.30	-10.73		
lambda	I	2031-12-05T16:22:55.457		27.19	-22.57	50026.71	-9.42		
delta	I	2031-12-05T16:26:19.581		26.90	-22.15	48300.35	-7.46		
gamma	I	2031-12-05T16:27:56.884		26.75	-21.94	47622.58	-6.46		
eta	I	2031-12-05T16:29:10.425		26.65	-21.79	47176.12	-5.68		

No planet occultations

eta	E	2031-12-05T16:45:38.936		25.07	-19.61	47176.12	5.68		
gamma	E	2031-12-05T16:46:52.284		24.94	-19.45	47621.11	6.46		
delta	E	2031-12-05T16:48:29.870		24.77	-19.22	48300.35	7.46		
lambda	E	2031-12-05T16:51:54.136		24.41	-18.75	50026.71	9.41		
epsilon	E	2031-12-05T16:54:09.506		24.17	-18.44	51381.35	10.72		