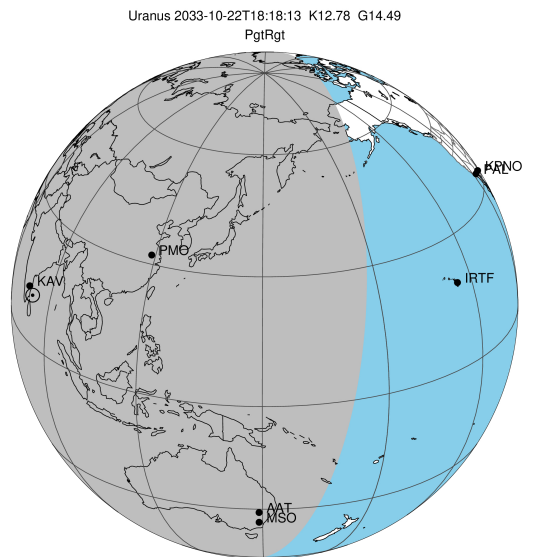


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-10-22T18:18:13.140
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3377402135133245824
 2Mass ID (if available) : 06241961+2334349

ICRS Star Coord at Epoch: 06h 24m 19.61167s +23:34:34.91326s

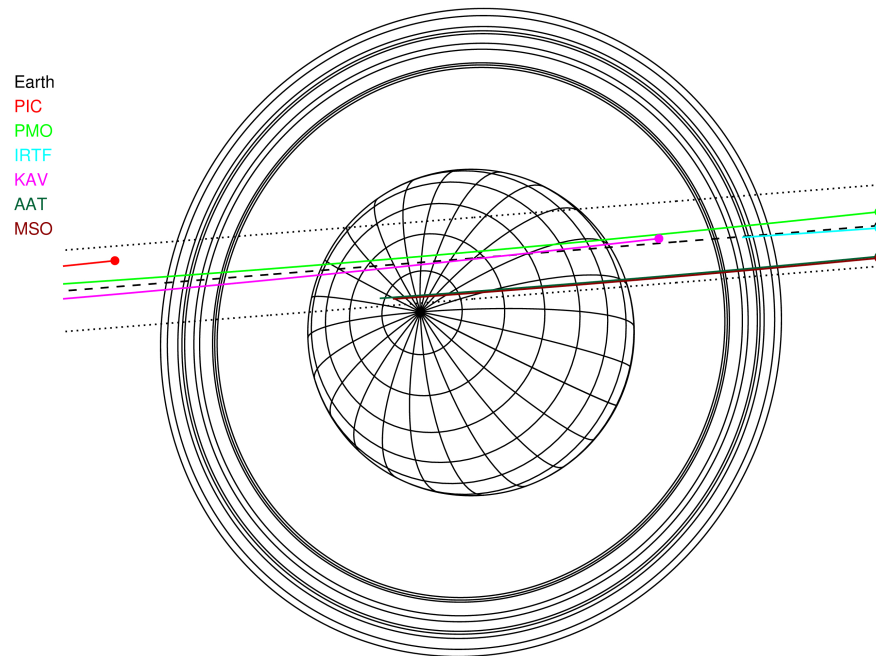
RUWE (>1.4 is poor) : 0.96
 K magnitude : 12.781
 G magnitude : 14.491
 RP magnitude : 13.909
 BP magnitude : 14.891
 DUPflag : 0
 Distance (au) : 18.544
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.55
 Sun-Target sep (deg) : 113.62
 Sun-Moon sep (deg) : 107.68
 B (ring opening deg) : 70.43
 PA of pole (deg) : 67.98

#	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



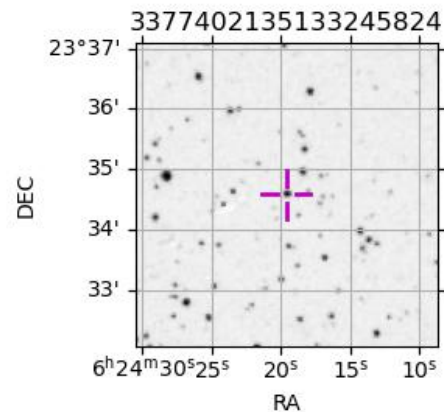
2033-10-22T18:18:13.1400 α: 06 24 19.6117 δ: +23 34 34.913 C/A 0.874° PA 184.58 deg v_sky - 5.55 km/s D 18.54 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2033-10-22T18:18:13 K12.78 G14.49 PgtRgt

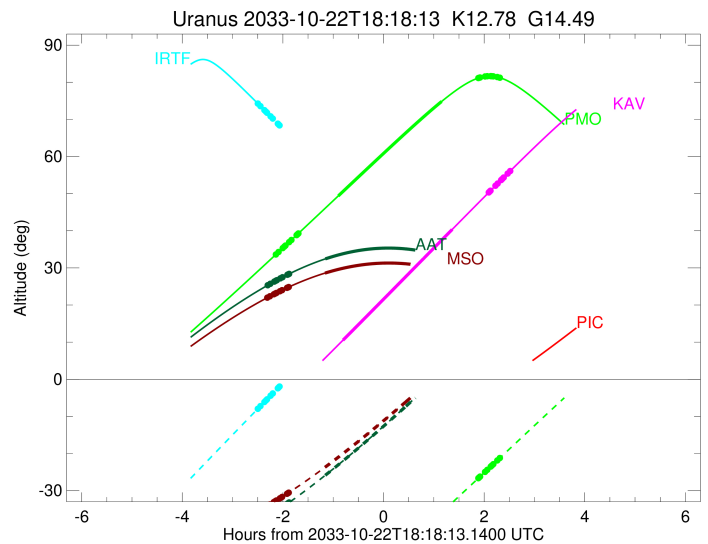
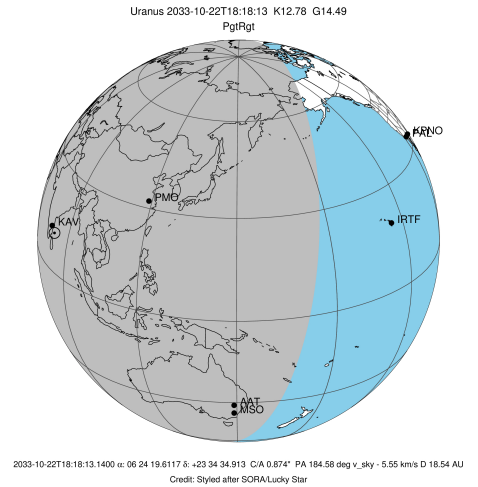


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++	+ +	+++++	OCT 22 16:10 - OCT 22 20:38	PieRie
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	+++++			OCT 22 15:49 - OCT 22 15:59	PnnRin
KAV	Kavalur Observatory	12.6	78.8		+ +	+++++	OCT 22 17:29 - OCT 22 20:50	PieRne
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	+++++	+		OCT 22 16:01 - OCT 22 17:08	PinRin
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+		OCT 22 16:00 - OCT 22 17:08	PinRin



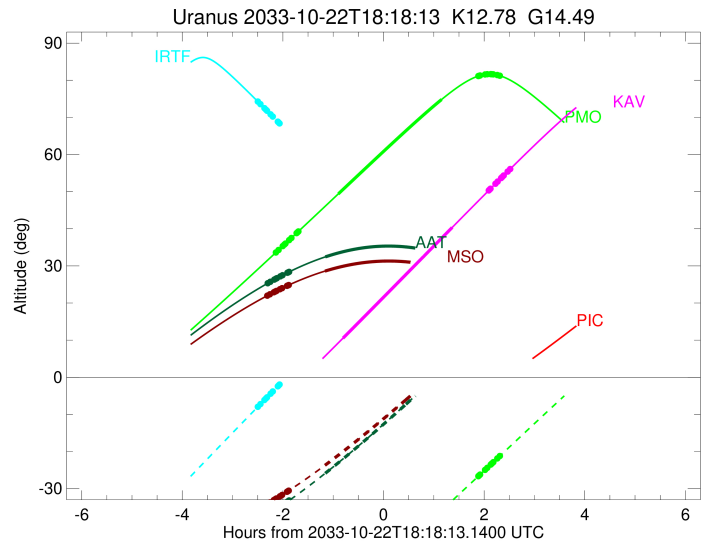
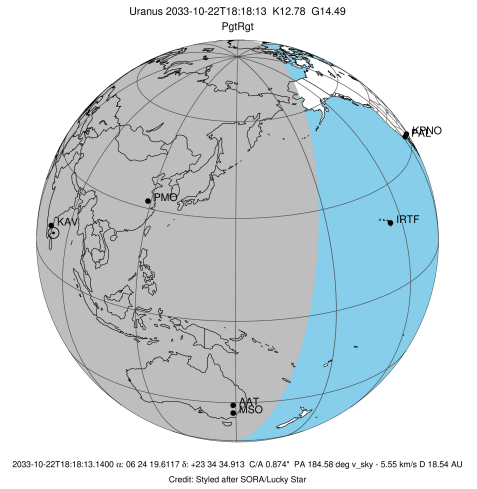
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-10-22T18:26:48.710
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3377402135133245824
 2Mass ID (if available) : 06241961+2334349
 ICRS Star Coord at Epoch: 06h 24m 19.61167s +23:34:34.91326s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 12.781
 G magnitude : 14.491
 RP magnitude : 13.909
 BP magnitude : 14.891
 DUPflag : 0
 Distance (au) : 18.544
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.55
 Sun-Target sep (deg) : 113.62
 Sun-Moon sep (deg) : 108.30
 B (ring opening deg) : 70.43
 PA of pole (deg) : 67.98
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.933
 C/A sky separation (km) : 12549.1
 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	2033-10-22T16:10:45.108		33.80	-68.83	50850.72	-5.80		
lambda	I	2033-10-22T16:13:07.358		34.30	-68.70	50026.71	-5.79		
delta	I	2033-10-22T16:18:05.564		35.35	-68.37	48300.35	-5.79		
gamma	I	2033-10-22T16:20:02.971		35.76	-68.23	47621.14	-5.78		
eta	I	2033-10-22T16:21:19.926		36.03	-68.13	47176.12	-5.78		
beta	I	2033-10-22T16:25:42.127		36.95	-67.77	45660.22	-5.77		
alpha	I	2033-10-22T16:28:20.811		37.51	-67.53	44747.88	-5.77		
4	I	2033-10-22T16:34:29.608		38.81	-66.92	42613.97	-5.75		
5	I	2033-10-22T16:35:48.494		39.09	-66.79	42171.64	-5.75		
6	I	2033-10-22T16:36:45.513		39.29	-66.68	41847.49	-5.75		
Uranus	I	2033-10-22T17:24:12.216		49.37	-59.96	25400.53		-10.55	-11.03
Uranus	E	2033-10-22T19:27:31.496		74.83	-35.89	25041.02		19.54	20.39
6	E	2033-10-22T20:11:10.161		81.13	-26.69	41804.45	5.99		
5	E	2033-10-22T20:12:35.750		81.24	-26.39	42315.21	6.00		
4	E	2033-10-22T20:13:17.440		81.28	-26.24	42545.39	6.01		
alpha	E	2033-10-22T20:19:11.311		81.57	-24.99	44684.70	6.04		
beta	E	2033-10-22T20:21:51.645		81.63	-24.42	45650.86	6.05		
eta	E	2033-10-22T20:26:03.443		81.65	-23.53	47176.12	6.06		
gamma	E	2033-10-22T20:27:18.476		81.64	-23.27	47631.35	6.07		
delta	E	2033-10-22T20:29:08.637		81.60	-22.88	48300.35	6.08		
lambda	E	2033-10-22T20:33:52.350		81.42	-21.87	50026.71	6.09		
epsilon	E	2033-10-22T20:38:01.187		81.16	-20.99	51544.56	6.11		

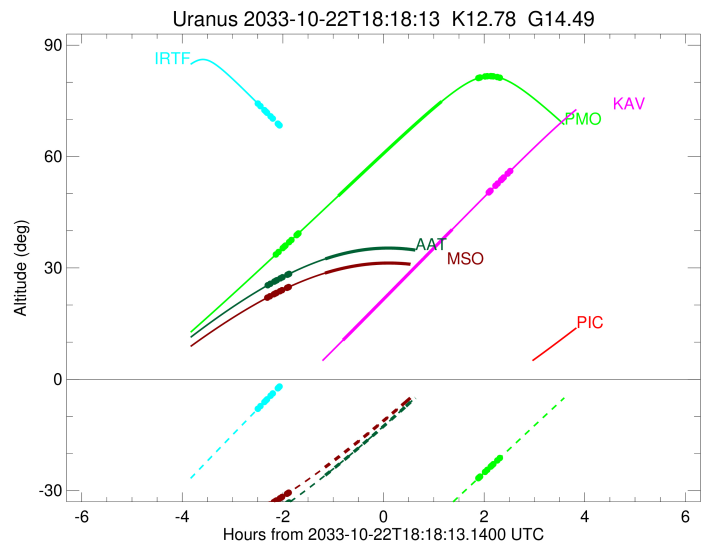
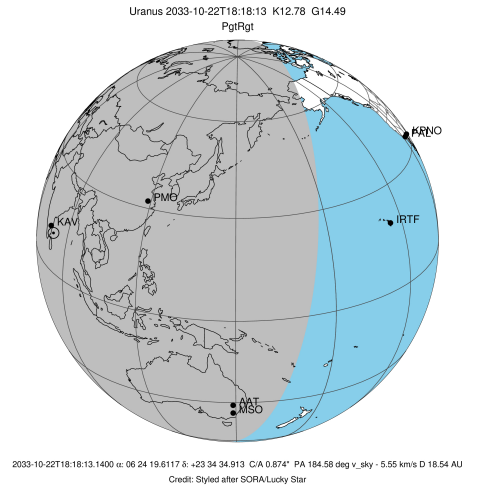
```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2033-10-22T18:03:30.000
Event type            : PgtRgt
: Uranus occs: geocentric, topocentric
: 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        : 3377402135133245824
2Mass ID (if available) : 06241961+2334349
ICRS Star Coord at Epoch: 06h 24m 19.61167s +23:34:34.91326s
RUWE (>1.4 is poor)  : 0.96
K magnitude           : 12.781
G magnitude           : 14.491
RP magnitude          : 13.909
BP magnitude          : 14.891
DUPflag              : 0
Distance (au)         : 18.544
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -5.55
Sun-Target sep (deg)  : 113.62
Sun-Moon sep (deg)    : 108.44
B (ring opening deg)  : 70.43
PA of pole (deg)      : 67.98
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.922
C/A sky separation (km) : 12397.0
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```



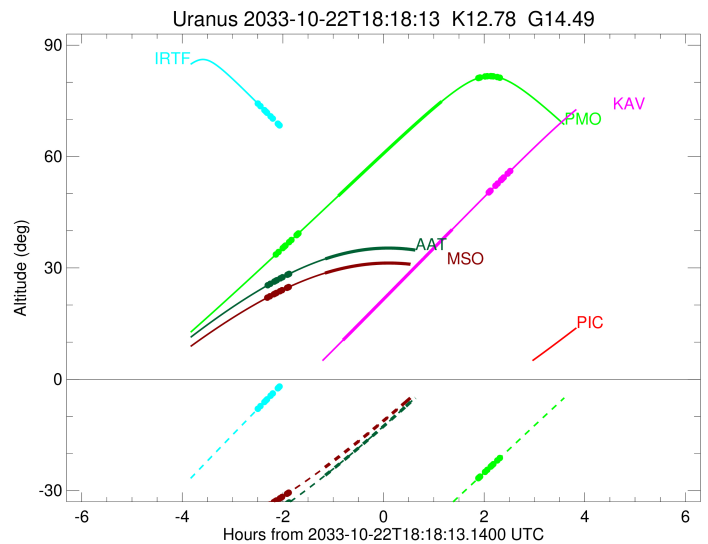
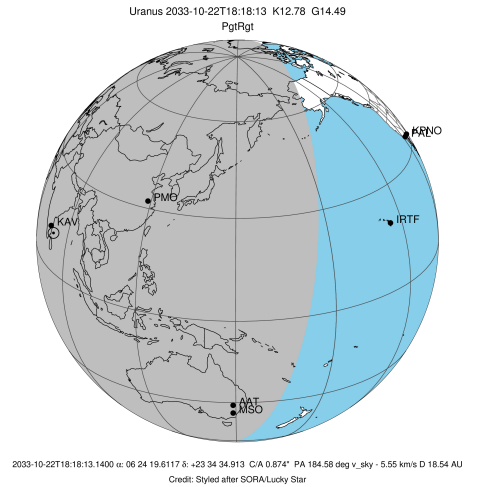
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-10-22T15:49:13.308		74.08	-7.75	50840.41	-6.04		
lambda	I	2033-10-22T15:51:28.265		73.57	-7.22	50026.71	-6.03		
delta	I	2033-10-22T15:56:15.140		72.48	-6.12	48300.35	-6.01		
gamma	I	2033-10-22T15:58:08.234		72.06	-5.68	47621.09	-6.00		
eta	I	2033-10-22T15:59:22.391		71.78	-5.39	47176.12	-6.00		
beta	I	2033-10-22T16:03:35.215		70.82	-4.42x	45661.00	-5.98		
alpha	I	2033-10-22T16:06:08.525		70.23	-3.83x	44748.52	-5.97		
4	I	2033-10-22T16:12:05.494		68.88	-2.45x	42613.35	-5.94		
5	I	2033-10-22T16:13:22.260		68.58	-2.16x	42169.78	-5.94		
6	I	2033-10-22T16:14:16.946		68.38	-1.95x	41849.09	-5.93		
Uranus	I	2033-10-22T17:00:31.495		57.77	8.64x	25379.61		-11.24	-11.75
Uranus	E	2033-10-22T19:06:10.572		29.05	35.87x	25042.87		19.50	20.35
6	E	2033-10-22T19:51:47.556		18.80	44.60x	41803.77	5.68		
5	E	2033-10-22T19:53:17.934		18.47	44.87x	42315.25	5.69		
4	E	2033-10-22T19:54:02.107		18.30	45.00x	42546.36	5.69		
alpha	E	2033-10-22T20:00:15.856		16.92	46.09x	44684.77	5.71		
beta	E	2033-10-22T20:03:05.414		16.29	46.58x	45650.41	5.71		
eta	E	2033-10-22T20:07:32.300		15.30	47.34x	47176.12	5.72		
gamma	E	2033-10-22T20:08:51.877		15.01	47.56x	47631.30	5.72		
delta	E	2033-10-22T20:10:48.792		14.57	47.88x	48300.35	5.72		
lambda	E	2033-10-22T20:15:50.241		13.46	48.71x	50026.71	5.73		
epsilon	E	2033-10-22T20:20:15.451		12.49	49.41x	51546.84	5.74		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-10-22T18:36:20.650
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3377402135133245824
 2Mass ID (if available) : 06241961+2334349
 ICRS Star Coord at Epoch: 06h 24m 19.61167s +23:34:34.91326s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 12.781
 G magnitude : 14.491
 RP magnitude : 13.909
 BP magnitude : 14.891
 DUPflag : 0
 Distance (au) : 18.544
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.55
 Sun-Target sep (deg) : 113.62
 Sun-Moon sep (deg) : 107.74
 B (ring opening deg) : 70.43
 PA of pole (deg) : 67.98
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.847
 C/A sky separation (km) : 11393.2
 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



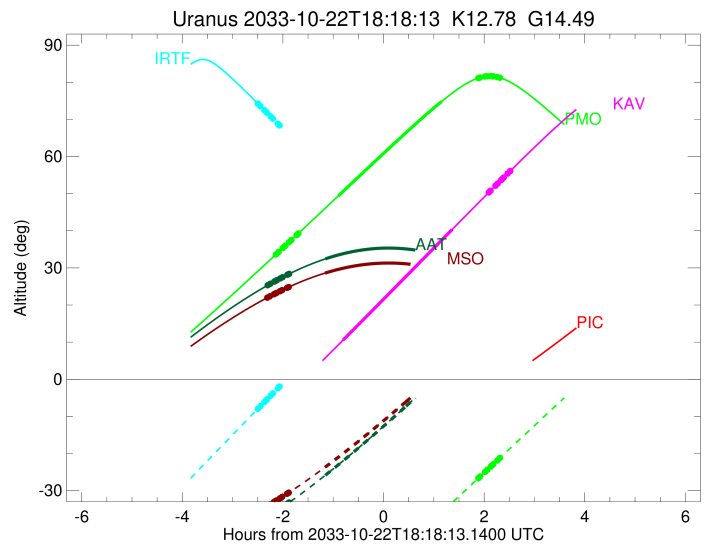
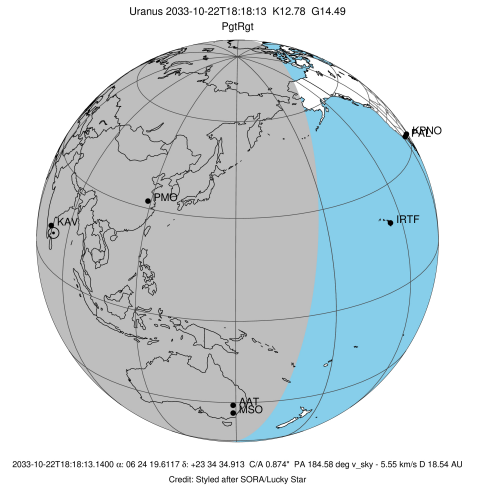
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-10-22T16:14:05.752		-6.44x	-56.99	50848.40	-5.55		
lambda	I	2033-10-22T16:16:33.962		-5.90x	-57.59	50026.71	-5.54		
delta	I	2033-10-22T16:21:45.304		-4.75x	-58.86	48300.35	-5.55		
gamma	I	2033-10-22T16:23:47.793		-4.30x	-59.36	47621.12	-5.55		
eta	I	2033-10-22T16:25:08.046		-4.01x	-59.68	47176.12	-5.54		
beta	I	2033-10-22T16:29:41.270		-3.00x	-60.79	45660.44	-5.54		
alpha	I	2033-10-22T16:32:26.516		-2.38x	-61.47	44748.08	-5.54		
4	I	2033-10-22T16:38:50.164		-0.96x	-63.03	42613.78	-5.54		
5	I	2033-10-22T16:40:12.259		-0.66x	-63.36	42171.00	-5.54		
6	I	2033-10-22T16:41:11.273		-0.44x	-63.60	41848.04	-5.53		
Uranus	I	2033-10-22T17:29:52.353		10.53	-75.48	25383.94		-11.10	-11.61
Uranus	E	2033-10-22T19:40:07.540		40.36	-72.58	25039.56		19.57	20.42
6	E	2033-10-22T20:23:35.830		50.29	-61.97	41805.75	6.01		
5	E	2033-10-22T20:25:01.025		50.61	-61.62	42315.02	6.02		
4	E	2033-10-22T20:25:42.338		50.77	-61.46	42543.71	6.02		
alpha	E	2033-10-22T20:31:35.599		52.10	-60.02	44684.63	6.05		
beta	E	2033-10-22T20:34:15.688		52.70	-59.37	45651.63	6.06		
eta	E	2033-10-22T20:38:26.626		53.65	-58.35	47176.12	6.08		
gamma	E	2033-10-22T20:39:41.437		53.93	-58.04	47631.41	6.09		
delta	E	2033-10-22T20:41:31.230		54.34	-57.60	48300.35	6.10		
lambda	E	2033-10-22T20:46:13.930		55.40	-56.45	50026.71	6.12		
epsilon	E	2033-10-22T20:50:21.082		56.32	-55.44	51540.40	6.14		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-10-22T18:17:18.670
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3377402135133245824
 2Mass ID (if available) : 06241961+2334349
 ICRS Star Coord at Epoch: 06h 24m 19.61167s +23:34:34.91326s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 12.781
 G magnitude : 14.491
 RP magnitude : 13.909
 BP magnitude : 14.891
 DUPflag : 0
 Distance (au) : 18.544
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.55
 Sun-Target sep (deg) : 113.62
 Sun-Moon sep (deg) : 108.17
 B (ring opening deg) : 70.43
 PA of pole (deg) : 67.98
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.474
 C/A sky separation (km) : 6376.2
 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	2033-10-22T16:01:05.652		25.45	-36.93	50816.21	-6.08		
lambda	I	2033-10-22T16:03:15.524		25.73	-36.61	50026.71	-6.08		
delta	I	2033-10-22T16:07:59.418		26.32	-35.92	48300.35	-6.08		
gamma	I	2033-10-22T16:09:51.106		26.54	-35.64	47620.99	-6.08		
eta	I	2033-10-22T16:11:04.236		26.69	-35.46	47176.12	-6.08		
beta	I	2033-10-22T16:15:12.760		27.19	-34.83	45663.27	-6.08		
alpha	I	2033-10-22T16:17:43.411		27.48	-34.44	44750.15	-6.09		
4	I	2033-10-22T16:23:33.323		28.15	-33.53	42610.97	-6.09		
5	I	2033-10-22T16:24:49.091		28.29	-33.33	42164.48	-6.09		
6	I	2033-10-22T16:25:40.706		28.39	-33.19	41854.14	-6.09		
Uranus	I	2033-10-22T17:08:44.165		32.42	-25.87	25260.76		-14.60	-15.26
Uranus	E	2033-10-22T19:25:02.845		33.41	1.00x	25059.00		19.17	20.01
6	E	2033-10-22T20:06:26.217		30.07	9.73x	41808.59	6.17		
5	E	2033-10-22T20:07:48.663		29.93	10.02x	42314.09	6.17		
4	E	2033-10-22T20:08:28.460		29.87	10.16x	42540.50	6.17		
alpha	E	2033-10-22T20:14:14.261		29.28	11.39x	44684.67	6.18		
beta	E	2033-10-22T20:16:51.566		29.00	11.95x	45653.14	6.18		
eta	E	2033-10-22T20:20:58.028		28.56	12.82x	47176.12	6.18		
gamma	E	2033-10-22T20:22:11.735		28.42	13.08x	47631.50	6.18		
delta	E	2033-10-22T20:23:59.984		28.22	13.47x	48300.35	6.18		
lambda	E	2033-10-22T20:28:39.344		27.69	14.46x	50026.71	6.18		
epsilon	E	2033-10-22T20:32:42.850		27.22	15.33x	51531.71	6.18		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-10-22T18:17:15.310
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 3377402135133245824
 2Mass ID (if available) : 06241961+2334349
 ICRS Star Coord at Epoch: 06h 24m 19.61167s +23:34:34.91326s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 12.781
 G magnitude : 14.491
 RP magnitude : 13.909
 BP magnitude : 14.891
 DUPflag : 0
 Distance (au) : 18.544
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -5.55
 Sun-Target sep (deg) : 113.62
 Sun-Moon sep (deg) : 108.12
 B (ring opening deg) : 70.43
 PA of pole (deg) : 67.98
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.456
 C/A sky separation (km) : 6132.4
 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_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	2033-10-22T16:00:34.781		22.10	-34.00	50815.07	-6.07		
lambda	I	2033-10-22T16:02:44.743		22.36	-33.71	50026.71	-6.07		
delta	I	2033-10-22T16:07:29.242		22.91	-33.07	48300.35	-6.07		
gamma	I	2033-10-22T16:09:21.167		23.12	-32.81	47620.99	-6.07		
eta	I	2033-10-22T16:10:34.451		23.26	-32.64	47176.12	-6.07		
beta	I	2033-10-22T16:14:43.476		23.72	-32.06	45663.38	-6.07		
alpha	I	2033-10-22T16:17:14.445		24.00	-31.70	44750.22	-6.07		
4	I	2033-10-22T16:23:05.097		24.62	-30.86	42610.84	-6.07		
5	I	2033-10-22T16:24:21.049		24.75	-30.67	42164.25	-6.08		
6	I	2033-10-22T16:25:12.692		24.84	-30.55	41854.37	-6.07		
Uranus	I	2033-10-22T17:08:18.399		28.59	-23.73	25255.73		-14.73	-15.40
Uranus	E	2033-10-22T19:25:22.803		29.54	1.91x	25061.09		19.13	19.97
6	E	2033-10-22T20:06:50.396		26.45	10.27x	41808.79	6.16		
5	E	2033-10-22T20:08:12.954		26.33	10.55x	42314.00	6.16		
4	E	2033-10-22T20:08:52.796		26.27	10.68x	42540.29	6.16		
alpha	E	2033-10-22T20:14:39.294		25.72	11.85x	44684.69	6.16		
beta	E	2033-10-22T20:17:16.926		25.46	12.39x	45653.25	6.16		
eta	E	2033-10-22T20:21:23.857		25.05	13.23x	47176.12	6.17		
gamma	E	2033-10-22T20:22:37.711		24.93	13.48x	47631.50	6.17		
delta	E	2033-10-22T20:24:26.176		24.74	13.85x	48300.35	6.17		
lambda	E	2033-10-22T20:29:06.098		24.25	14.80x	50026.71	6.17		
epsilon	E	2033-10-22T20:33:09.979		23.81	15.63x	51530.98	6.17		