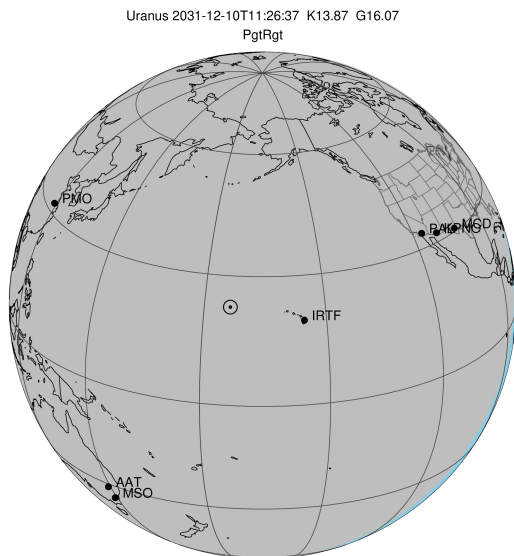


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-10T11:26:37.210
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3404401983181157120
 2Mass ID (if available) : 05382902+2329542

ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s

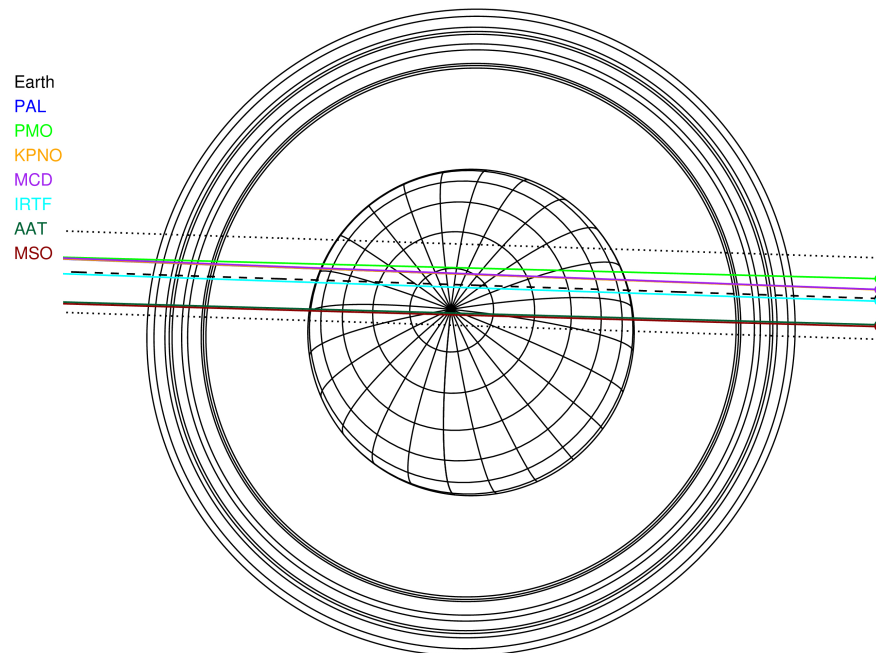
RUWE (>1.4 is poor) : 0.93
 K magnitude : 13.868
 G magnitude : 16.065
 RP magnitude : 15.367
 BP magnitude : 16.626
 DUPflag : 0
 Distance (au) : 18.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.20
 Sun-Target sep (deg) : 172.68
 Sun-Moon sep (deg) : 121.54
 B (ring opening deg) : 79.20
 PA of pole (deg) : 40.93

#	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



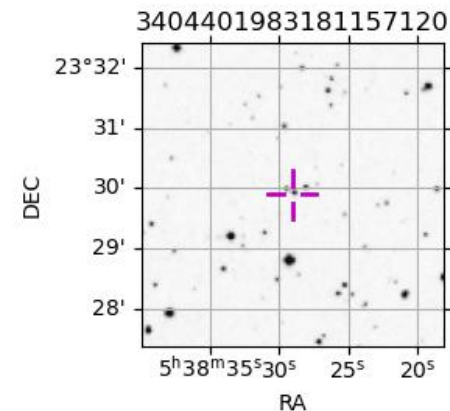
2031-12-10T11:26:37.2100 ra: 05 38 29.0215 s: +23 29 53.902 C/A 0.5711 PA 178.11 deg v_sky -23.20 km/s D 18.11 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2031-12-10T11:26:37 K13.87 G16.07 PgtRgt

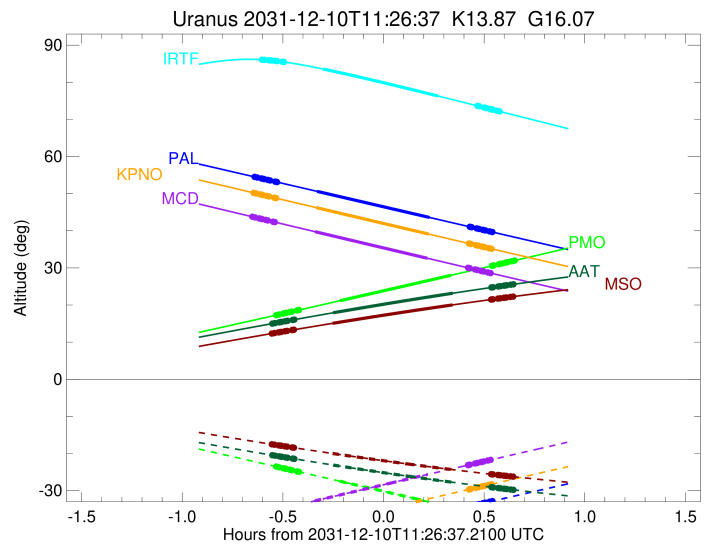
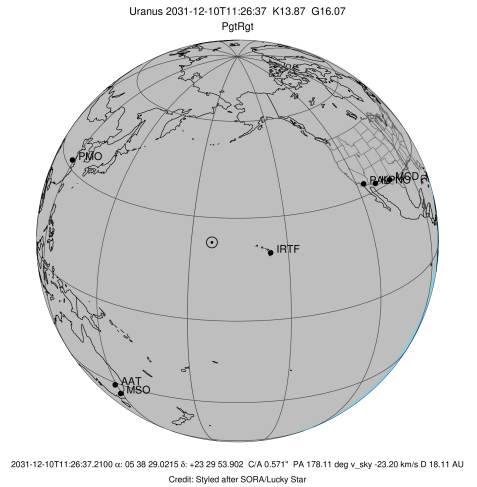


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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	+++++	+ +	+++++	DEC 10 10:48 - DEC 10 11:58	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	DEC 10 10:54 - DEC 10 12:05	PieRie
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	DEC 10 10:47 - DEC 10 11:58	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 10 10:47 - DEC 10 11:58	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	DEC 10 10:50 - DEC 10 12:01	PieRie
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	+++++	+ +	+++++	DEC 10 10:53 - DEC 10 12:05	PieRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	DEC 10 10:53 - DEC 10 12:05	PieRie

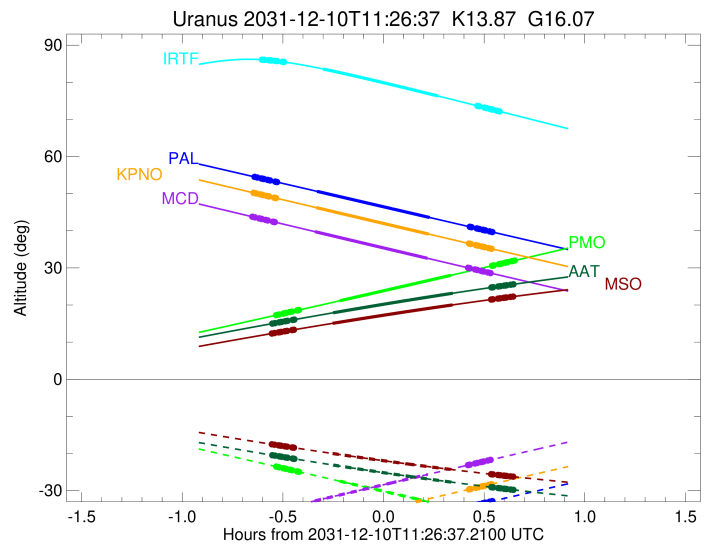
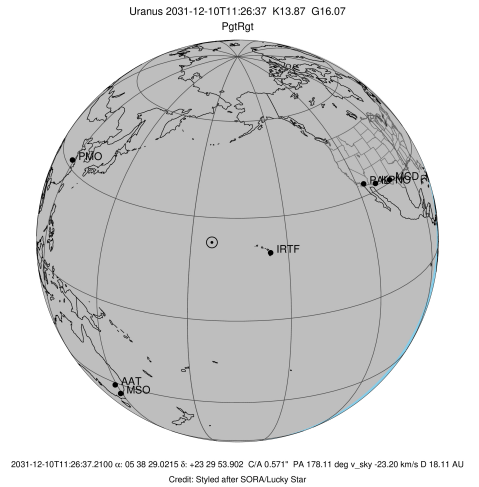


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-10T11:23:42.510
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3404401983181157120
 2Mass ID (if available) : 05382902+2329542
 ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
 RUWE (>1.4 is poor) : 0.93
 K magnitude : 13.868
 G magnitude : 16.065
 RP magnitude : 15.367
 BP magnitude : 16.626
 DUPflag : 0
 Distance (au) : 18.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.20
 Sun-Target sep (deg) : 172.68
 Sun-Moon sep (deg) : 122.45
 B (ring opening deg) : 79.20
 PA of pole (deg) : 40.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.691
 C/A sky separation (km) : 9071.1
 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_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	2031-12-10T10:48:04.910		54.54	-47.63	51311.67	-23.29		
lambda	I	2031-12-10T10:49:00.033		54.35	-47.44	50026.71	-23.30		
delta	I	2031-12-10T10:50:14.176		54.09	-47.18	48300.35	-23.27		
gamma	I	2031-12-10T10:50:43.030		53.99	-47.08	47629.13	-23.26		
eta	I	2031-12-10T10:51:02.514		53.92	-47.01	47176.12	-23.25		
beta	I	2031-12-10T10:52:06.967		53.70	-46.79	45678.42	-23.21		
alpha	I	2031-12-10T10:52:47.940		53.56	-46.65	44728.21	-23.19		
4	I	2031-12-10T10:54:19.824		53.24	-46.33	42597.40	-23.14		
5	I	2031-12-10T10:54:37.834		53.17	-46.26	42186.31	-23.14		
6	I	2031-12-10T10:54:54.536		53.11	-46.20	41799.54	-23.11		
Uranus	I	2031-12-10T11:06:48.613		50.62	-43.72	25475.91		-4.06	-4.25
Uranus	E	2031-12-10T11:40:20.000		43.59	-36.72	25097.44		9.72	10.17
6	E	2031-12-10T11:52:21.970		41.07	-34.21	41862.83	23.05		
5	E	2031-12-10T11:52:40.997		41.00	-34.15	42306.16	23.07		
4	E	2031-12-10T11:52:52.577		40.96	-34.11	42563.09	23.07		
alpha	E	2031-12-10T11:54:24.820		40.64	-33.79	44696.52	23.12		
beta	E	2031-12-10T11:55:05.665		40.50	-33.65	45641.22	23.14		
eta	E	2031-12-10T11:56:11.927		40.26	-33.42	47176.12	23.17		
gamma	E	2031-12-10T11:56:31.311		40.20	-33.35	47625.32	23.18		
delta	E	2031-12-10T11:57:00.428		40.10	-33.25	48300.35	23.19		
lambda	E	2031-12-10T11:58:14.826		39.84	-32.99	50026.71	23.22		
epsilon	E	2031-12-10T11:58:50.795		39.71	-32.87	50862.04	23.21		

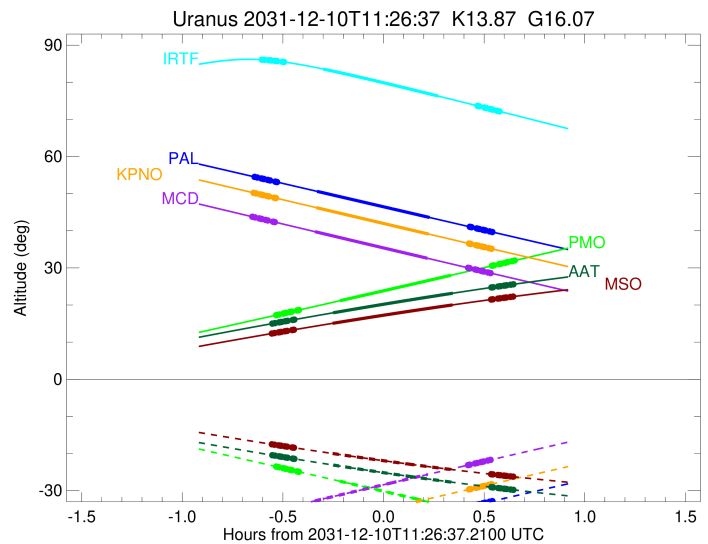
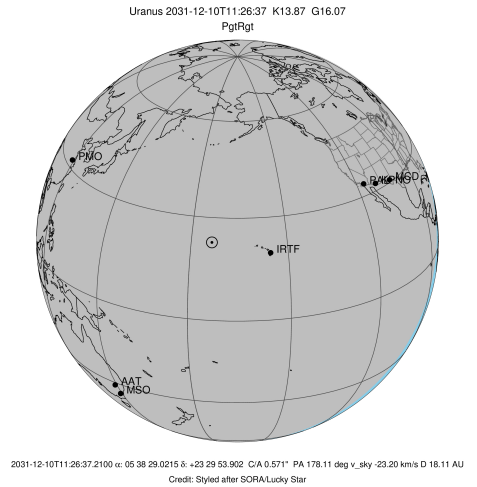
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-10T11:30:21.680
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3404401983181157120
 2Mass ID (if available) : 05382902+2329542
 ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
 RUWE (>1.4 is poor) : 0.93
 K magnitude : 13.868
 G magnitude : 16.065
 RP magnitude : 15.367
 BP magnitude : 16.626
 DUPflag : 0
 Distance (au) : 18.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.20
 Sun-Target sep (deg) : 172.68
 Sun-Moon sep (deg) : 121.46
 B (ring opening deg) : 79.20
 PA of pole (deg) : 40.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.768
 C/A sky separation (km) : 10086.0
 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	2031-12-10T10:54:31.945		17.25	-23.50	51299.93	-22.93		
lambda	I	2031-12-10T10:55:27.423		17.44	-23.69	50026.71	-22.94		
delta	I	2031-12-10T10:56:42.738		17.70	-23.95	48300.35	-22.90		
gamma	I	2031-12-10T10:57:12.046		17.80	-24.06	47629.27	-22.89		
eta	I	2031-12-10T10:57:31.848		17.86	-24.12	47176.12	-22.88		
beta	I	2031-12-10T10:58:37.358		18.09	-24.35	45678.07	-22.84		
alpha	I	2031-12-10T10:59:19.033		18.23	-24.49	44727.09	-22.81		
4	I	2031-12-10T11:00:52.338		18.54	-24.82	42598.70	-22.76		
5	I	2031-12-10T11:01:10.587		18.61	-24.88	42188.62	-22.75		
6	I	2031-12-10T11:01:27.713		18.66	-24.94	41798.86	-22.73		
Uranus	I	2031-12-10T11:13:36.278		21.15	-27.46	25496.47		-3.52	-3.69
Uranus	E	2031-12-10T11:46:46.553		28.02	-34.40	25083.69		9.87	10.33
6	E	2031-12-10T11:58:59.356		30.57	-36.98	41862.35	22.83		
5	E	2031-12-10T11:59:18.601		30.64	-37.05	42306.67	22.85		
4	E	2031-12-10T11:59:30.299		30.68	-37.09	42563.69	22.86		
alpha	E	2031-12-10T12:01:03.330		31.00	-37.41	44696.21	22.92		
beta	E	2031-12-10T12:01:44.532		31.15	-37.56	45641.19	22.95		
eta	E	2031-12-10T12:02:51.329		31.38	-37.79	47176.12	22.99		
gamma	E	2031-12-10T12:03:10.865		31.45	-37.86	47625.37	23.00		
delta	E	2031-12-10T12:03:40.200		31.55	-37.97	48300.35	23.02		
lambda	E	2031-12-10T12:04:55.137		31.81	-38.23	50026.71	23.06		
epsilon	E	2031-12-10T12:05:31.240		31.94	-38.36	50859.43	23.05		

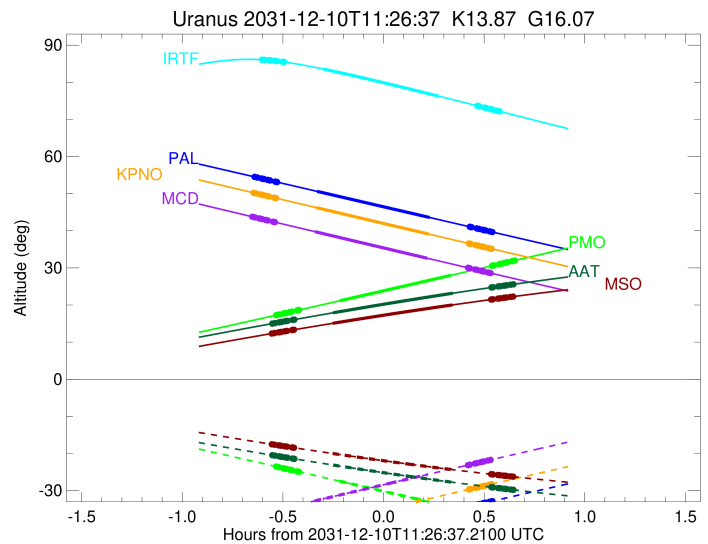
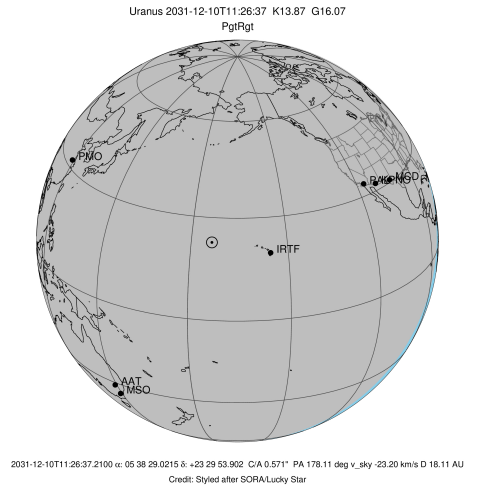
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-10T11:23:26.190
Event type           : PgtRgt
: Ring occs: geocentric, topocentric
Observer code        : KPNO
Location             : Kitt Peak Natl Obs
Latitude (deg)       : 31.96333
E. Longitude (deg)   : 248.40000
Altitude (km)        : 2.120
Gaia source ID       : 3404401983181157120
2Mass ID (if available) : 05382902+2329542
ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
RUWE (>1.4 is poor) : 0.93
K magnitude           : 13.868
G magnitude           : 16.065
RP magnitude          : 15.367
BP magnitude          : 16.626
DUPflag              : 0
Distance (au)         : 18.111
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.20
Sun-Target sep (deg) : 172.68
Sun-Moon sep (deg)   : 122.43
B (ring opening deg) : 79.20
PA of pole (deg)     : 40.93
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.691
C/A sky separation (km) : 9069.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall11.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.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	2031-12-10T10:47:46.667		50.25	-43.24	51311.87	-23.27		
lambda	I	2031-12-10T10:48:41.843		50.05	-43.05	50026.71	-23.28		
delta	I	2031-12-10T10:49:56.044		49.79	-42.79	48300.35	-23.25		
gamma	I	2031-12-10T10:50:24.921		49.68	-42.68	47629.12	-23.24		
eta	I	2031-12-10T10:50:44.420		49.61	-42.61	47176.12	-23.23		
beta	I	2031-12-10T10:51:48.925		49.39	-42.39	45678.43	-23.19		
alpha	I	2031-12-10T10:52:29.931		49.24	-42.24	44728.23	-23.17		
4	I	2031-12-10T10:54:01.890		48.91	-41.92	42597.39	-23.12		
5	I	2031-12-10T10:54:19.916		48.85	-41.85	42186.27	-23.12		
6	I	2031-12-10T10:54:36.630		48.79	-41.79	41799.55	-23.10		
Uranus	I	2031-12-10T11:06:31.315		46.25	-39.27	25475.68		-4.07	-4.26
Uranus	E	2031-12-10T11:40:04.718		39.12	-32.19	25097.25		9.72	10.18
6	E	2031-12-10T11:52:07.475		36.57	-29.67	41862.81	23.02		
5	E	2031-12-10T11:52:26.524		36.50	-29.60	42306.18	23.04		
4	E	2031-12-10T11:52:38.118		36.46	-29.56	42563.11	23.05		
alpha	E	2031-12-10T11:54:10.463		36.13	-29.24	44696.51	23.09		
beta	E	2031-12-10T11:54:51.355		35.99	-29.10	45641.22	23.11		
eta	E	2031-12-10T11:55:57.693		35.76	-28.87	47176.12	23.14		
gamma	E	2031-12-10T11:56:17.099		35.69	-28.80	47625.32	23.15		
delta	E	2031-12-10T11:56:46.249		35.59	-28.70	48300.35	23.16		
lambda	E	2031-12-10T11:58:00.733		35.32	-28.44	50026.71	23.19		
epsilon	E	2031-12-10T11:58:36.737		35.20	-28.31	50861.92	23.18		

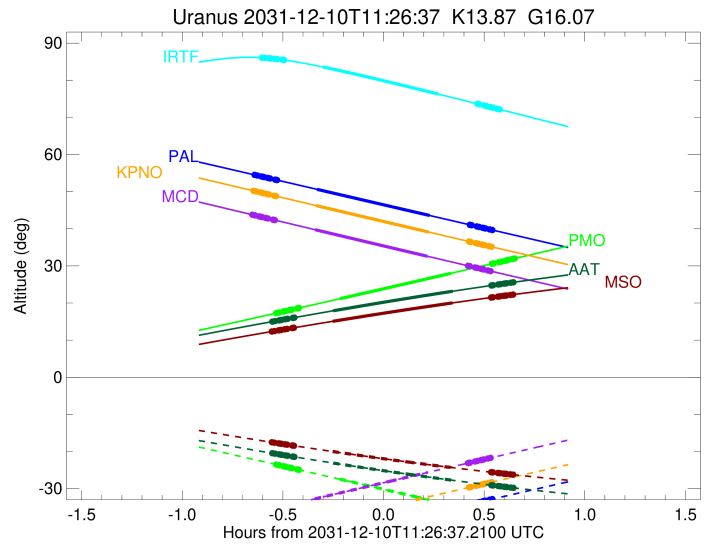
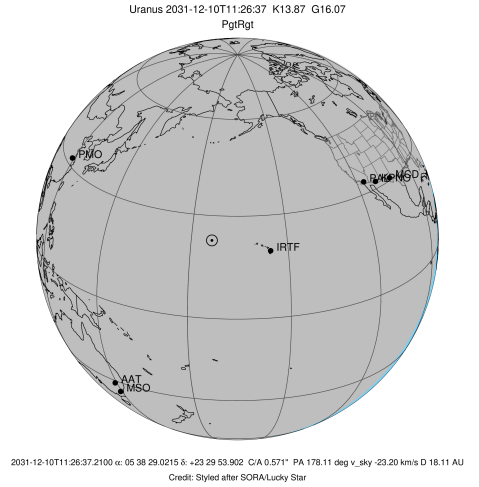
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-10T11:23:06.320
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 3404401983181157120
 2Mass ID (if available) : 05382902+2329542
 ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
 RUWE (>1.4 is poor) : 0.93
 K magnitude : 13.868
 G magnitude : 16.065
 RP magnitude : 15.367
 BP magnitude : 16.626
 DUPflag : 0
 Distance (au) : 18.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.20
 Sun-Target sep (deg) : 172.68
 Sun-Moon sep (deg) : 122.40
 B (ring opening deg) : 79.20
 PA of pole (deg) : 40.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.698
 C/A sky separation (km) : 9166.5
 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	2031-12-10T10:47:24.102		43.80	-36.75	51311.40	-23.23		
lambda	I	2031-12-10T10:48:19.358		43.60	-36.56	50026.71	-23.24		
delta	I	2031-12-10T10:49:33.697		43.34	-36.29	48300.35	-23.21		
gamma	I	2031-12-10T10:50:02.629		43.23	-36.19	47629.13	-23.19		
eta	I	2031-12-10T10:50:22.165		43.16	-36.12	47176.12	-23.18		
beta	I	2031-12-10T10:51:26.794		42.93	-35.89	45678.41	-23.15		
alpha	I	2031-12-10T10:52:07.881		42.78	-35.74	44728.18	-23.12		
4	I	2031-12-10T10:53:40.020		42.45	-35.41	42597.45	-23.08		
5	I	2031-12-10T10:53:58.079		42.39	-35.35	42186.38	-23.07		
6	I	2031-12-10T10:54:14.834		42.33	-35.29	41799.52	-23.05		
Uranus	I	2031-12-10T11:06:11.278		39.76	-32.75	25477.05		-4.03	-4.23
Uranus	E	2031-12-10T11:39:44.924		32.59	-25.65	25095.20		9.75	10.20
6	E	2031-12-10T11:51:49.704		30.02	-23.12	41862.72	22.97		
5	E	2031-12-10T11:52:08.807		29.96	-23.06	42306.29	22.99		
4	E	2031-12-10T11:52:20.430		29.91	-23.01	42563.24	22.99		
alpha	E	2031-12-10T11:53:52.988		29.59	-22.69	44696.44	23.04		
beta	E	2031-12-10T11:54:33.979		29.44	-22.55	45641.21	23.06		
eta	E	2031-12-10T11:55:40.472		29.21	-22.32	47176.12	23.09		
gamma	E	2031-12-10T11:55:59.924		29.14	-22.25	47625.33	23.10		
delta	E	2031-12-10T11:56:29.140		29.04	-22.15	48300.35	23.11		
lambda	E	2031-12-10T11:57:43.796		28.77	-21.89	50026.71	23.14		
epsilon	E	2031-12-10T11:58:19.852		28.65	-21.76	50861.20	23.13		

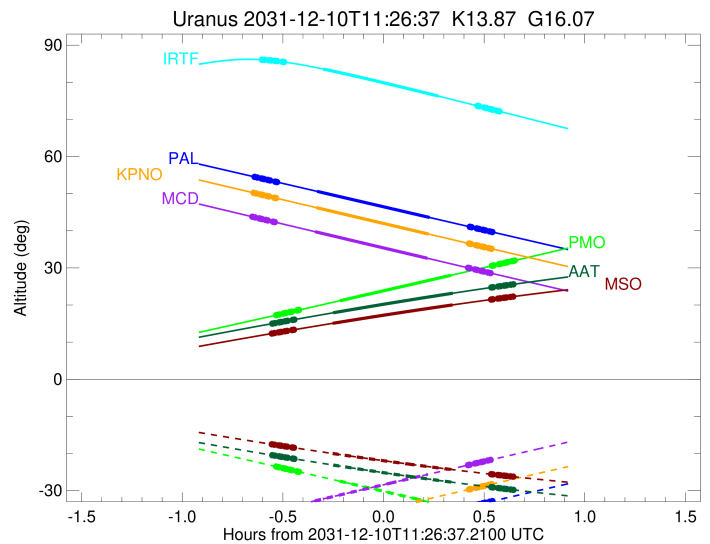
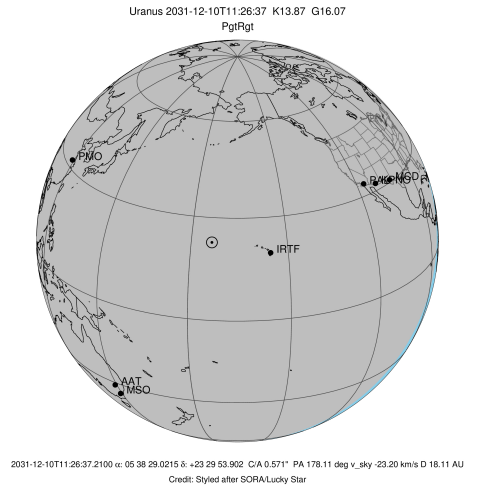
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-10T11:25:53.020
Event type           : PgtRgt
: 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       : 3404401983181157120
2Mass ID (if available) : 05382902+2329542
ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
RUWE (>1.4 is poor) : 0.93
K magnitude           : 13.868
G magnitude           : 16.065
RP magnitude          : 15.367
BP magnitude          : 16.626
DUPflag               : 0
Distance (au)         : 18.111
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.20
Sun-Target sep (deg) : 172.68
Sun-Moon sep (deg)   : 122.42
B (ring opening deg) : 79.20
PA of pole (deg)     : 40.93
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.533
C/A sky separation (km) : 6997.0
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
    
```



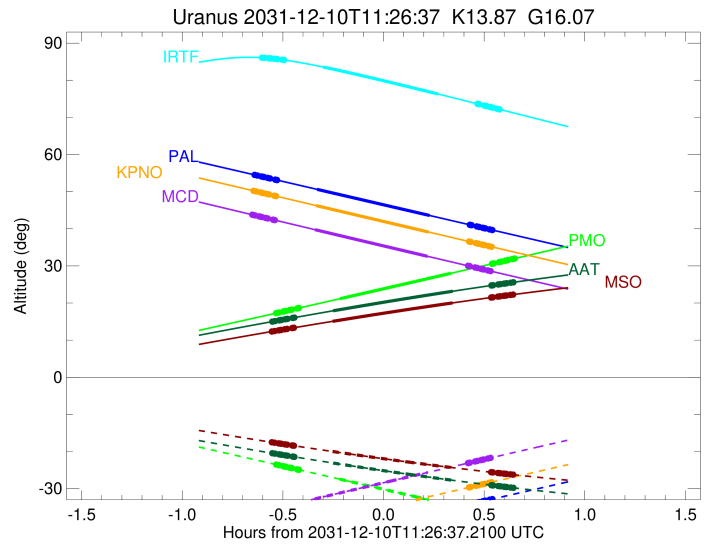
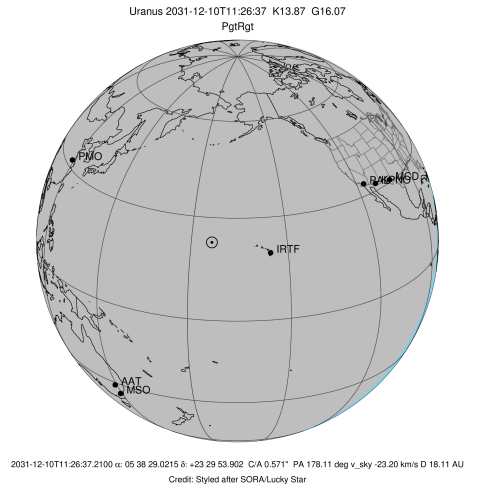
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-10T10:50:15.843		86.09	-81.08	51325.50	-23.58		
lambda	I	2031-12-10T10:51:10.874		86.03	-80.88	50026.71	-23.59		
delta	I	2031-12-10T10:52:24.069		85.94	-80.62	48300.35	-23.58		
gamma	I	2031-12-10T10:52:52.551		85.90	-80.51	47628.94	-23.57		
eta	I	2031-12-10T10:53:11.766		85.88	-80.44	47176.12	-23.56		
beta	I	2031-12-10T10:54:15.313		85.78	-80.21	45678.85	-23.54		
alpha	I	2031-12-10T10:54:55.659		85.71	-80.06	44729.62	-23.53		
4	I	2031-12-10T10:56:26.298		85.53	-79.73	42595.67	-23.50		
5	I	2031-12-10T10:56:44.102		85.50	-79.66	42183.40	-23.50		
6	I	2031-12-10T10:57:00.362		85.46	-79.60	41800.50	-23.49		
Uranus	I	2031-12-10T11:08:38.378		83.57	-77.00	25440.39		-4.86	-5.09
Uranus	E	2031-12-10T11:42:54.620		76.30	-69.19	25139.81		9.25	9.68
6	E	2031-12-10T11:54:38.373		73.66	-66.50	41864.64	23.47		
5	E	2031-12-10T11:54:56.915		73.59	-66.42	42304.05	23.49		
4	E	2031-12-10T11:55:08.258		73.55	-66.38	42560.71	23.49		
alpha	E	2031-12-10T11:56:39.062		73.20	-66.03	44697.87	23.51		
beta	E	2031-12-10T11:57:19.176		73.05	-65.88	45641.37	23.53		
eta	E	2031-12-10T11:58:24.351		72.80	-65.63	47176.12	23.55		
gamma	E	2031-12-10T11:58:43.414		72.73	-65.56	47625.07	23.55		
delta	E	2031-12-10T11:59:12.080		72.62	-65.45	48300.35	23.56		
lambda	E	2031-12-10T12:00:25.326		72.35	-65.17	50026.71	23.58		
epsilon	E	2031-12-10T12:01:01.310		72.21	-65.03	50875.26	23.57		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-10T11:29:28.920
 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 : 3404401983181157120
 2Mass ID (if available) : 05382902+2329542
 ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
 RUWE (>1.4 is poor) : 0.93
 K magnitude : 13.868
 G magnitude : 16.065
 RP magnitude : 15.367
 BP magnitude : 16.626
 DUPflag : 0
 Distance (au) : 18.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.20
 Sun-Target sep (deg) : 172.68
 Sun-Moon sep (deg) : 121.52
 B (ring opening deg) : 79.20
 PA of pole (deg) : 40.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.226
 C/A sky separation (km) : 2962.9
 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	2031-12-10T10:53:20.043		14.98	-20.44	51352.24	-23.57		
lambda	I	2031-12-10T10:54:16.252		15.13	-20.58	50026.71	-23.58		
delta	I	2031-12-10T10:55:29.463		15.33	-20.76	48300.35	-23.58		
gamma	I	2031-12-10T10:55:57.953		15.41	-20.83	47628.57	-23.58		
eta	I	2031-12-10T10:56:17.142		15.46	-20.88	47176.12	-23.58		
beta	I	2031-12-10T10:57:20.595		15.63	-21.04	45679.58	-23.58		
alpha	I	2031-12-10T10:58:00.793		15.74	-21.14	44732.34	-23.57		
4	I	2031-12-10T10:59:31.473		15.98	-21.36	42592.11	-23.57		
5	I	2031-12-10T10:59:49.347		16.03	-21.41	42177.99	-23.57		
6	I	2031-12-10T11:00:05.203		16.08	-21.44	41802.63	-23.57		
Uranus	I	2031-12-10T11:11:35.881		17.91	-23.10	25361.29		-6.30	-6.59
Uranus	E	2031-12-10T11:47:15.269		23.17	-27.75	25229.77		8.17	8.55
6	E	2031-12-10T11:58:48.054		24.73	-29.08	41867.87	23.65		
5	E	2031-12-10T11:59:06.180		24.77	-29.11	42299.48	23.65		
4	E	2031-12-10T11:59:17.409		24.79	-29.13	42556.26	23.65		
alpha	E	2031-12-10T12:00:47.945		24.99	-29.30	44700.59	23.65		
beta	E	2031-12-10T12:01:27.742		25.08	-29.37	45641.81	23.66		
eta	E	2031-12-10T12:02:32.562		25.22	-29.49	47176.12	23.66		
gamma	E	2031-12-10T12:02:51.513		25.26	-29.52	47624.60	23.67		
delta	E	2031-12-10T12:03:20.066		25.32	-29.57	48300.35	23.67		
lambda	E	2031-12-10T12:04:33.000		25.47	-29.70	50026.71	23.67		
epsilon	E	2031-12-10T12:05:09.972		25.55	-29.77	50902.00	23.67		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-12-10T11:29:21.950
 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 : 3404401983181157120
 2Mass ID (if available) : 05382902+2329542
 ICRS Star Coord at Epoch: 05h 38m 29.02148s +23:29:53.90194s
 RUWE (>1.4 is poor) : 0.93
 K magnitude : 13.868
 G magnitude : 16.065
 RP magnitude : 15.367
 BP magnitude : 16.626
 DUPflag : 0
 Distance (au) : 18.111
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.20
 Sun-Target sep (deg) : 172.68
 Sun-Moon sep (deg) : 121.49
 B (ring opening deg) : 79.20
 PA of pole (deg) : 40.93
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.205
 C/A sky separation (km) : 2686.8
 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	2031-12-10T10:53:11.436		12.30	-17.50	51354.24	-23.57		
lambda	I	2031-12-10T10:54:07.739		12.45	-17.63	50026.71	-23.58		
delta	I	2031-12-10T10:55:20.961		12.64	-17.80	48300.35	-23.58		
gamma	I	2031-12-10T10:55:49.456		12.71	-17.87	47628.54	-23.58		
eta	I	2031-12-10T10:56:08.646		12.76	-17.91	47176.12	-23.58		
beta	I	2031-12-10T10:57:12.103		12.92	-18.06	45679.63	-23.57		
alpha	I	2031-12-10T10:57:52.298		13.02	-18.16	44732.54	-23.57		
4	I	2031-12-10T10:59:23.003		13.26	-18.37	42591.83	-23.57		
5	I	2031-12-10T10:59:40.885		13.30	-18.41	42177.61	-23.57		
6	I	2031-12-10T10:59:56.716		13.34	-18.44	41802.81	-23.57		
Uranus	I	2031-12-10T11:11:27.279		15.07	-20.00	25355.23		-6.39	-6.69
Uranus	E	2031-12-10T11:47:10.506		20.02	-24.35	25235.79		8.09	8.47
6	E	2031-12-10T11:58:43.145		21.48	-25.58	41868.06	23.64		
5	E	2031-12-10T11:59:01.256		21.52	-25.61	42299.17	23.65		
4	E	2031-12-10T11:59:12.485		21.54	-25.63	42555.99	23.64		
alpha	E	2031-12-10T12:00:43.058		21.72	-25.78	44700.76	23.65		
beta	E	2031-12-10T12:01:22.859		21.80	-25.85	45641.84	23.65		
eta	E	2031-12-10T12:02:27.694		21.93	-25.96	47176.12	23.66		
gamma	E	2031-12-10T12:02:46.649		21.97	-25.99	47624.57	23.66		
delta	E	2031-12-10T12:03:15.210		22.03	-26.03	48300.35	23.66		
lambda	E	2031-12-10T12:04:28.166		22.17	-26.16	50026.71	23.67		
epsilon	E	2031-12-10T12:05:05.222		22.25	-26.22	50903.69	23.66		