

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:12:35.970  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036

Uranus 2031-12-08T06:12:35 K10.07 G11.76 PgtRgt

ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s

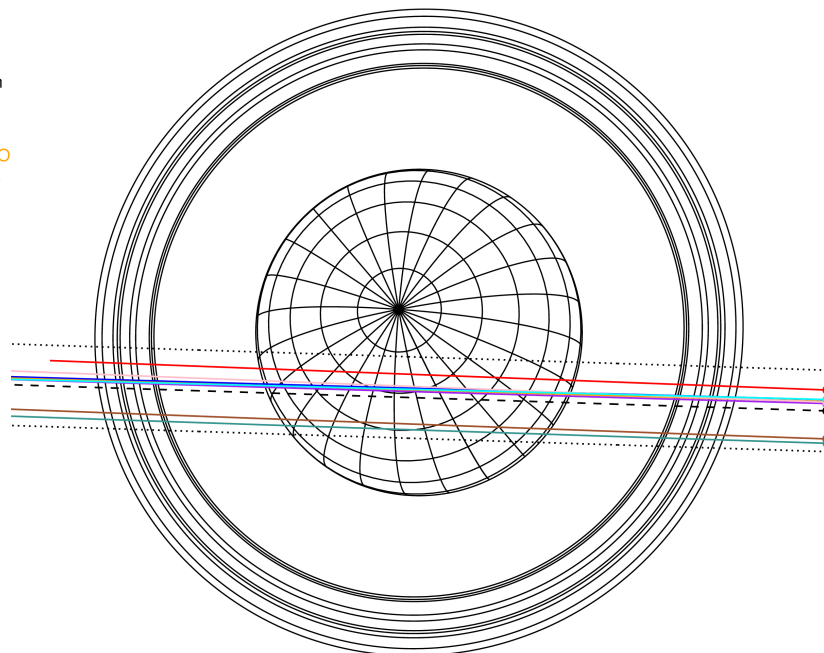
RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 92.97  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33

#	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



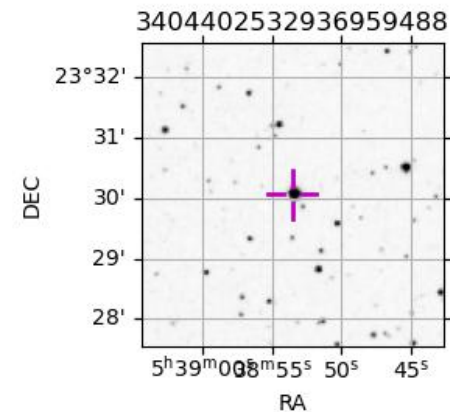
2031-12-08T06:12:35.9700 ra: 05 38 53.5247 s: +23 30 03.517 C/A 0.772° PA 358.17 deg v\_sky -23.02 km/s D 18.12 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 IRTF  
 RIO  
 ESO

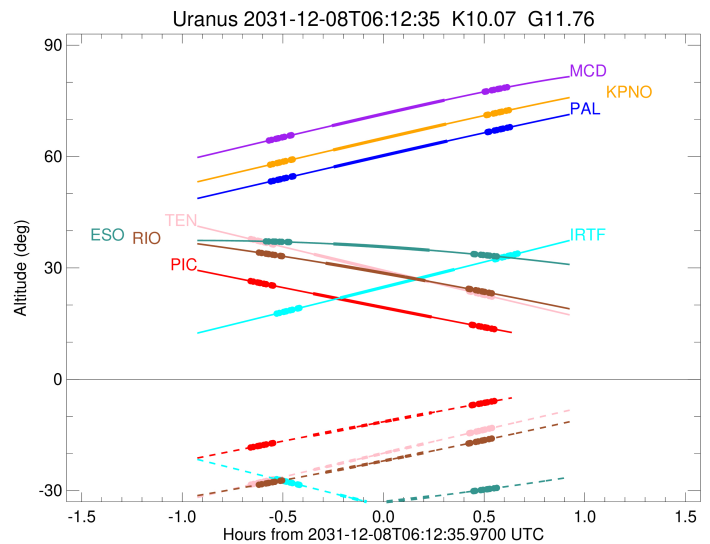
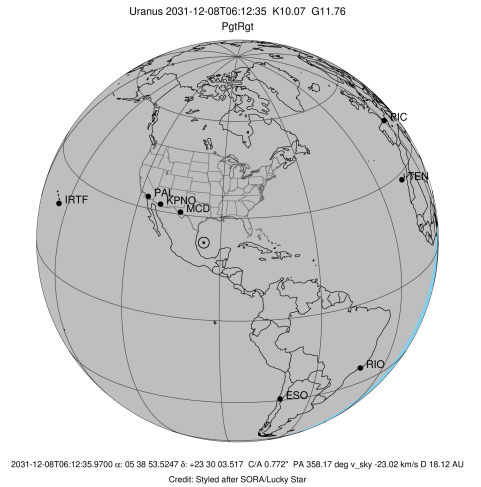


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	DEC 08 05:32 - DEC 08 06:45	PieRie
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	DEC 08 05:38 - DEC 08 06:50	PieRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8	+++++	+ +	+++++	DEC 08 05:38 - DEC 08 06:49	PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	DEC 08 05:38 - DEC 08 06:49	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	DEC 08 05:38 - DEC 08 06:49	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++	+ +	+++++	DEC 08 05:32 - DEC 08 06:44	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	DEC 08 05:40 - DEC 08 06:52	PieRie
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	DEC 08 05:40 - DEC 08 06:52	PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	+++++	+ +	+++++	DEC 08 05:35 - DEC 08 06:44	PieRie
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	DEC 08 05:37 - DEC 08 06:46	PieRie
AAT	Siding Spring (AAT)	-31.3	149.1	+++++	+ +	+++++	DEC 08 05:37 - DEC 08 06:46	PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++	+ +	+++++	DEC 08 05:37 - DEC 08 06:46	PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	DEC 08 05:37 - DEC 08 06:46	PnnRnn

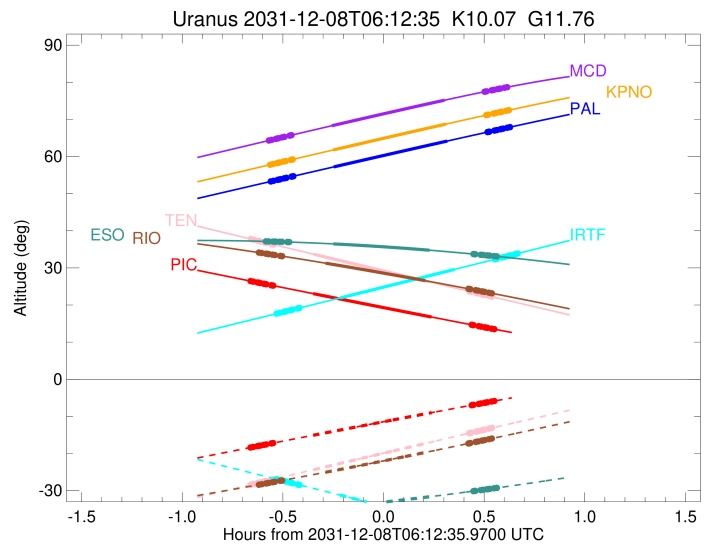
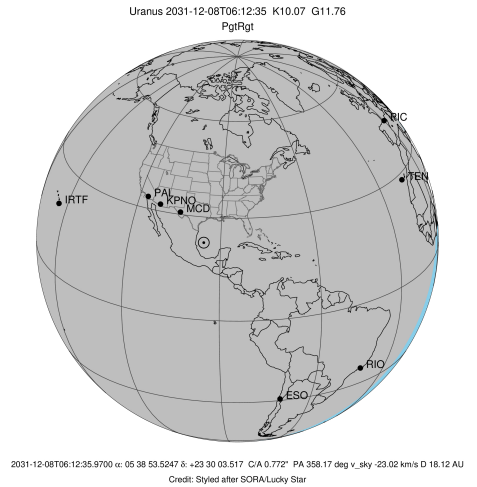


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:09:10.860  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036  
 ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s  
 RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 93.31  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.502  
 C/A sky separation (km) : 6590.2  
 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	2031-12-08T05:32:47.765		26.49	-18.41	51401.50	-23.13		
lambda	I	2031-12-08T05:33:47.280		26.30	-18.23	50026.71	-23.09		
delta	I	2031-12-08T05:35:02.062		26.08	-18.01	48300.35	-23.08		
gamma	I	2031-12-08T05:35:31.210		25.99	-17.93	47627.84	-23.07		
eta	I	2031-12-08T05:35:50.793		25.93	-17.87	47176.12	-23.06		
beta	I	2031-12-08T05:36:55.637		25.73	-17.68	45680.53	-23.05		
alpha	I	2031-12-08T05:37:36.604		25.61	-17.56	44736.60	-23.04		
4	I	2031-12-08T05:39:09.880		25.33	-17.28	42586.40	-23.00		
5	I	2031-12-08T05:39:28.375		25.27	-17.23	42170.85	-23.00		
6	I	2031-12-08T05:39:44.018		25.22	-17.18	41806.27	-23.00		
Uranus	I	2031-12-08T05:51:39.075		23.07	-15.08	25142.93		-9.27	-9.70
Uranus	E	2031-12-08T06:26:56.551		16.77	-8.99	25427.20		5.16	5.40
6	E	2031-12-08T06:38:54.739		14.67	-6.98	41875.73	22.91		
5	E	2031-12-08T06:39:12.354		14.61	-6.93	42281.03	22.91		
4	E	2031-12-08T06:39:24.104		14.58	-6.90	42543.66	22.92		
alpha	E	2031-12-08T06:40:58.443		14.31	-6.64	44709.58	22.95		
beta	E	2031-12-08T06:41:39.178		14.19	-6.53	45644.07	22.96		
eta	E	2031-12-08T06:42:45.877		14.00	-6.34	47176.12	22.97		
gamma	E	2031-12-08T06:43:05.345		13.94	-6.29	47623.36	22.97		
delta	E	2031-12-08T06:43:34.809		13.85	-6.21	48300.35	22.98		
lambda	E	2031-12-08T06:44:49.910		13.64	-6.00	50026.71	22.99		
epsilon	E	2031-12-08T06:45:31.461		13.52	-5.88	50982.29	23.02		

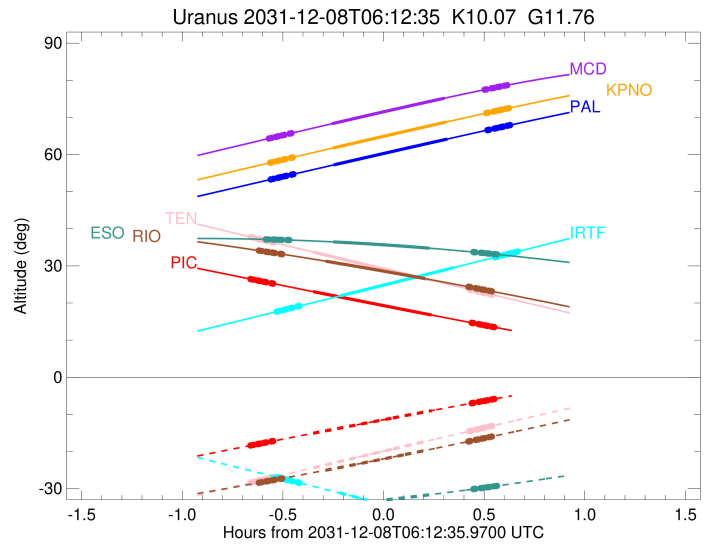
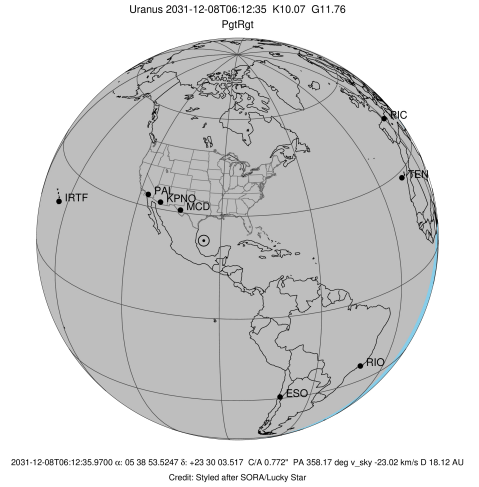
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:14:34.190  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036  
 ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s  
 RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 93.74  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.667  
 C/A sky separation (km) : 8761.4  
 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	2031-12-08T05:38:49.002		53.25	-61.57	51411.98	-23.17		
lambda	I	2031-12-08T05:39:48.870		53.46	-61.77	50026.71	-23.13		
delta	I	2031-12-08T05:41:03.552		53.72	-62.02	48300.35	-23.10		
gamma	I	2031-12-08T05:41:32.676		53.82	-62.12	47627.66	-23.09		
eta	I	2031-12-08T05:41:52.233		53.89	-62.19	47176.12	-23.08		
beta	I	2031-12-08T05:42:57.025		54.12	-62.40	45680.72	-23.06		
alpha	I	2031-12-08T05:43:37.936		54.26	-62.54	44737.73	-23.04		
4	I	2031-12-08T05:45:11.361		54.59	-62.86	42584.56	-22.98		
5	I	2031-12-08T05:45:29.891		54.65	-62.92	42168.83	-22.98		
6	I	2031-12-08T05:45:45.382		54.70	-62.97	41807.57	-22.98		
Uranus	I	2031-12-08T05:57:46.072		57.21	-65.37	25104.68		-9.70	-10.15
Uranus	E	2031-12-08T06:31:38.346		64.18	-71.82	25471.47		4.20	4.39
6	E	2031-12-08T06:43:37.931		66.59	-73.90	41876.78	23.03		
5	E	2031-12-08T06:43:55.249		66.65	-73.95	42276.86	23.03		
4	E	2031-12-08T06:44:06.989		66.69	-73.98	42541.50	23.04		
alpha	E	2031-12-08T06:45:40.945		67.00	-74.24	44711.53	23.10		
beta	E	2031-12-08T06:46:21.348		67.13	-74.35	45644.71	23.12		
eta	E	2031-12-08T06:47:27.531		67.35	-74.53	47176.12	23.15		
gamma	E	2031-12-08T06:47:46.838		67.41	-74.58	47623.11	23.16		
delta	E	2031-12-08T06:48:16.078		67.51	-74.66	48300.35	23.17		
lambda	E	2031-12-08T06:49:30.546		67.76	-74.86	50026.71	23.20		
epsilon	E	2031-12-08T06:50:12.575		67.89	-74.97	51001.96	23.24		

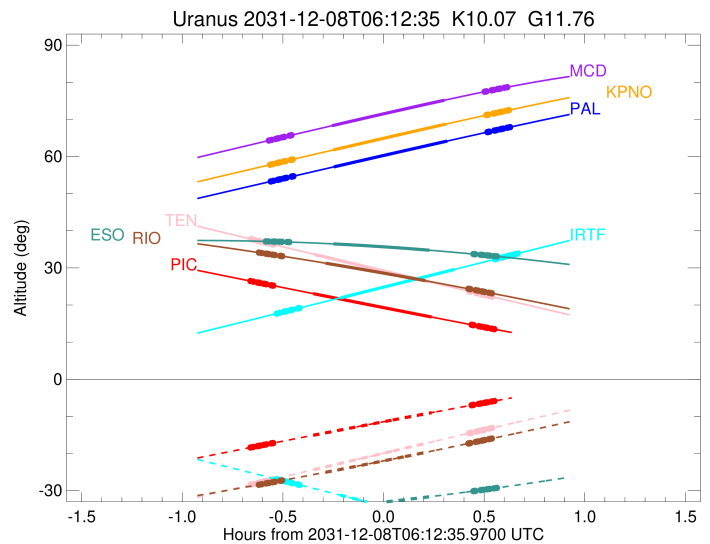
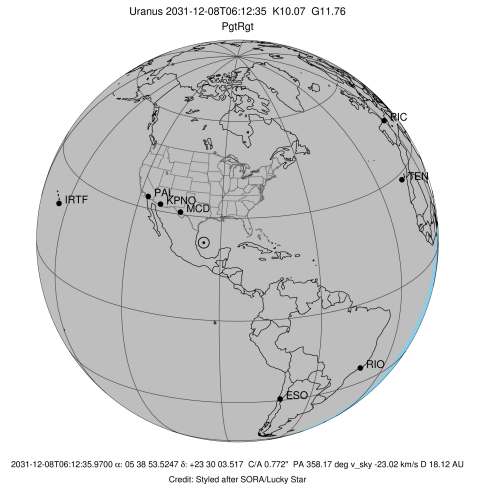
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-08T06:14:17.880
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       : 3404402532936959488
2Mass ID (if available) : 05385349+2330036
ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s
RUWE (>1.4 is poor) : 8.92
K magnitude           : 10.067
G magnitude          : 11.758
RP magnitude         : 10.788
BP magnitude         : 11.446
DUPflag              : 0
Distance (au)        : 18.117
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.02
Sun-Target sep (deg) : 170.33
Sun-Moon sep (deg)   : 93.78
B (ring opening deg) : 79.13
PA of pole (deg)     : 41.33
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.686
C/A sky separation (km) : 9014.9
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
  
```



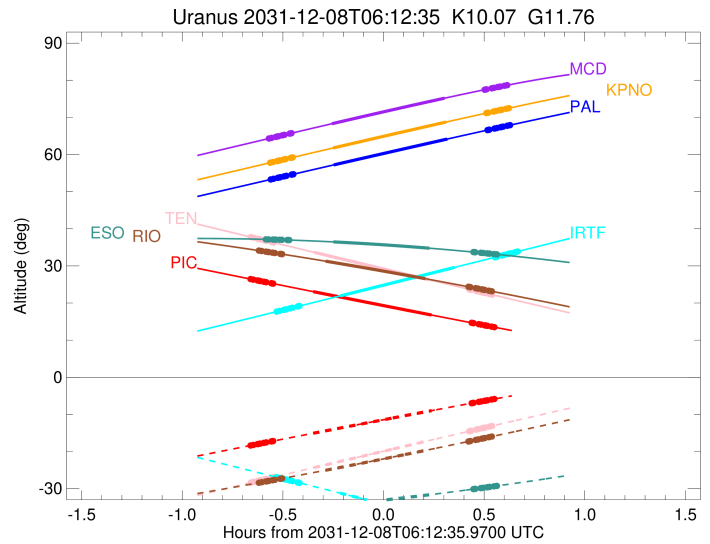
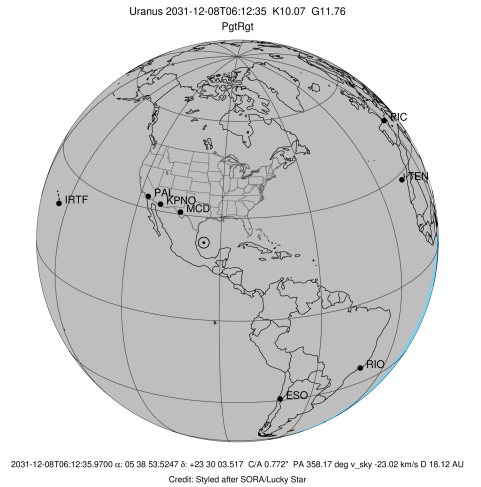
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-12-08T05:38:37.033		57.76	-66.17	51413.68	-23.18		
lambda	I	2031-12-08T05:39:36.961		57.97	-66.38	50026.71	-23.13		
delta	I	2031-12-08T05:40:51.630		58.23	-66.63	48300.35	-23.11		
gamma	I	2031-12-08T05:41:20.752		58.34	-66.73	47627.62	-23.09		
eta	I	2031-12-08T05:41:40.307		58.41	-66.79	47176.12	-23.09		
beta	I	2031-12-08T05:42:45.095		58.64	-67.01	45680.75	-23.06		
alpha	I	2031-12-08T05:43:26.000		58.78	-67.15	44737.90	-23.04		
4	I	2031-12-08T05:44:59.458		59.11	-67.47	42584.28	-22.98		
5	I	2031-12-08T05:45:17.994		59.17	-67.53	42168.54	-22.97		
6	I	2031-12-08T05:45:33.464		59.23	-67.58	41807.78	-22.97		
Uranus	I	2031-12-08T05:57:35.122		61.77	-69.98	25099.70		-9.76	-10.21
Uranus	E	2031-12-08T06:31:17.243		68.76	-76.20	25475.61		4.10	4.29
6	E	2031-12-08T06:43:17.875		71.17	-78.08	41876.87	23.02		
5	E	2031-12-08T06:43:35.183		71.23	-78.12	42276.47	23.02		
4	E	2031-12-08T06:43:46.935		71.27	-78.14	42541.30	23.03		
alpha	E	2031-12-08T06:45:20.950		71.58	-78.36	44711.71	23.09		
beta	E	2031-12-08T06:46:01.363		71.71	-78.46	45644.77	23.11		
eta	E	2031-12-08T06:47:07.564		71.93	-78.61	47176.12	23.14		
gamma	E	2031-12-08T06:47:26.876		71.99	-78.65	47623.09	23.15		
delta	E	2031-12-08T06:47:56.123		72.09	-78.71	48300.35	23.16		
lambda	E	2031-12-08T06:49:10.606		72.33	-78.87	50026.71	23.19		
epsilon	E	2031-12-08T06:49:52.716		72.47	-78.96	51003.70	23.24		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:13:51.230  
 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 : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036  
 ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s  
 RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 93.83  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.706  
 C/A sky separation (km) : 9281.6  
 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	2031-12-08T05:38:15.246		64.28	-72.64	51415.54	-23.19		
lambda	I	2031-12-08T05:39:15.231		64.49	-72.84	50026.71	-23.14		
delta	I	2031-12-08T05:40:29.878		64.76	-73.09	48300.35	-23.11		
gamma	I	2031-12-08T05:40:58.995		64.86	-73.19	47627.59	-23.10		
eta	I	2031-12-08T05:41:18.544		64.93	-73.25	47176.12	-23.09		
beta	I	2031-12-08T05:42:23.321		65.16	-73.46	45680.78	-23.06		
alpha	I	2031-12-08T05:43:04.215		65.31	-73.60	44738.09	-23.04		
4	I	2031-12-08T05:44:37.697		65.64	-73.90	42583.96	-22.98		
5	I	2031-12-08T05:44:56.238		65.70	-73.96	42168.21	-22.97		
6	I	2031-12-08T05:45:11.683		65.76	-74.01	41808.00	-22.97		
Uranus	I	2031-12-08T05:57:14.331		68.30	-76.29	25094.42		-9.82	-10.27
Uranus	E	2031-12-08T06:30:45.376		75.17	-81.32	25479.78		3.99	4.18
6	E	2031-12-08T06:42:47.179		77.47	-82.11	41876.96	23.00		
5	E	2031-12-08T06:43:04.478		77.52	-82.12	42276.07	23.01		
4	E	2031-12-08T06:43:16.244		77.56	-82.13	42541.11	23.01		
alpha	E	2031-12-08T06:44:50.327		77.85	-82.16	44711.89	23.08		
beta	E	2031-12-08T06:45:30.753		77.97	-82.18	45644.83	23.10		
eta	E	2031-12-08T06:46:36.978		78.17	-82.19	47176.12	23.13		
gamma	E	2031-12-08T06:46:56.295		78.23	-82.19	47623.07	23.14		
delta	E	2031-12-08T06:47:25.553		78.31	-82.19	48300.35	23.16		
lambda	E	2031-12-08T06:48:40.057		78.53	-82.19	50026.71	23.19		
epsilon	E	2031-12-08T06:49:22.251		78.66	-82.18	51005.44	23.24		

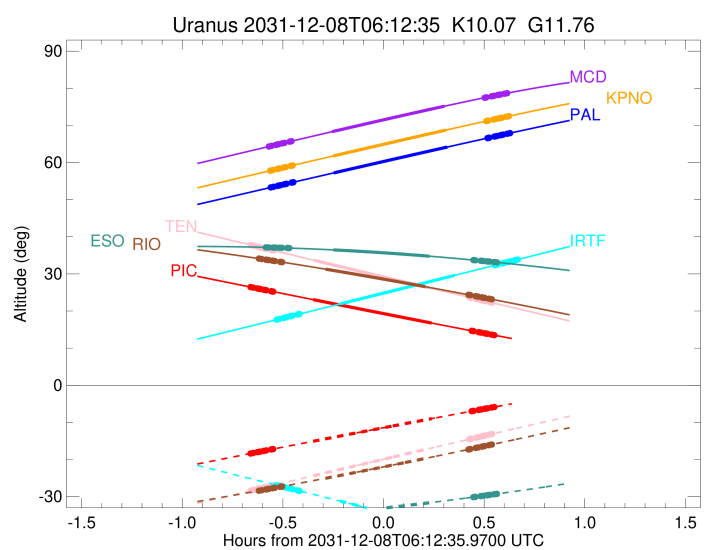
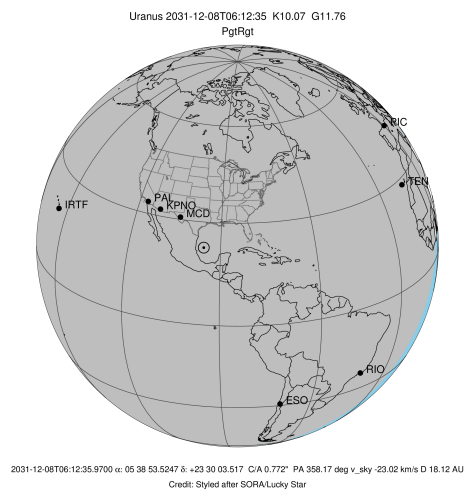
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:08:50.660  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036  
 ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s  
 RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 93.46  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.646  
 C/A sky separation (km) : 8484.7  
 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	2031-12-08T05:32:52.523		37.81	-28.42	51413.43	-23.13		
lambda	I	2031-12-08T05:33:52.575		37.59	-28.21	50026.71	-23.08		
delta	I	2031-12-08T05:35:07.412		37.32	-27.94	48300.35	-23.05		
gamma	I	2031-12-08T05:35:36.599		37.21	-27.83	47627.64	-23.04		
eta	I	2031-12-08T05:35:56.197		37.14	-27.76	47176.12	-23.03		
beta	I	2031-12-08T05:37:01.129		36.90	-27.53	45680.74	-23.01		
alpha	I	2031-12-08T05:37:42.126		36.75	-27.38	44737.83	-22.99		
4	I	2031-12-08T05:39:15.771		36.41	-27.05	42584.41	-22.93		
5	I	2031-12-08T05:39:34.344		36.34	-26.98	42168.69	-22.93		
6	I	2031-12-08T05:39:49.858		36.29	-26.93	41807.67	-22.92		
Uranus	I	2031-12-08T05:51:51.879		33.67	-24.34	25105.33		-9.69	-10.15
Uranus	E	2031-12-08T06:26:06.981		26.27	-17.07	25462.39		4.41	4.62
6	E	2031-12-08T06:38:11.697		23.69	-14.53	41876.52	22.83		
5	E	2031-12-08T06:38:29.221		23.63	-14.47	42278.00	22.84		
4	E	2031-12-08T06:38:41.048		23.58	-14.43	42542.07	22.84		
alpha	E	2031-12-08T06:40:15.790		23.25	-14.10	44710.99	22.89		
beta	E	2031-12-08T06:40:56.577		23.10	-13.96	45644.52	22.91		
eta	E	2031-12-08T06:42:03.383		22.86	-13.72	47176.12	22.93		
gamma	E	2031-12-08T06:42:22.875		22.80	-13.66	47623.18	22.94		
delta	E	2031-12-08T06:42:52.389		22.69	-13.55	48300.35	22.95		
lambda	E	2031-12-08T06:44:07.574		22.42	-13.29	50026.71	22.97		
epsilon	E	2031-12-08T06:44:49.762		22.27	-13.15	50996.14	23.01		

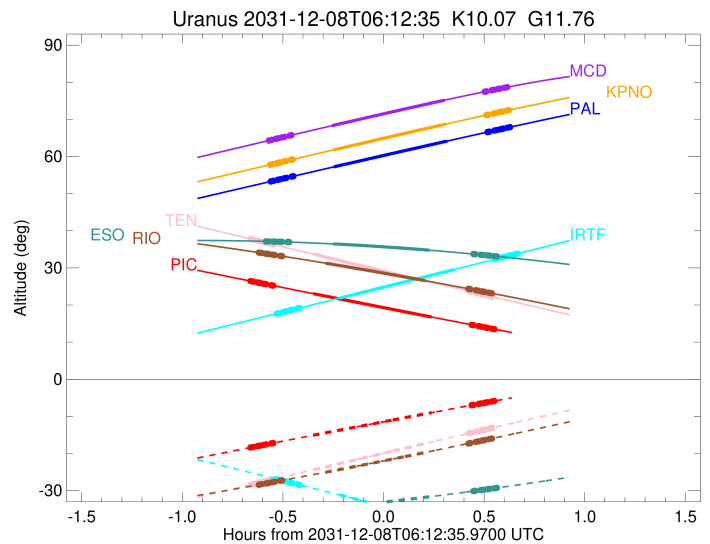
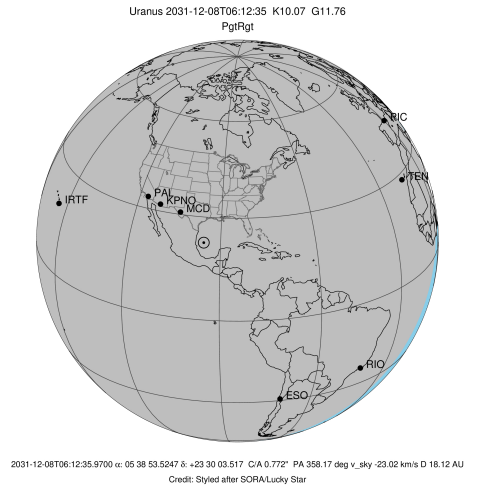
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-12-08T06:16:36.390
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      : 3404402532936959488
2Mass ID (if available) : 05385349+2330036
ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s
RUWE (>1.4 is poor) : 8.92
K magnitude         : 10.067
G magnitude         : 11.758
RP magnitude        : 10.788
BP magnitude        : 11.446
DUPflag            : 0
Distance (au)       : 18.117
f0 (km)            : 0.000
g0 (km)            : 0.000
skyplane vel. (km/s) : -23.02
Sun-Target sep (deg) : 170.33
Sun-Moon sep (deg)  : 93.31
B (ring opening deg) : 79.13
PA of pole (deg)    : 41.33
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.679
C/A sky separation (km) : 8924.6
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_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	2031-12-08T05:40:34.312		17.64	-26.88	51412.04	-22.95		
lambda	I	2031-12-08T05:41:34.765		17.87	-27.11	50026.71	-22.91		
delta	I	2031-12-08T05:42:50.174		18.15	-27.39	48300.35	-22.88		
gamma	I	2031-12-08T05:43:19.582		18.26	-27.50	47627.65	-22.87		
eta	I	2031-12-08T05:43:39.330		18.33	-27.58	47176.12	-22.86		
beta	I	2031-12-08T05:44:44.753		18.57	-27.82	45680.73	-22.83		
alpha	I	2031-12-08T05:45:26.062		18.73	-27.98	44737.75	-22.82		
4	I	2031-12-08T05:47:00.403		19.08	-28.33	42584.53	-22.76		
5	I	2031-12-08T05:47:19.115		19.15	-28.40	42168.79	-22.75		
6	I	2031-12-08T05:47:34.755		19.20	-28.46	41807.60	-22.75		
Uranus	I	2031-12-08T05:59:42.832		21.92	-31.21	25103.03		-9.72	-10.17
Uranus	E	2031-12-08T06:33:45.737		29.59	-38.97	25475.68		4.09	4.29
6	E	2031-12-08T06:45:51.343		32.33	-41.74	41876.90	22.86		
5	E	2031-12-08T06:46:08.766		32.40	-41.81	42276.35	22.86		
4	E	2031-12-08T06:46:20.601		32.44	-41.85	42541.24	22.87		
alpha	E	2031-12-08T06:47:55.275		32.80	-42.21	44711.77	22.93		
beta	E	2031-12-08T06:48:35.965		32.95	-42.37	45644.79	22.95		
eta	E	2031-12-08T06:49:42.622		33.21	-42.62	47176.12	22.98		
gamma	E	2031-12-08T06:50:02.066		33.28	-42.70	47623.08	22.99		
delta	E	2031-12-08T06:50:31.515		33.39	-42.81	48300.35	23.00		
lambda	E	2031-12-08T06:51:46.507		33.68	-43.10	50026.71	23.04		
epsilon	E	2031-12-08T06:52:28.942		33.84	-43.26	51004.55	23.08		

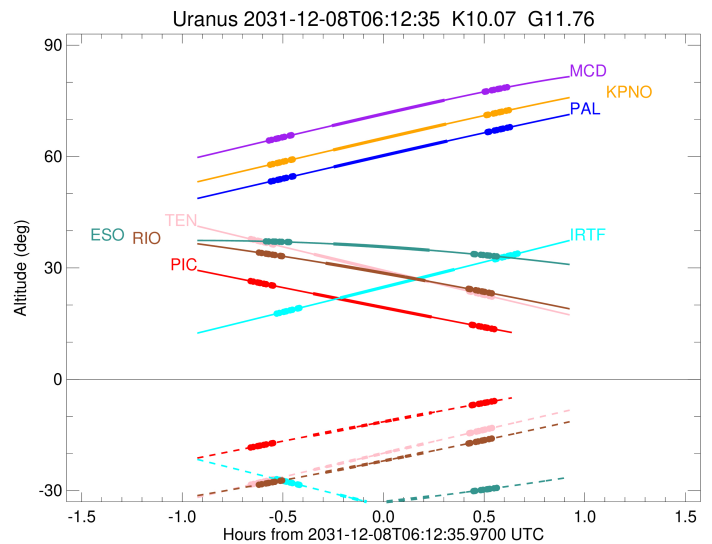
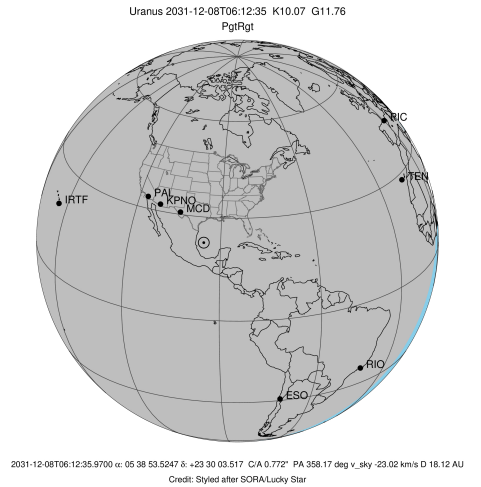
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:09:56.690  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036  
 ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s  
 RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 93.45  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.094  
 C/A sky separation (km) : 14370.3  
 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	2031-12-08T05:35:13.831		34.15	-28.45	51447.65	-22.65		
lambda	I	2031-12-08T05:36:16.737		34.01	-28.27	50026.71	-22.56		
delta	I	2031-12-08T05:37:33.392		33.84	-28.06	48300.35	-22.48		
gamma	I	2031-12-08T05:38:03.365		33.77	-27.98	47626.98	-22.45		
eta	I	2031-12-08T05:38:23.459		33.72	-27.93	47176.12	-22.43		
beta	I	2031-12-08T05:39:30.207		33.56	-27.74	45681.15	-22.35		
alpha	I	2031-12-08T05:40:12.290		33.47	-27.62	44741.43	-22.30		
4	I	2031-12-08T05:41:49.496		33.24	-27.35	42578.09	-22.14		
5	I	2031-12-08T05:42:08.745		33.19	-27.30	42162.88	-22.12		
6	I	2031-12-08T05:42:24.282		33.16	-27.26	41812.42	-22.11		
Uranus	I	2031-12-08T05:55:19.752		31.27	-25.05	25015.95		-10.65	-11.14
Uranus	E	2031-12-08T06:25:01.781		26.56	-19.71	25544.11		1.73	1.81
6	E	2031-12-08T06:37:57.022		24.37	-17.29	41878.50	22.05		
5	E	2031-12-08T06:38:14.641		24.32	-17.24	42267.52	22.06		
4	E	2031-12-08T06:38:27.053		24.28	-17.20	42537.30	22.08		
alpha	E	2031-12-08T06:40:05.269		24.00	-16.89	44715.66	22.23		
beta	E	2031-12-08T06:40:47.105		23.88	-16.75	45646.21	22.28		
eta	E	2031-12-08T06:41:55.635		23.68	-16.53	47176.12	22.36		
gamma	E	2031-12-08T06:42:15.596		23.62	-16.47	47622.64	22.38		
delta	E	2031-12-08T06:42:45.856		23.53	-16.37	48300.35	22.41		
lambda	E	2031-12-08T06:44:02.756		23.31	-16.13	50026.71	22.49		
epsilon	E	2031-12-08T06:44:47.894		23.18	-15.99	51042.58	22.58		



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-12-08T06:11:45.210  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 3404402532936959488  
 2Mass ID (if available) : 05385349+2330036  
 ICRS Star Coord at Epoch: 05h 38m 53.52469s +23:30:03.51677s  
 RUWE (>1.4 is poor) : 8.92  
 K magnitude : 10.067  
 G magnitude : 11.758  
 RP magnitude : 10.788  
 BP magnitude : 11.446  
 DUPflag : 0  
 Distance (au) : 18.117  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.02  
 Sun-Target sep (deg) : 170.33  
 Sun-Moon sep (deg) : 93.52  
 B (ring opening deg) : 79.13  
 PA of pole (deg) : 41.33  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.162  
 C/A sky separation (km) : 15264.0  
 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\_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	2031-12-08T05:37:19.091		37.15	-36.06	51451.79	-22.56		
lambda	I	2031-12-08T05:38:22.441		37.13	-35.99	50026.71	-22.46		
delta	I	2031-12-08T05:39:39.442		37.10	-35.90	48300.35	-22.38		
gamma	I	2031-12-08T05:40:09.564		37.08	-35.86	47626.89	-22.34		
eta	I	2031-12-08T05:40:29.753		37.07	-35.84	47176.12	-22.31		
beta	I	2031-12-08T05:41:36.853		37.04	-35.76	45681.18	-22.22		
alpha	I	2031-12-08T05:42:19.153		37.02	-35.71	44741.88	-22.17		
4	I	2031-12-08T05:43:57.028		36.98	-35.59	42577.22	-22.00		
5	I	2031-12-08T05:44:16.402		36.97	-35.56	42162.21	-21.97		
6	I	2031-12-08T05:44:31.975		36.96	-35.55	41813.12	-21.95		
Uranus	I	2031-12-08T05:57:39.077		36.47	-34.49	25007.94		-10.73	-11.22
Uranus	E	2031-12-08T06:26:20.645		34.77	-31.64	25551.38		1.23	1.29
6	E	2031-12-08T06:39:26.067		33.72	-30.12	41878.75	21.94		
5	E	2031-12-08T06:39:43.681		33.70	-30.09	42265.60	21.95		
4	E	2031-12-08T06:39:56.190		33.68	-30.06	42536.54	21.98		
alpha	E	2031-12-08T06:41:34.901		33.54	-29.86	44716.49	22.15		
beta	E	2031-12-08T06:42:16.864		33.48	-29.78	45646.54	22.21		
eta	E	2031-12-08T06:43:25.594		33.38	-29.64	47176.12	22.30		
gamma	E	2031-12-08T06:43:45.607		33.35	-29.60	47622.56	22.32		
delta	E	2031-12-08T06:44:15.949		33.30	-29.53	48300.35	22.36		
lambda	E	2031-12-08T06:45:33.020		33.18	-29.37	50026.71	22.44		
epsilon	E	2031-12-08T06:46:18.616		33.12	-29.28	51051.03	22.54		