

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T09:36:59.090
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3404366897592084352
 2Mass ID (if available) : 05412918+2331074

ICRS Star Coord at Epoch: 05h 41m 29.19406s +23:31:07.38274s

RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.787
 G magnitude : 18.571
 RP magnitude : 17.449
 BP magnitude : 19.947
 DUPflag : 0
 Distance (au) : 18.194
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.58
 Sun-Target sep (deg) : 154.69
 Sun-Moon sep (deg) : 92.34
 B (ring opening deg) : 78.72
 PA of pole (deg) : 43.76

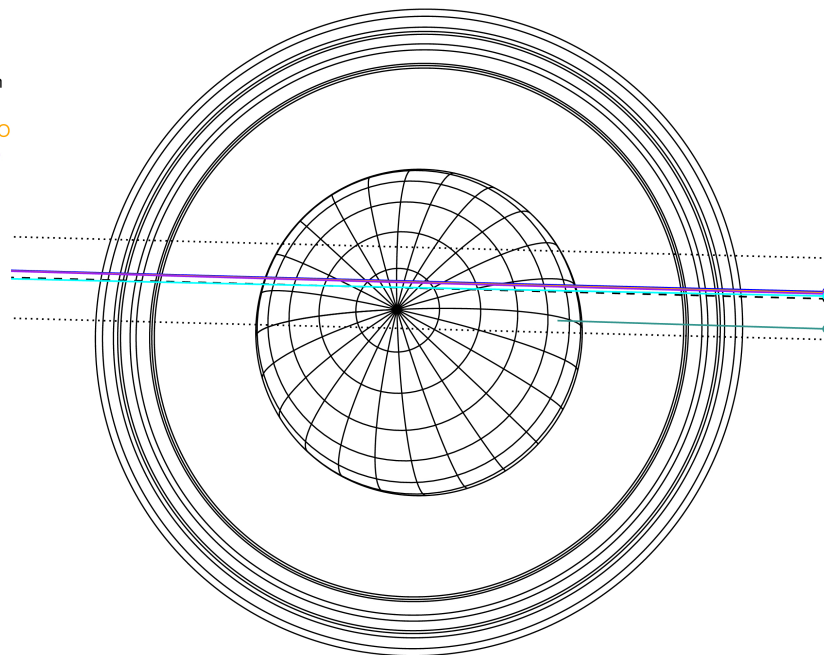
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2031-11-23T09:36:59.0900 ra: 05 41 29.1941 ra: +23 31 07.383 C/A 0.533° PA 178.50 deg v_sky -20.58 km/s D 18.19 AU
 Credit: Styled after SORA/Lucky Star

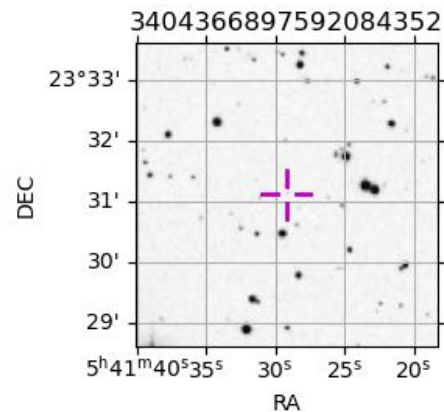
Uranus 2031-11-23T09:36:59 K14.79 G18.57 PgtRgt

Earth
 PAL
 KPNO
 MCD
 IRTF
 ESO

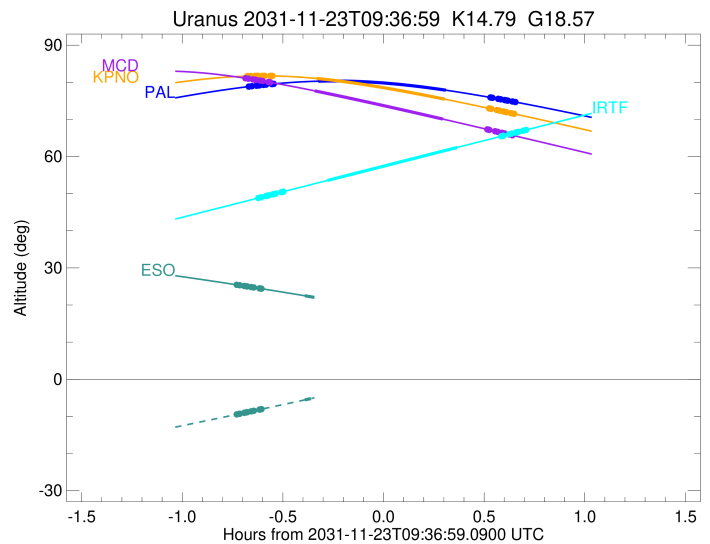
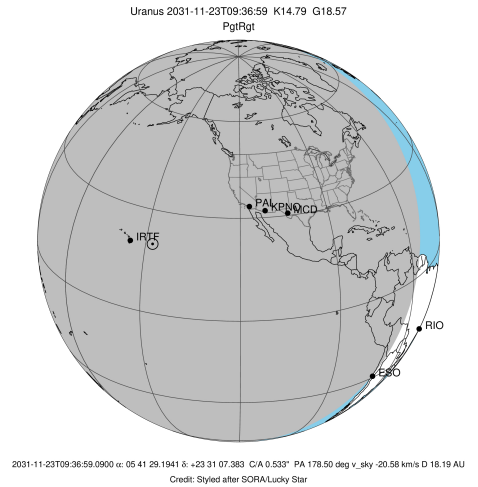


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	NOV 23 08:56 - NOV 23 10:16	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	NOV 23 08:56 - NOV 23 10:15	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	NOV 23 08:55 - NOV 23 10:15	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++	+ +	+++++	NOV 23 08:59 - NOV 23 10:19	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	+++++	+		NOV 23 08:53 - NOV 23 09:13	PinRin
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



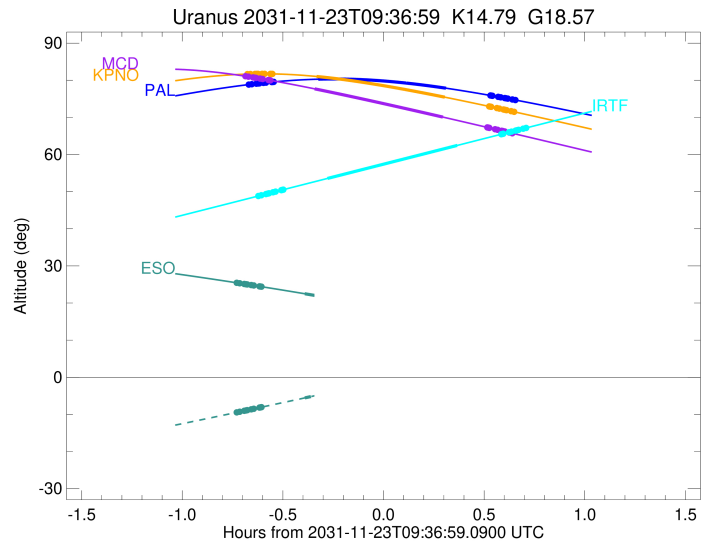
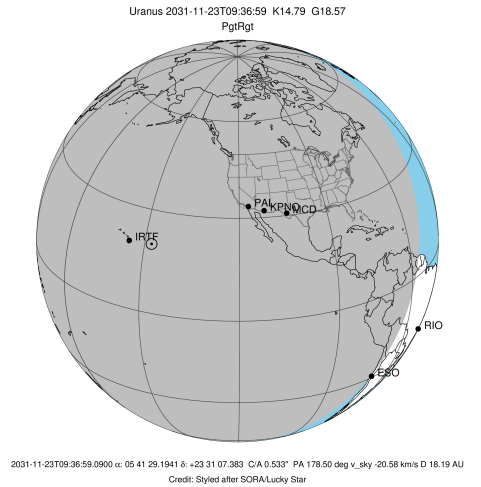
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T09:36:41.510
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3404366897592084352
 2Mass ID (if available) : 05412918+2331074
 ICRS Star Coord at Epoch: 05h 41m 29.19406s +23:31:07.38274s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.787
 G magnitude : 18.571
 RP magnitude : 17.449
 BP magnitude : 19.947
 DUPflag : 0
 Distance (au) : 18.194
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.58
 Sun-Target sep (deg) : 154.69
 Sun-Moon sep (deg) : 93.29
 B (ring opening deg) : 78.72
 PA of pole (deg) : 43.76
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.607
 C/A sky separation (km) : 8005.8
 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	2031-11-23T08:56:49.316		78.85	-67.51	51156.96	-20.87		
lambda	I	2031-11-23T08:57:43.413		78.95	-67.34	50026.71	-20.89		
delta	I	2031-11-23T08:59:06.105		79.09	-67.09	48300.35	-20.87		
gamma	I	2031-11-23T08:59:38.192		79.14	-66.99	47630.94	-20.86		
eta	I	2031-11-23T09:00:00.000		79.18	-66.93	47176.12	-20.85		
beta	I	2031-11-23T09:01:12.252		79.30	-66.71	45669.84	-20.83		
alpha	I	2031-11-23T09:01:58.469		79.37	-66.56	44707.11	-20.81		
4	I	2031-11-23T09:03:38.940		79.52	-66.25	42615.66	-20.78		
5	I	2031-11-23T09:03:57.124		79.55	-66.20	42244.88	-20.78		
6	I	2031-11-23T09:04:18.438		79.58	-66.13	41796.95	-20.77		
Uranus	I	2031-11-23T09:17:29.914		80.29	-63.62	25440.56		-5.08	-5.32
Uranus	E	2031-11-23T09:55:36.013		77.87	-56.04	25101.96		10.12	10.59
6	E	2031-11-23T10:08:53.572		75.91	-53.32	41879.64	20.77		
5	E	2031-11-23T10:09:11.228		75.86	-53.26	42255.78	20.79		
4	E	2031-11-23T10:09:24.994		75.82	-53.21	42533.46	20.78		
alpha	E	2031-11-23T10:11:09.928		75.54	-52.85	44717.68	20.82		
beta	E	2031-11-23T10:11:54.472		75.42	-52.70	45646.63	20.83		
eta	E	2031-11-23T10:13:07.818		75.22	-52.44	47176.12	20.86		
gamma	E	2031-11-23T10:13:29.227		75.16	-52.37	47622.72	20.86		
delta	E	2031-11-23T10:14:01.699		75.07	-52.26	48300.35	20.87		
lambda	E	2031-11-23T10:15:24.369		74.83	-51.97	50026.71	20.89		
epsilon	E	2031-11-23T10:16:11.349		74.70	-51.81	51008.51	20.88		

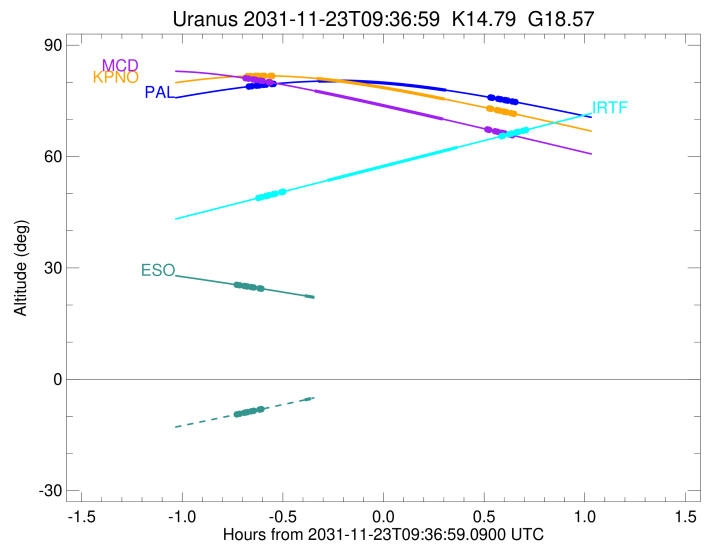
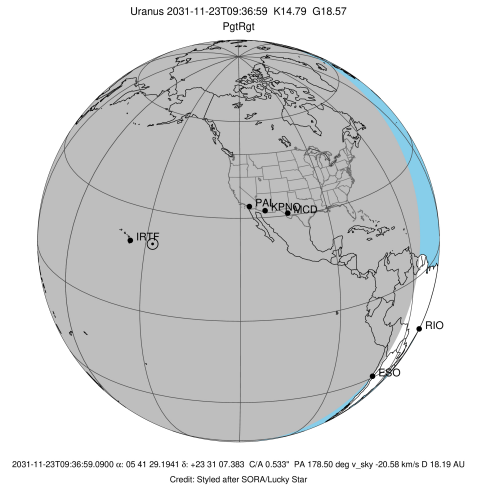
```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2031-11-23T09:36:17.560
Event type             : PgtRgt
: Uranus occs: geocentric, topocentric
: 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        : 3404366897592084352
2Mass ID (if available) : 05412918+2331074
ICRS Star Coord at Epoch: 05h 41m 29.19406s +23:31:07.38274s
RUWE (>1.4 is poor)  : 1.05
K magnitude           : 14.787
G magnitude           : 18.571
RP magnitude          : 17.449
BP magnitude          : 19.947
DUPflag              : 0
Distance (au)         : 18.194
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -20.58
Sun-Target sep (deg)  : 154.69
Sun-Moon sep (deg)    : 93.28
B (ring opening deg)  : 78.72
PA of pole (deg)      : 43.76
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.596
C/A sky separation (km) : 7863.3
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	2031-11-23T08:56:25.027		81.67	-64.13	51158.39	-20.89		
lambda	I	2031-11-23T08:57:19.144		81.69	-63.95	50026.71	-20.91		
delta	I	2031-11-23T08:58:41.761		81.72	-63.67	48300.35	-20.89		
gamma	I	2031-11-23T08:59:13.819		81.73	-63.57	47630.93	-20.88		
eta	I	2031-11-23T08:59:35.606		81.73	-63.49	47176.12	-20.87		
beta	I	2031-11-23T09:00:47.786		81.74	-63.25	45669.91	-20.85		
alpha	I	2031-11-23T09:01:33.955		81.74	-63.10	44707.23	-20.83		
4	I	2031-11-23T09:03:14.333		81.73	-62.76	42615.63	-20.80		
5	I	2031-11-23T09:03:32.513		81.72	-62.70	42244.55	-20.81		
6	I	2031-11-23T09:03:53.789		81.72	-62.63	41796.89	-20.79		
Uranus	I	2031-11-23T09:17:04.111		81.02	-59.94	25437.52		-5.14	-5.39
Uranus	E	2031-11-23T09:55:14.394		75.46	-51.99	25104.30		10.09	10.56
6	E	2031-11-23T10:08:31.060		72.96	-49.19	41879.65	20.78		
5	E	2031-11-23T10:08:48.696		72.90	-49.12	42255.56	20.80		
4	E	2031-11-23T10:09:02.463		72.86	-49.08	42533.39	20.80		
alpha	E	2031-11-23T10:10:47.350		72.52	-48.71	44717.77	20.83		
beta	E	2031-11-23T10:11:31.871		72.37	-48.55	45646.66	20.84		
eta	E	2031-11-23T10:12:45.185		72.13	-48.29	47176.12	20.87		
gamma	E	2031-11-23T10:13:06.586		72.06	-48.22	47622.72	20.87		
delta	E	2031-11-23T10:13:39.046		71.96	-48.10	48300.35	20.88		
lambda	E	2031-11-23T10:15:01.688		71.69	-47.81	50026.71	20.90		
epsilon	E	2031-11-23T10:15:48.693		71.53	-47.64	51009.34	20.89		

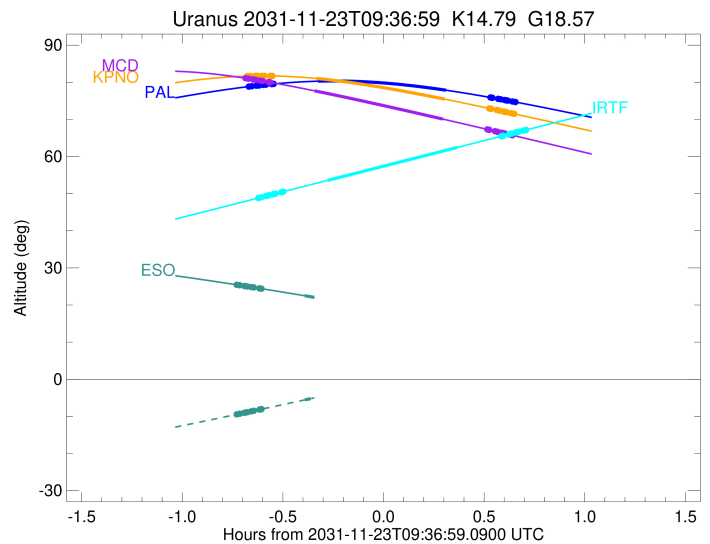
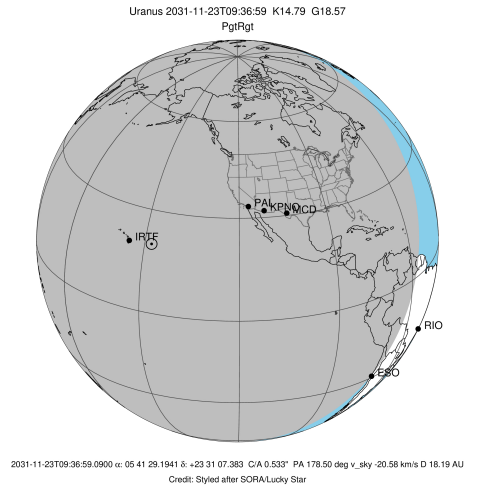
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T09:35:42.960
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 3404366897592084352
 2Mass ID (if available) : 05412918+2331074
 ICRS Star Coord at Epoch: 05h 41m 29.19406s +23:31:07.38274s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.787
 G magnitude : 18.571
 RP magnitude : 17.449
 BP magnitude : 19.947
 DUPflag : 0
 Distance (au) : 18.194
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.58
 Sun-Target sep (deg) : 154.69
 Sun-Moon sep (deg) : 93.26
 B (ring opening deg) : 78.72
 PA of pole (deg) : 43.76
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.589
 C/A sky separation (km) : 7767.2
 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	2031-11-23T08:55:49.670		81.10	-58.33	51159.57	-20.90		
lambda	I	2031-11-23T08:56:43.816		80.97	-58.14	50026.71	-20.92		
delta	I	2031-11-23T08:58:06.393		80.77	-57.85	48300.35	-20.90		
gamma	I	2031-11-23T08:58:38.435		80.69	-57.74	47630.92	-20.89		
eta	I	2031-11-23T08:59:00.211		80.64	-57.66	47176.12	-20.88		
beta	I	2031-11-23T09:00:12.351		80.46	-57.41	45669.97	-20.86		
alpha	I	2031-11-23T09:00:58.493		80.34	-57.24	44707.33	-20.84		
4	I	2031-11-23T09:02:38.823		80.08	-56.89	42615.60	-20.81		
5	I	2031-11-23T09:02:57.006		80.03	-56.82	42244.29	-20.82		
6	I	2031-11-23T09:03:18.258		79.97	-56.75	41796.84	-20.80		
Uranus	I	2031-11-23T09:16:27.957		77.69	-53.94	25435.20		-5.19	-5.44
Uranus	E	2031-11-23T09:54:41.771		70.09	-45.74	25105.65		10.08	10.54
6	E	2031-11-23T10:07:58.229		67.30	-42.88	41879.66	20.78		
5	E	2031-11-23T10:08:15.863		67.24	-42.82	42255.45	20.80		
4	E	2031-11-23T10:08:29.635		67.19	-42.77	42533.35	20.79		
alpha	E	2031-11-23T10:10:14.546		66.82	-42.39	44717.82	20.82		
beta	E	2031-11-23T10:10:59.076		66.67	-42.23	45646.68	20.84		
eta	E	2031-11-23T10:12:12.408		66.41	-41.97	47176.12	20.86		
gamma	E	2031-11-23T10:12:33.814		66.33	-41.89	47622.71	20.87		
delta	E	2031-11-23T10:13:06.285		66.22	-41.78	48300.35	20.87		
lambda	E	2031-11-23T10:14:28.953		65.92	-41.48	50026.71	20.89		
epsilon	E	2031-11-23T10:15:15.992		65.76	-41.31	51009.71	20.88		

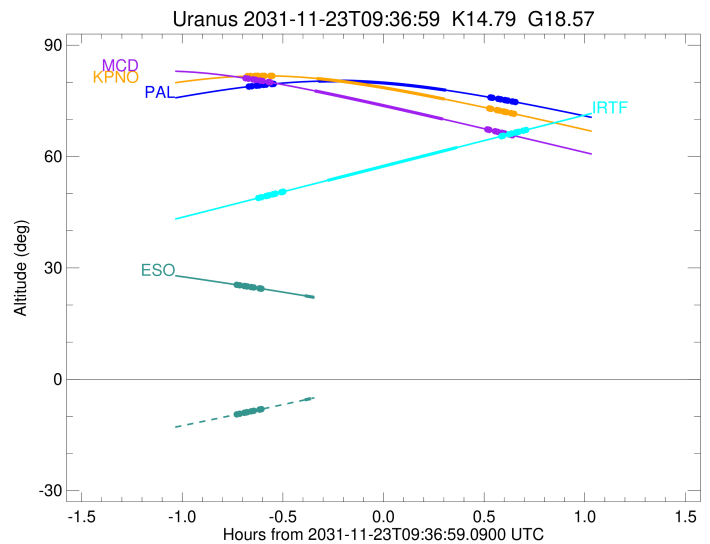
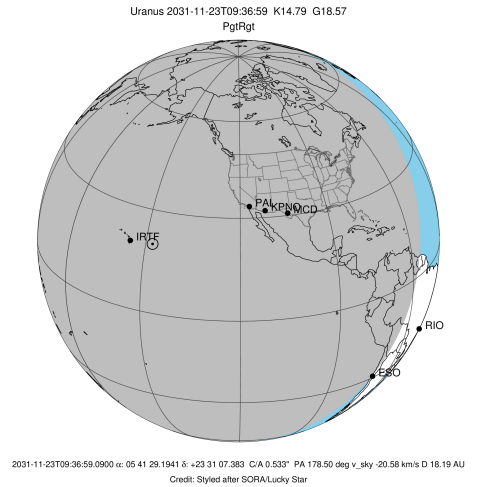
```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2031-11-23T09:39:44.910
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        : 3404366897592084352
2Mass ID (if available) : 05412918+2331074
ICRS Star Coord at Epoch: 05h 41m 29.19406s +23:31:07.38274s
RUWE (>1.4 is poor)  : 1.05
K magnitude           : 14.787
G magnitude           : 18.571
RP magnitude          : 17.449
BP magnitude          : 19.947
DUPflag              : 0
Distance (au)         : 18.194
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s)  : -20.58
Sun-Target sep (deg)  : 154.69
Sun-Moon sep (deg)    : 93.18
B (ring opening deg)  : 78.72
PA of pole (deg)     : 43.76
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 0.531
C/A sky separation (km) : 7007.3
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ural11.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ural11.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	2031-11-23T08:59:40.059		48.83	-73.90	51163.02	-20.86		
lambda	I	2031-11-23T09:00:34.478		49.04	-74.12	50026.71	-20.88		
delta	I	2031-11-23T09:01:57.200		49.35	-74.44	48300.35	-20.86		
gamma	I	2031-11-23T09:02:29.293		49.48	-74.57	47630.89	-20.86		
eta	I	2031-11-23T09:02:51.100		49.56	-74.65	47176.12	-20.85		
beta	I	2031-11-23T09:04:03.325		49.84	-74.93	45670.16	-20.84		
alpha	I	2031-11-23T09:04:49.508		50.01	-75.11	44707.68	-20.82		
4	I	2031-11-23T09:06:29.936		50.40	-75.51	42615.48	-20.80		
5	I	2031-11-23T09:06:48.173		50.47	-75.58	42243.35	-20.81		
6	I	2031-11-23T09:07:09.389		50.55	-75.66	41796.69	-20.79		
Uranus	I	2031-11-23T09:20:17.243		53.56	-78.74	25423.56		-5.44	-5.69
Uranus	E	2031-11-23T09:58:56.321		62.45	-87.74	25123.25		9.87	10.33
6	E	2031-11-23T10:12:07.676		65.47	-88.88	41879.71	20.87		
5	E	2031-11-23T10:12:25.147		65.54	-88.82	42253.50	20.89		
4	E	2031-11-23T10:12:38.924		65.59	-88.77	42532.74	20.88		
alpha	E	2031-11-23T10:14:23.450		65.99	-88.41	44718.63	20.91		
beta	E	2031-11-23T10:15:07.775		66.16	-88.25	45647.02	20.93		
eta	E	2031-11-23T10:16:20.792		66.44	-87.98	47176.12	20.94		
gamma	E	2031-11-23T10:16:42.108		66.52	-87.90	47622.62	20.95		
delta	E	2031-11-23T10:17:14.453		66.65	-87.78	48300.35	20.96		
lambda	E	2031-11-23T10:18:36.796		66.96	-87.47	50026.71	20.97		
epsilon	E	2031-11-23T10:19:24.053		67.14	-87.29	51018.09	20.96		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T09:33:38.930
 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 : 3404366897592084352
 2Mass ID (if available) : 05412918+2331074
 ICRS Star Coord at Epoch: 05h 41m 29.19406s +23:31:07.38274s
 RUWE (>1.4 is poor) : 1.05
 K magnitude : 14.787
 G magnitude : 18.571
 RP magnitude : 17.449
 BP magnitude : 19.947
 DUPflag : 0
 Distance (au) : 18.194
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.58
 Sun-Target sep (deg) : 154.69
 Sun-Moon sep (deg) : 92.62
 B (ring opening deg) : 78.72
 PA of pole (deg) : 43.76
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.193
 C/A sky separation (km) : 2544.9
 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	2031-11-23T08:53:11.560		25.45	-9.47	51203.15	-21.06		
lambda	I	2031-11-23T08:54:07.396		25.32	-9.29	50026.71	-21.07		
delta	I	2031-11-23T08:55:29.344		25.13	-9.03	48300.35	-21.06		
gamma	I	2031-11-23T08:56:01.140		25.05	-8.93	47630.59	-21.06		
eta	I	2031-11-23T08:56:22.718		25.00	-8.86	47176.12	-21.06		
beta	I	2031-11-23T08:57:34.113		24.84	-8.63	45672.07	-21.06		
alpha	I	2031-11-23T08:58:19.709		24.73	-8.49	44711.34	-21.05		
4	I	2031-11-23T08:59:59.248		24.49	-8.17	42614.03	-21.05		
5	I	2031-11-23T09:00:17.683		24.45	-8.11	42233.90	-21.05		
6	I	2031-11-23T09:00:38.189		24.40	-8.05	41795.47	-21.05		
Uranus	I	2031-11-23T09:13:31.147		22.50	-5.56	25323.63		-7.19	-7.53
Uranus	E	2031-11-23T09:53:42.626		16.05	2.44x	25210.60		8.79	9.20
6	E	2031-11-23T10:06:42.612		13.82	5.08x	41879.67	20.97		
5	E	2031-11-23T10:06:59.685		13.77	5.14x	42245.85	20.98		
4	E	2031-11-23T10:07:13.663		13.73	5.19x	42530.62	20.97		
alpha	E	2031-11-23T10:08:58.064		13.42	5.55x	44721.71	20.97		
beta	E	2031-11-23T10:09:42.203		13.30	5.70x	45648.34	20.97		
eta	E	2031-11-23T10:10:55.022		13.08	5.95x	47176.12	20.97		
gamma	E	2031-11-23T10:11:16.294		13.02	6.02x	47622.31	20.98		
delta	E	2031-11-23T10:11:48.620		12.93	6.13x	48300.35	20.98		
lambda	E	2031-11-23T10:13:10.923		12.68	6.41x	50026.71	20.98		
epsilon	E	2031-11-23T10:13:59.635		12.54	6.58x	51048.50	20.97		