

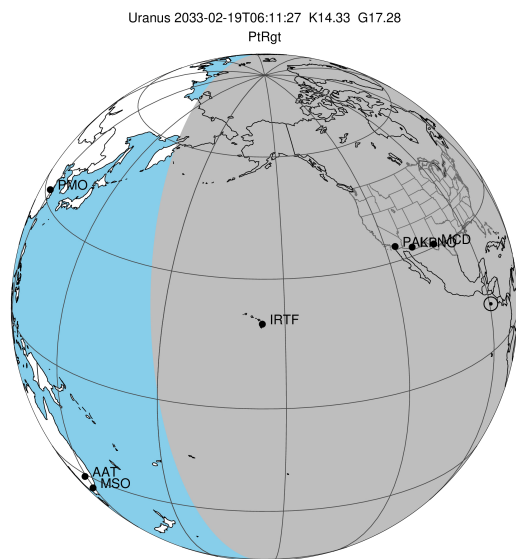
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-19T06:11:27.410
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427684141900524160
 2Mass ID (if available) : 05475133+2337329

ICRS Star Coord at Epoch: 05h 47m 51.33578s +23:37:32.65650s

RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.326
 G magnitude : 17.281
 RP magnitude : 16.409
 BP magnitude : 18.084
 DUPflag : 0
 Distance (au) : 18.543
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -7.07
 Sun-Target sep (deg) : 116.77
 Sun-Moon sep (deg) : 117.03
 B (ring opening deg) : 77.59
 PA of pole (deg) : 48.84

a(km) ring

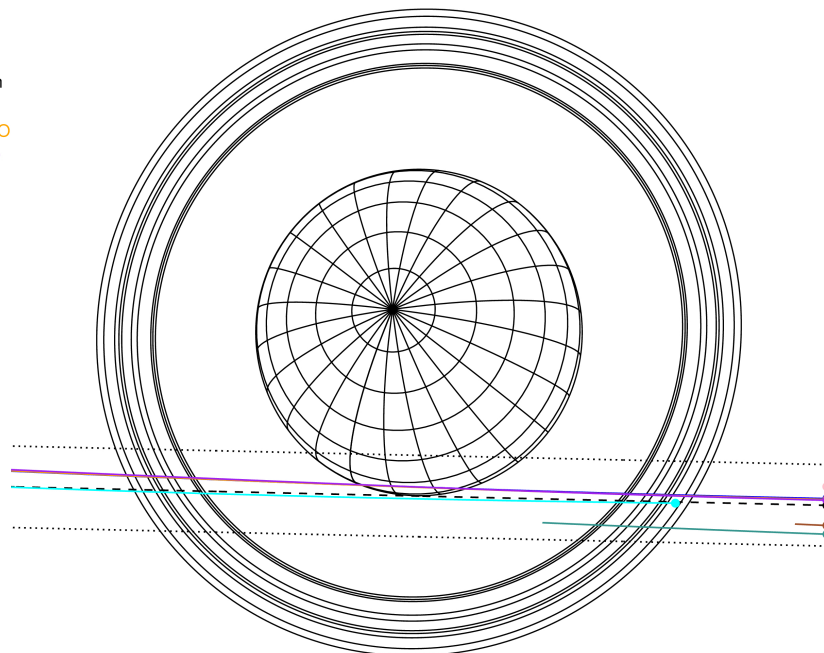
- 1 41837.2 6
- 2 42235.0 5
- 3 42571.2 4
- 4 44718.5 alpha
- 5 45661.1 beta
- 6 47176.1 eta
- 7 47626.3 gamma
- 8 48300.3 delta
- 9 50026.7 lambda
- 10 51149.4 epsilon



2033-02-19T06:11:27.4100 α: 05 47 51.3358 δ: +23 37 32.656 C/A 1.898° PA 358.70 deg v_sky - 7.07 km/s D 18.54 AU
 Credit: Styled after SORA/Lucky Star

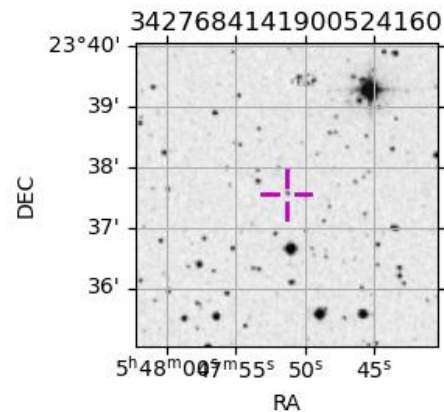
Uranus 2033-02-19T06:11:27 K14.33 G17.28 PtRgt

Earth
 PAL
 KPNO
 MCD
 TEN
 IRTF
 RIO
 ESO

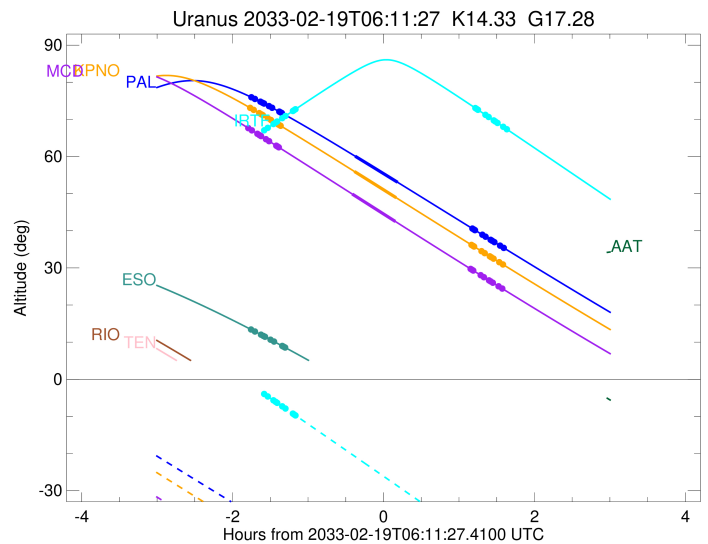
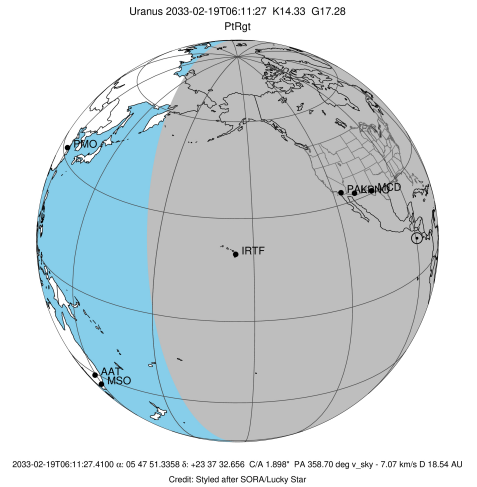


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	+++++	+ +	+++++	FEB 19 04:27 - FEB 19 07:47	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++	+ +	+++++	FEB 19 04:26 - FEB 19 07:47	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++	+ +	+++++	FEB 19 04:24 - FEB 19 07:46	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++		+++++	FEB 19 04:44 - FEB 19 07:50	PnnRie
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	+++++			FEB 19 04:27 - FEB 19 04:53	PnnRin
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



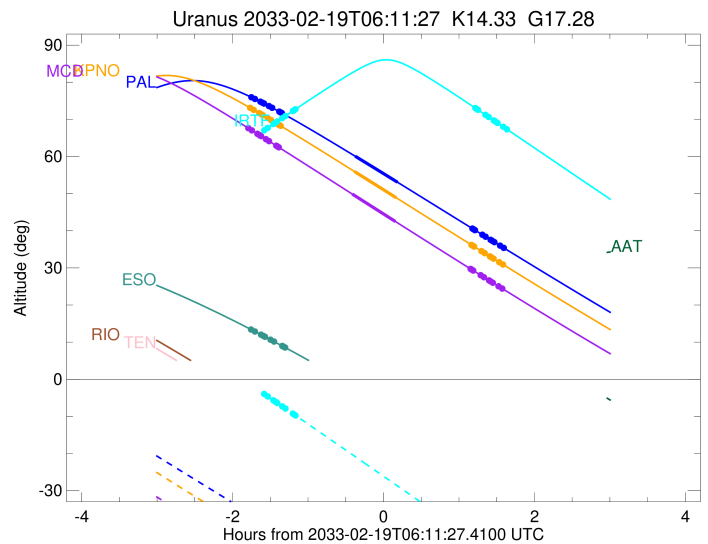
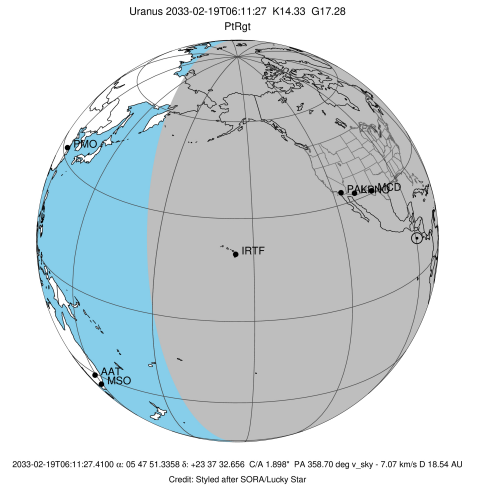
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-19T06:04:36.530
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : PAL
 Location : Palomar Mt (200")
 Latitude (deg) : 33.35622
 E. Longitude (deg) : 243.13601
 Altitude (km) : 1.706
 Gaia source ID : 3427684141900524160
 2Mass ID (if available) : 05475133+2337329
 ICRS Star Coord at Epoch: 05h 47m 51.33578s +23:37:32.65650s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.326
 G magnitude : 17.281
 RP magnitude : 16.409
 BP magnitude : 18.084
 DUPflag : 0
 Distance (au) : 18.543
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -7.07
 Sun-Target sep (deg) : 116.77
 Sun-Moon sep (deg) : 117.91
 B (ring opening deg) : 77.59
 PA of pole (deg) : 48.84
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.800
 C/A sky separation (km) : 24201.5
 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	2033-02-19T04:27:20.668		75.82	-36.50	50793.75	-6.65		
lambda	I	2033-02-19T04:29:16.509		75.50	-36.90	50026.71	-6.61		
delta	I	2033-02-19T04:33:39.404		74.77	-37.79	48300.35	-6.53		
gamma	I	2033-02-19T04:35:23.613		74.47	-38.15	47621.93	-6.49		
eta	I	2033-02-19T04:36:32.388		74.27	-38.38	47176.12	-6.47		
beta	I	2033-02-19T04:40:31.241		73.56	-39.19	45641.06	-6.39		
alpha	I	2033-02-19T04:43:00.927		73.12	-39.70	44688.20	-6.33		
4	I	2033-02-19T04:48:45.277		72.06	-40.86	42529.38	-6.18		
5	I	2033-02-19T04:49:35.927		71.91	-41.03	42224.60	-6.17		
6	I	2033-02-19T04:50:33.488		71.73	-41.22	41876.43	-6.13		
Uranus	I	2033-02-19T05:48:55.802		60.08	-52.56	25177.97		-10.17	-10.64
Uranus	E	2033-02-19T06:22:42.025		53.06	-58.46	25485.95		-4.39	-4.60
6	E	2033-02-19T07:22:01.395		40.62	-66.19	41808.83	5.97		
5	E	2033-02-19T07:23:25.908		40.32	-66.31	42313.31	6.01		
4	E	2033-02-19T07:24:08.173		40.18	-66.37	42569.64	6.02		
alpha	E	2033-02-19T07:30:05.547		38.93	-66.82	44744.86	6.15		
beta	E	2033-02-19T07:32:35.146		38.41	-66.99	45670.17	6.20		
eta	E	2033-02-19T07:36:36.591		37.57	-67.24	47176.12	6.27		
gamma	E	2033-02-19T07:37:48.136		37.32	-67.30	47625.69	6.29		
delta	E	2033-02-19T07:39:35.092		36.95	-67.39	48300.35	6.32		
lambda	E	2033-02-19T07:44:06.707		36.00	-67.60	50026.71	6.39		
epsilon	E	2033-02-19T07:47:57.807		35.20	-67.74	51509.04	6.43		

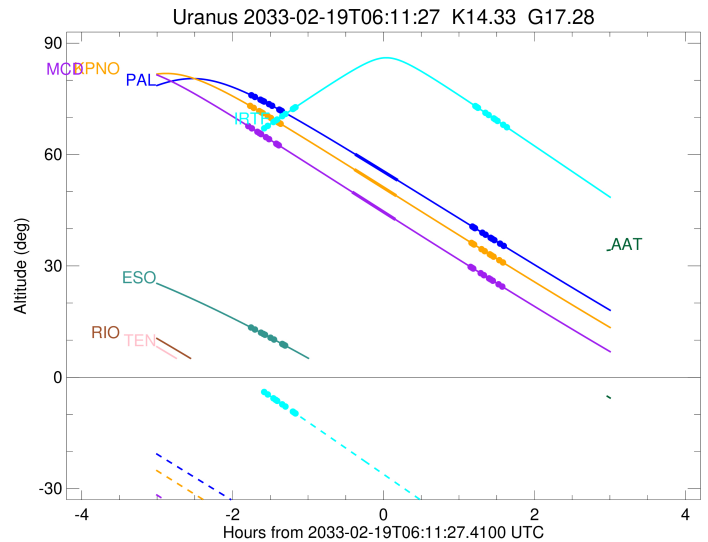
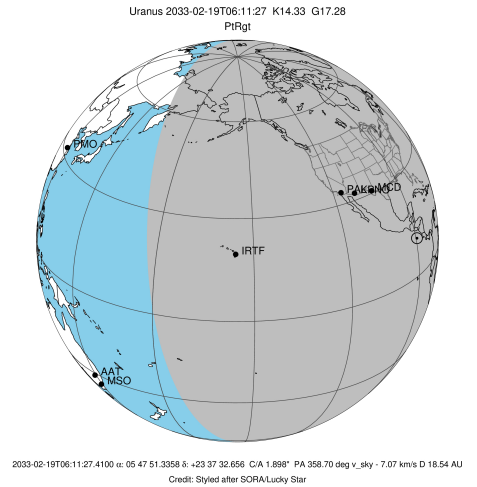
```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-02-19T06:03:43.130
Event type           : PtRgt
: Uranus occs: topocentric, not geocentric
: 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       : 3427684141900524160
2Mass ID (if available) : 05475133+2337329
ICRS Star Coord at Epoch: 05h 47m 51.33578s +23:37:32.65650s
RUWE (>1.4 is poor) : 0.96
K magnitude          : 14.326
G magnitude          : 17.281
RP magnitude         : 16.409
BP magnitude         : 18.084
DUPflag             : 0
Distance (au)        : 18.543
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -7.07
Sun-Target sep (deg) : 116.77
Sun-Moon sep (deg)   : 117.90
B (ring opening deg) : 77.59
PA of pole (deg)     : 48.84
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.802
C/A sky separation (km) : 24236.3
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	2033-02-19T04:26:22.991		72.93	-40.94	50794.25	-6.65		
lambda	I	2033-02-19T04:28:18.983		72.56	-41.34	50026.71	-6.60		
delta	I	2033-02-19T04:32:42.076		71.69	-42.24	48300.35	-6.52		
gamma	I	2033-02-19T04:34:26.373		71.35	-42.60	47621.92	-6.49		
eta	I	2033-02-19T04:35:35.208		71.12	-42.83	47176.12	-6.46		
beta	I	2033-02-19T04:39:34.291		70.32	-43.65	45641.06	-6.38		
alpha	I	2033-02-19T04:42:04.133		69.82	-44.15	44688.24	-6.32		
4	I	2033-02-19T04:47:48.914		68.65	-45.32	42529.33	-6.17		
5	I	2033-02-19T04:48:39.593		68.48	-45.49	42224.82	-6.16		
6	I	2033-02-19T04:49:37.275		68.29	-45.69	41876.38	-6.12		
Uranus	I	2033-02-19T05:48:15.487		55.99	-56.97	25181.26		-10.13	-10.60
Uranus	E	2033-02-19T06:21:36.159		48.89	-62.53	25484.88		-4.43	-4.64
6	E	2033-02-19T07:21:17.555		36.22	-68.89	41808.82	5.95		
5	E	2033-02-19T07:22:42.419		35.92	-68.95	42313.30	5.98		
4	E	2033-02-19T07:23:24.864		35.77	-68.98	42569.66	5.99		
alpha	E	2033-02-19T07:29:23.711		34.51	-69.19	44744.87	6.13		
beta	E	2033-02-19T07:31:53.927		33.98	-69.25	45670.18	6.17		
eta	E	2033-02-19T07:35:56.369		33.13	-69.31	47176.12	6.25		
gamma	E	2033-02-19T07:37:08.211		32.88	-69.32	47625.69	6.27		
delta	E	2033-02-19T07:38:55.611		32.50	-69.33	48300.35	6.30		
lambda	E	2033-02-19T07:43:28.357		31.54	-69.32	50026.71	6.36		
epsilon	E	2033-02-19T07:47:20.449		30.73	-69.27	51509.19	6.40		

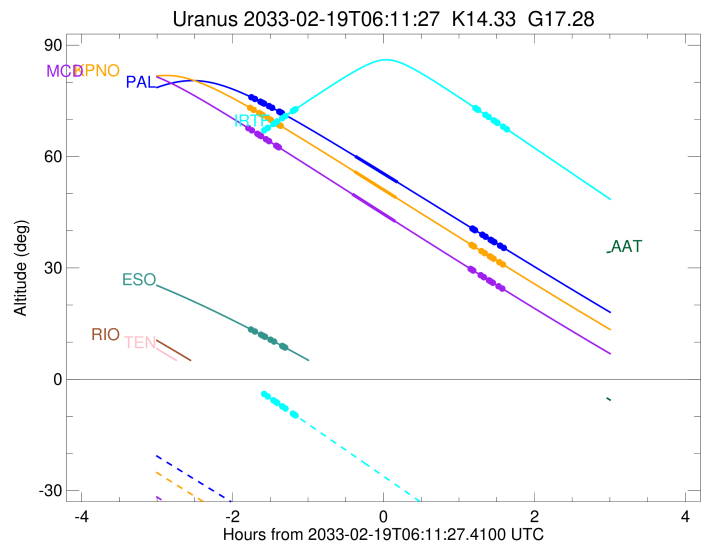
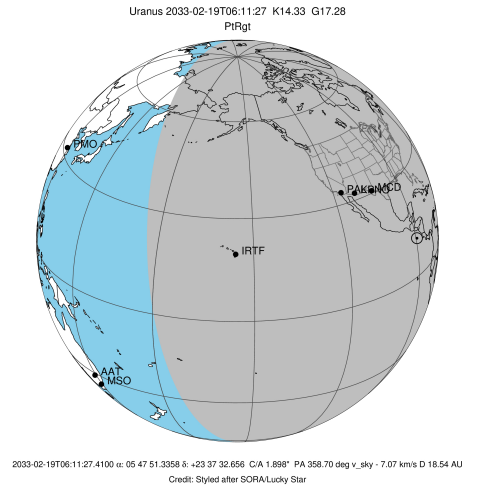
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-19T06:02:33.980
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : Ring occs: geocentric, topocentric
 Observer code : MCD
 Location : McDonald Obs. 2.7m
 Latitude (deg) : 30.67158
 E. Longitude (deg) : 255.97844
 Altitude (km) : 2.075
 Gaia source ID : 3427684141900524160
 2Mass ID (if available) : 05475133+2337329
 ICRS Star Coord at Epoch: 05h 47m 51.33578s +23:37:32.65650s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.326
 G magnitude : 17.281
 RP magnitude : 16.409
 BP magnitude : 18.084
 DUPflag : 0
 Distance (au) : 18.543
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -7.07
 Sun-Target sep (deg) : 116.77
 Sun-Moon sep (deg) : 117.87
 B (ring opening deg) : 77.59
 PA of pole (deg) : 48.84
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.798
 C/A sky separation (km) : 24184.1
 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	2033-02-19T04:24:53.682		67.45	-47.22	50794.50	-6.64		
lambda	I	2033-02-19T04:26:49.797		67.04	-47.62	50026.71	-6.60		
delta	I	2033-02-19T04:31:13.095		66.11	-48.51	48300.35	-6.52		
gamma	I	2033-02-19T04:32:57.478		65.74	-48.87	47621.92	-6.48		
eta	I	2033-02-19T04:34:06.370		65.50	-49.10	47176.12	-6.46		
beta	I	2033-02-19T04:38:05.657		64.65	-49.91	45641.06	-6.37		
alpha	I	2033-02-19T04:40:35.628		64.12	-50.41	44688.26	-6.32		
4	I	2033-02-19T04:46:20.721		62.89	-51.56	42529.31	-6.17		
5	I	2033-02-19T04:47:11.434		62.71	-51.73	42224.88	-6.15		
6	I	2033-02-19T04:48:09.180		62.50	-51.92	41876.37	-6.12		
Uranus	I	2033-02-19T05:46:39.155		49.89	-62.68	25178.73		-10.16	-10.63
Uranus	E	2033-02-19T06:20:54.910		42.50	-67.56	25488.38		-4.32	-4.52
6	E	2033-02-19T07:20:36.327		29.75	-70.47	41808.70	5.92		
5	E	2033-02-19T07:22:01.598		29.45	-70.42	42313.24	5.95		
4	E	2033-02-19T07:22:44.277		29.30	-70.40	42569.82	5.97		
alpha	E	2033-02-19T07:28:44.847		28.03	-70.13	44744.95	6.10		
beta	E	2033-02-19T07:31:15.813		27.50	-70.00	45670.24	6.14		
eta	E	2033-02-19T07:35:19.492		26.65	-69.74	47176.12	6.22		
gamma	E	2033-02-19T07:36:31.713		26.39	-69.66	47625.71	6.23		
delta	E	2033-02-19T07:38:19.677		26.01	-69.53	48300.35	6.26		
lambda	E	2033-02-19T07:42:53.895		25.05	-69.16	50026.71	6.33		
epsilon	E	2033-02-19T07:46:47.360		24.24	-68.81	51509.77	6.36		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-02-19T06:11:31.660
Event type           : PtRgt
: Uranus occs: topocentric, not geocentric
: 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       : 3427684141900524160
2Mass ID (if available) : 05475133+2337329
ICRS Star Coord at Epoch: 05h 47m 51.33578s +23:37:32.65650s
RUWE (>1.4 is poor) : 0.96
K magnitude           : 14.326
G magnitude           : 17.281
RP magnitude          : 16.409
BP magnitude          : 18.084
DUPflag              : 0
Distance (au)        : 18.543
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -7.07
Sun-Target sep (deg) : 116.77
Sun-Moon sep (deg)   : 117.82
B (ring opening deg) : 77.59
PA of pole (deg)     : 48.84
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation ("): 1.937
C/A sky separation (km): 26047.6
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
    
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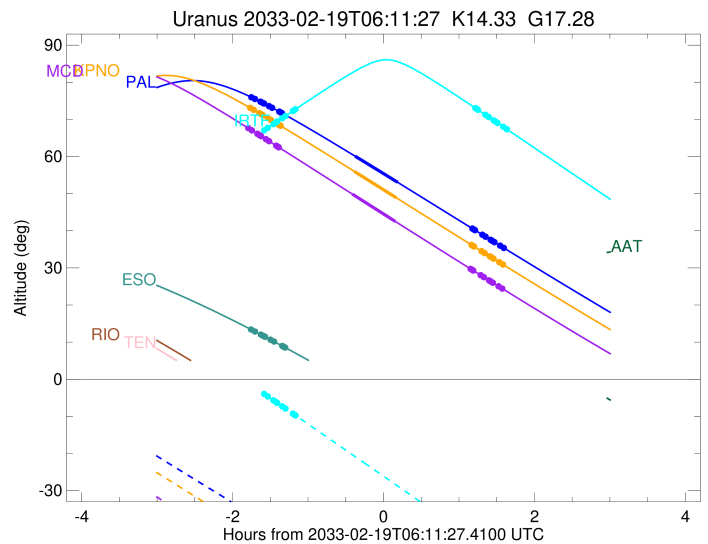
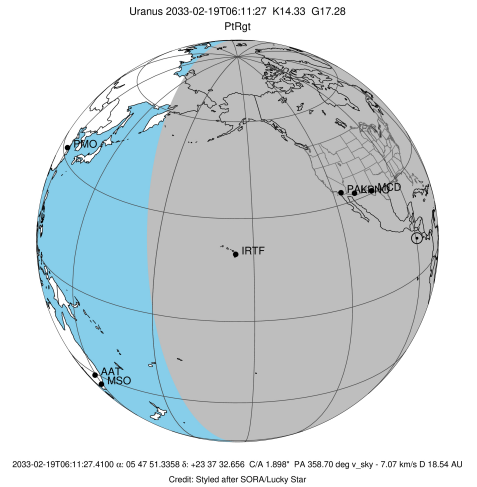


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-02-19T04:37:30.582		67.28	-4.18x	50799.55	-6.50		
lambda	I	2033-02-19T04:39:30.100		67.74	-4.64x	50026.71	-6.45		
delta	I	2033-02-19T04:43:59.664		68.76	-5.68	48300.35	-6.36		
gamma	I	2033-02-19T04:45:46.683		69.17	-6.09	47621.83	-6.32		
eta	I	2033-02-19T04:46:57.341		69.44	-6.37	47176.12	-6.29		
beta	I	2033-02-19T04:51:03.139		70.37	-7.32	45641.08	-6.20		
alpha	I	2033-02-19T04:53:37.430		70.96	-7.91	44688.80	-6.13		
4	I	2033-02-19T04:59:33.859		72.31	-9.30	42528.69	-5.96		
5	I	2033-02-19T05:00:25.807		72.50	-9.50	42227.97	-5.94		
6	I	2033-02-19T05:01:26.254		72.73	-9.73	41875.68	-5.90		

No planet occultations

6	E	2033-02-19T07:24:21.580		73.08	-43.26	41811.06	5.87		
5	E	2033-02-19T07:25:47.266		72.76	-43.60	42314.31	5.91		
4	E	2033-02-19T07:26:29.580		72.60	-43.77	42566.62	5.93		
alpha	E	2033-02-19T07:32:31.545		71.23	-45.18	44743.47	6.10		
beta	E	2033-02-19T07:35:02.398		70.66	-45.77	45669.06	6.16		
eta	E	2033-02-19T07:39:05.214		69.74	-46.72	47176.12	6.25		
gamma	E	2033-02-19T07:40:16.915		69.47	-47.00	47625.38	6.28		
delta	E	2033-02-19T07:42:04.105		69.06	-47.42	48300.35	6.32		
lambda	E	2033-02-19T07:46:35.592		68.03	-48.48	50026.71	6.40		
epsilon	E	2033-02-19T07:50:24.322		67.15	-49.37	51498.40	6.45		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-02-19T06:00:08.830
 Event type : PtRgt
 : Uranus occs: topocentric, not geocentric
 : 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 : 3427684141900524160
 2Mass ID (if available) : 05475133+2337329
 ICRS Star Coord at Epoch: 05h 47m 51.33578s +23:37:32.65650s
 RUWE (>1.4 is poor) : 0.96
 K magnitude : 14.326
 G magnitude : 17.281
 RP magnitude : 16.409
 BP magnitude : 18.084
 DUPflag : 0
 Distance (au) : 18.543
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -7.07
 Sun-Target sep (deg) : 116.77
 Sun-Moon sep (deg) : 117.29
 B (ring opening deg) : 77.59
 PA of pole (deg) : 48.84
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.149
 C/A sky separation (km) : 28900.5
 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	2033-02-19T04:27:04.916		13.24	-49.10	50820.11	-6.09		
lambda	I	2033-02-19T04:29:16.135		12.86	-49.19	50026.71	-6.02		
delta	I	2033-02-19T04:34:05.740		12.01	-49.37	48300.35	-5.90		
gamma	I	2033-02-19T04:36:01.299		11.66	-49.43	47621.56	-5.85		
eta	I	2033-02-19T04:37:17.699		11.44	-49.46	47176.12	-5.81		
beta	I	2033-02-19T04:41:44.788		10.64	-49.57	45641.30	-5.68		
alpha	I	2033-02-19T04:44:33.280		10.13	-49.63	44690.72	-5.59		
4	I	2033-02-19T04:51:07.210		8.94	-49.72	42527.19	-5.36		
5	I	2033-02-19T04:52:03.212		8.77	-49.72	42237.24	-5.34		
6	I	2033-02-19T04:53:12.731		8.56	-49.73	41873.29	-5.28		

No planet occultations

6	E	2033-02-19T07:11:21.579	-18.84x	-38.29	41813.52	5.08		
5	E	2033-02-19T07:12:59.952	-19.18x	-38.04	42314.98	5.13		
4	E	2033-02-19T07:13:47.998	-19.35x	-37.92	42563.52	5.15		
alpha	E	2033-02-19T07:20:42.138	-20.80x	-36.85	44742.00	5.36		
beta	E	2033-02-19T07:23:33.533	-21.40x	-36.40	45667.94	5.43		
eta	E	2033-02-19T07:28:08.230	-22.37x	-35.66	47176.12	5.54		
gamma	E	2033-02-19T07:29:28.984	-22.65x	-35.45	47625.10	5.57		
delta	E	2033-02-19T07:31:29.640	-23.08x	-35.12	48300.35	5.62		
lambda	E	2033-02-19T07:36:34.164	-24.15x	-34.28	50026.71	5.72		
epsilon	E	2033-02-19T07:40:48.050	-25.05x	-33.57	51488.15	5.78		