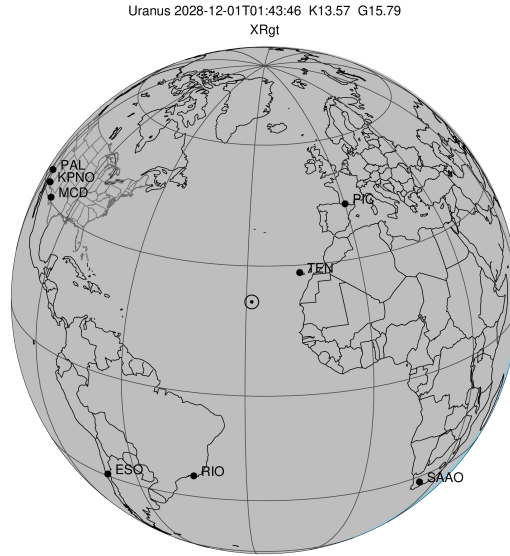


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:43:46.320
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Gaia source ID : 146370084562725632
 2Mass ID (if available) : 04413934+2211080

ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s

RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 15.15
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15

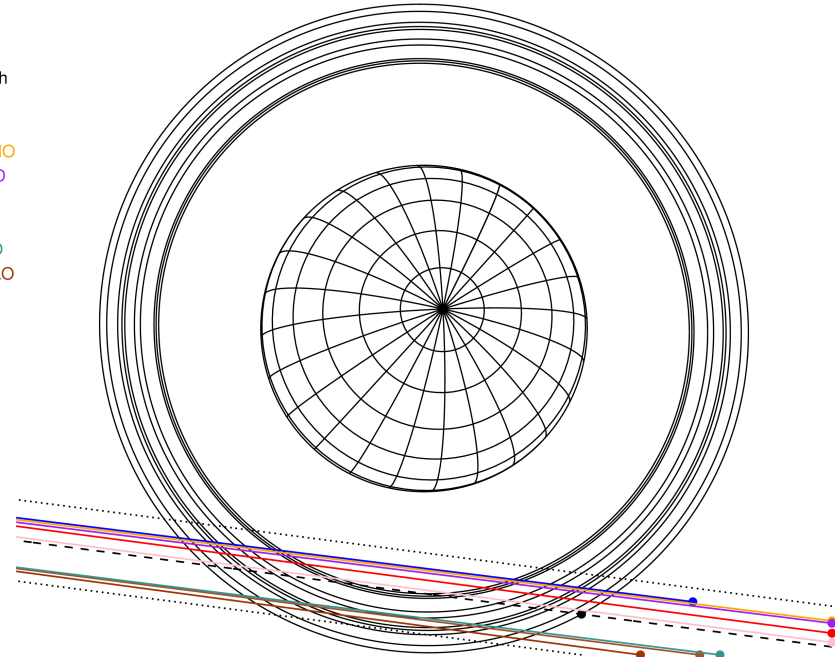
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2028-12-01T01:43:46.3200 ra: 04 41 39.3385 s: +22 11 07.844 C/A 3.095° PA 352.56 deg v_sky -23.41 km/s D 18.31 AU
 Credit: Styled after SORA/Lucky Star

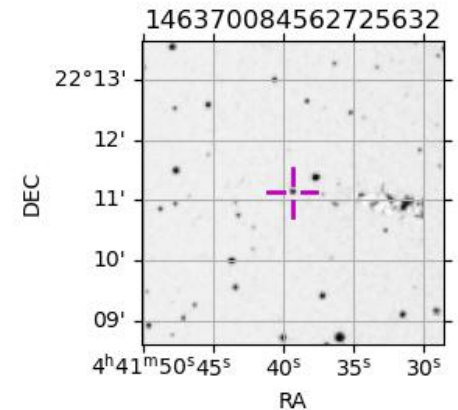
Uranus 2028-12-01T01:43:46 K13.57 G15.79 XRgt

Earth
 PIC
 PAL
 KPNO
 MCD
 TEN
 RIO
 ESO
 SAAO

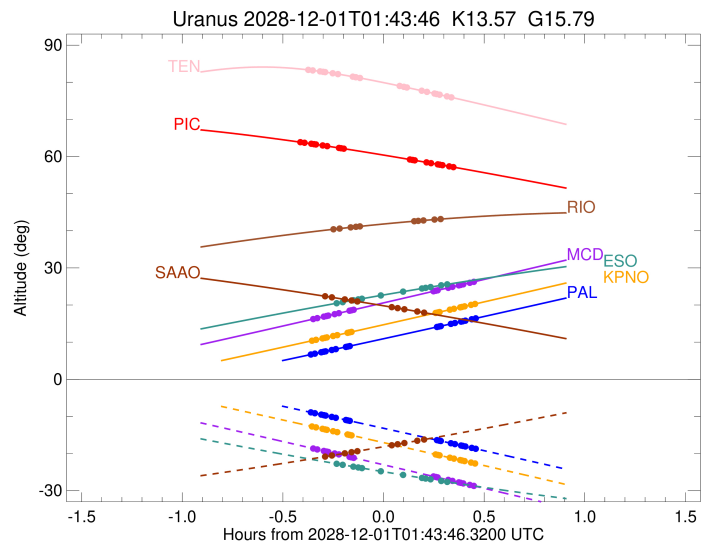
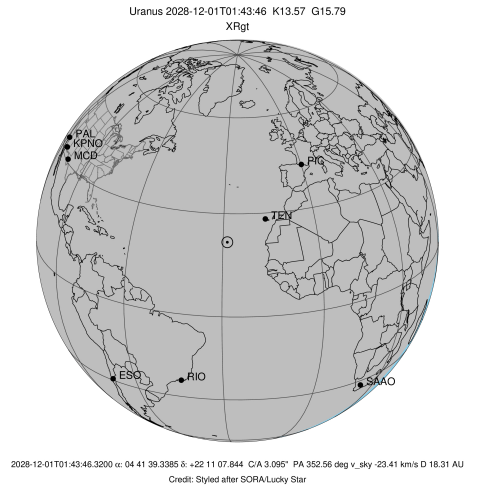


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 01 01:18 - DEC 01 02:05	PnnRie
PAL	Palomar Mt (200")	33.4	243.1	+++++		+++++	DEC 01 01:22 - DEC 01 02:11	PnnRie
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+++++		+++++	DEC 01 01:22 - DEC 01 02:11	PnnRie
MCD	McDonald Obs. 2.7m	30.7	256.0	+++++		+++++	DEC 01 01:22 - DEC 01 02:11	PnnRie
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	DEC 01 01:21 - DEC 01 02:04	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8	++++		++++	DEC 01 01:28 - DEC 01 02:01	PnnRie
ESO	European Southern Obs	-29.3	289.3	+++++		+++++	DEC 01 01:29 - DEC 01 02:03	PnnRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	++++		++++	DEC 01 01:26 - DEC 01 01:56	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:42:09.750
 Event type : XRgt
 : No Uranus occs
 : 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 : 146370084562725632
 2Mass ID (if available) : 04413934+2211080
 ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
 RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 15.61
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.940
 C/A sky separation (km) : 39036.5
 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

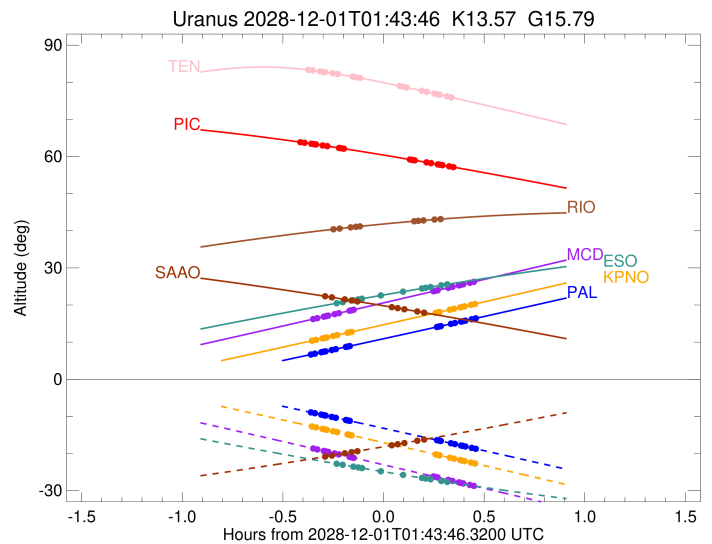
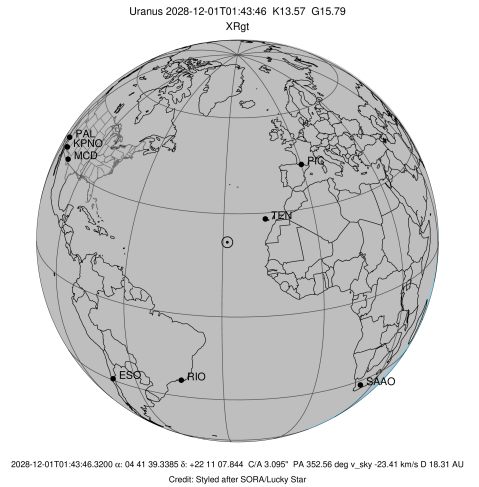


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:18:51.370		63.88	-61.88	51275.32	-15.39		
lambda	I	2028-12-01T01:20:14.745		63.70	-61.69	50026.71	-14.69		
delta	I	2028-12-01T01:22:15.930		63.44	-61.40	48300.35	-13.79		
gamma	I	2028-12-01T01:23:05.143		63.33	-61.29	47631.50	-13.39		
eta	I	2028-12-01T01:23:39.508		63.25	-61.21	47176.12	-13.11		
beta	I	2028-12-01T01:25:38.681		62.99	-60.92	45675.96	-12.06		
alpha	I	2028-12-01T01:27:01.648		62.80	-60.72	44708.78	-11.24		
4	I	2028-12-01T01:30:35.810		62.30	-60.20	42533.89	-8.96		
5	I	2028-12-01T01:31:16.894		62.21	-60.10	42175.09	-8.47		
6	I	2028-12-01T01:32:00.924		62.11	-59.99	41815.91	-7.95		

No planet occultations

6	E	2028-12-01T01:51:31.298		59.22	-56.98	41797.53	7.94		
5	E	2028-12-01T01:52:16.396		59.10	-56.86	42154.82	8.47		
4	E	2028-12-01T01:52:58.415		58.99	-56.74	42526.59	8.96		
alpha	E	2028-12-01T01:56:31.725		58.44	-56.17	44686.08	11.24		
beta	E	2028-12-01T01:57:56.998		58.21	-55.94	45680.21	12.05		
eta	E	2028-12-01T01:59:55.950		57.90	-55.62	47176.12	13.10		
gamma	E	2028-12-01T02:00:30.163		57.81	-55.52	47629.05	13.38		
delta	E	2028-12-01T02:01:19.602		57.68	-55.39	48300.35	13.77		
lambda	E	2028-12-01T02:03:20.905		57.35	-55.06	50026.71	14.67		
epsilon	E	2028-12-01T02:05:02.371		57.08	-54.78	51550.74	15.38		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:47:04.880
 Event type : XRgt
 : No Uranus occs
 : 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 : 146370084562725632
 2Mass ID (if available) : 04413934+2211080
 ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
 RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 14.39
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.807
 C/A sky separation (km) : 37270.8
 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_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



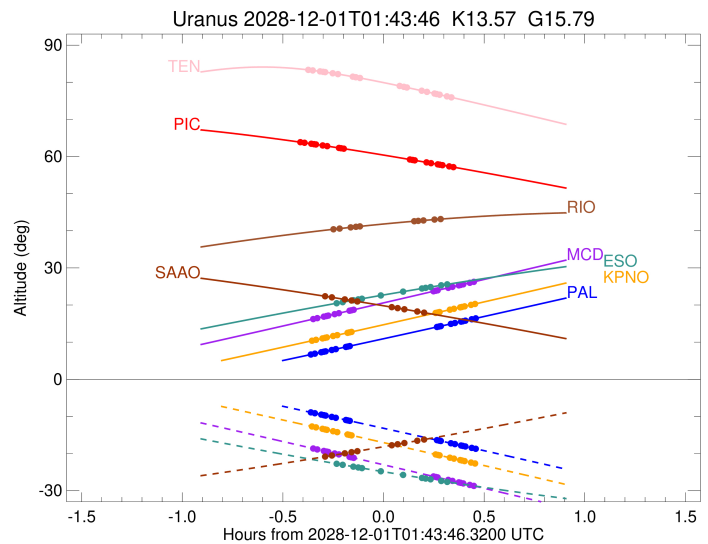
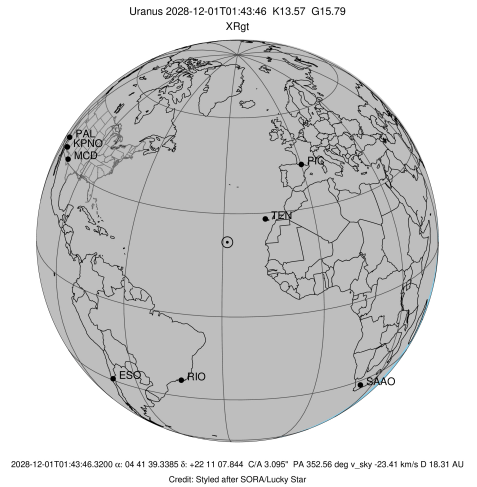
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:22:01.548		6.65	-8.90	51252.40	-16.07		
lambda	I	2028-12-01T01:23:19.589		6.90	-9.15	50026.71	-15.47		
delta	I	2028-12-01T01:25:13.906		7.27	-9.53	48300.35	-14.72		
gamma	I	2028-12-01T01:25:59.851		7.42	-9.68	47631.42	-14.40		
eta	I	2028-12-01T01:26:31.734		7.53	-9.78	47176.12	-14.16		
beta	I	2028-12-01T01:28:20.969		7.88	-10.14	45674.84	-13.32		
alpha	I	2028-12-01T01:29:35.075		8.12	-10.38	44711.59	-12.67		
4	I	2028-12-01T01:32:38.520		8.72	-10.99	42536.82	-10.95		
5	I	2028-12-01T01:33:11.504		8.83	-11.10	42181.38	-10.59		
6	I	2028-12-01T01:33:46.289		8.94	-11.21	41820.37	-10.23		

No planet occultations

6	E	2028-12-01T01:59:36.592		14.06	-16.37	41796.17	10.25		
5	E	2028-12-01T02:00:12.297		14.18	-16.49	42155.22	10.61		
4	E	2028-12-01T02:00:46.192		14.30	-16.61	42527.49	10.97		
alpha	E	2028-12-01T02:03:48.229		14.90	-17.22	44685.46	12.70		
beta	E	2028-12-01T02:05:04.450		15.16	-17.47	45679.75	13.35		
eta	E	2028-12-01T02:06:53.051		15.52	-17.84	47176.12	14.20		
gamma	E	2028-12-01T02:07:24.659		15.63	-17.95	47628.79	14.44		
delta	E	2028-12-01T02:08:10.647		15.78	-18.10	48300.35	14.77		
lambda	E	2028-12-01T02:10:04.598		16.16	-18.49	50026.71	15.52		
epsilon	E	2028-12-01T02:11:40.766		16.49	-18.81	51547.59	16.13		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch             : 2028-12-01T01:47:08.800
Event type           : XRgt
: No Uranus occs
: 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       : 146370084562725632
2Mass ID (if available) : 04413934+2211080
ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
RUWE (>1.4 is poor) : 1.26
K magnitude           : 13.573
G magnitude           : 15.787
RP magnitude          : 15.057
BP magnitude          : 16.327
DUPflag              : 0
Distance (au)        : 18.310
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.41
Sun-Target sep (deg) : 177.07
Sun-Moon sep (deg)   : 14.40
B (ring opening deg) : 80.42
PA of pole (deg)     : -44.15
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.829
C/A sky separation (km) : 37568.9
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_itrf93_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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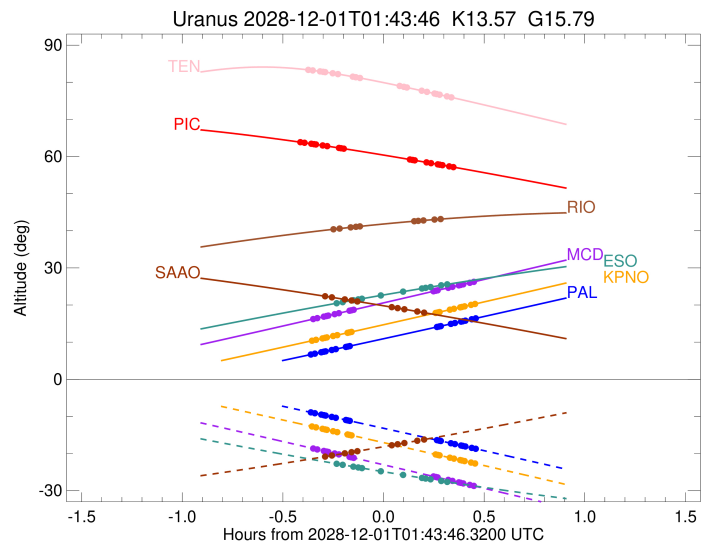
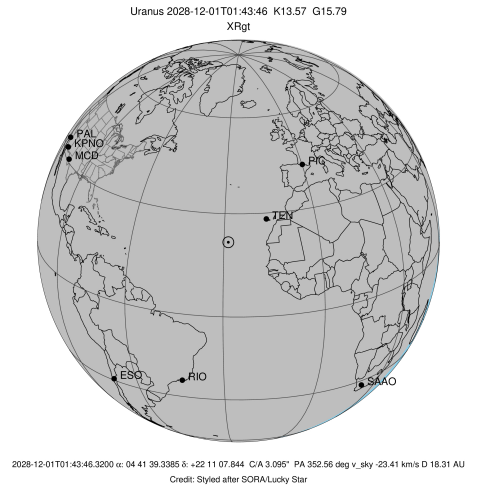


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:22:21.263		10.36	-12.70	51255.67	-15.94		
lambda	I	2028-12-01T01:23:40.177		10.62	-12.97	50026.71	-15.33		
delta	I	2028-12-01T01:25:35.644		11.01	-13.36	48300.35	-14.56		
gamma	I	2028-12-01T01:26:22.119		11.17	-13.51	47631.43	-14.23		
eta	I	2028-12-01T01:26:54.398		11.27	-13.62	47176.12	-13.98		
beta	I	2028-12-01T01:28:45.177		11.65	-14.00	45675.00	-13.11		
alpha	I	2028-12-01T01:30:00.597		11.90	-14.25	44711.18	-12.44		
4	I	2028-12-01T01:33:08.268		12.53	-14.89	42536.38	-10.64		
5	I	2028-12-01T01:33:42.280		12.65	-15.00	42180.45	-10.27		
6	I	2028-12-01T01:34:18.194		12.77	-15.12	41819.72	-9.89		

No planet occultations

6	E	2028-12-01T01:59:12.288		17.84	-20.23	41796.36	9.91		
5	E	2028-12-01T01:59:49.127		17.97	-20.36	42155.10	10.29		
4	E	2028-12-01T02:00:24.044		18.09	-20.48	42527.31	10.66		
alpha	E	2028-12-01T02:03:30.306		18.72	-21.12	44685.56	12.47		
beta	E	2028-12-01T02:04:47.836		18.99	-21.39	45679.84	13.15		
eta	E	2028-12-01T02:06:37.977		19.37	-21.77	47176.12	14.03		
gamma	E	2028-12-01T02:07:09.981		19.48	-21.88	47628.84	14.27		
delta	E	2028-12-01T02:07:56.497		19.64	-22.04	48300.35	14.60		
lambda	E	2028-12-01T02:09:51.594		20.03	-22.43	50026.71	15.38		
epsilon	E	2028-12-01T02:11:28.612		20.37	-22.77	51548.27	16.00		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:47:08.980
 Event type : XRgt
 : No Uranus occs
 : 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 : 146370084562725632
 2Mass ID (if available) : 04413934+2211080
 ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
 RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 14.43
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.858
 C/A sky separation (km) : 37957.5
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl1.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

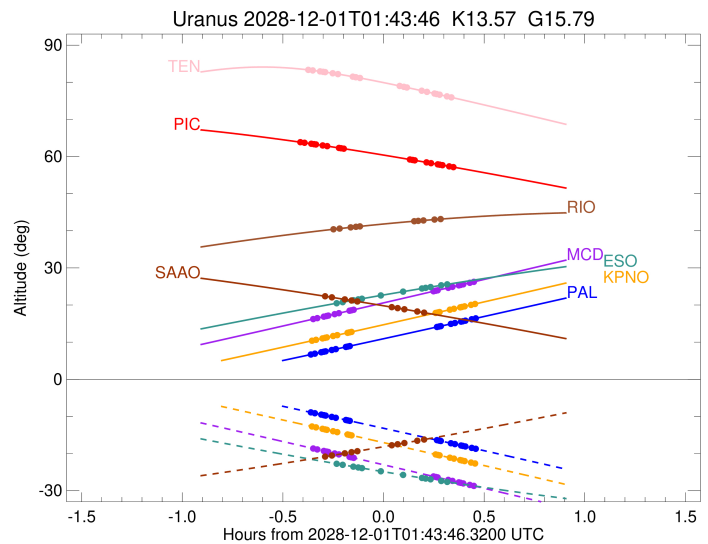
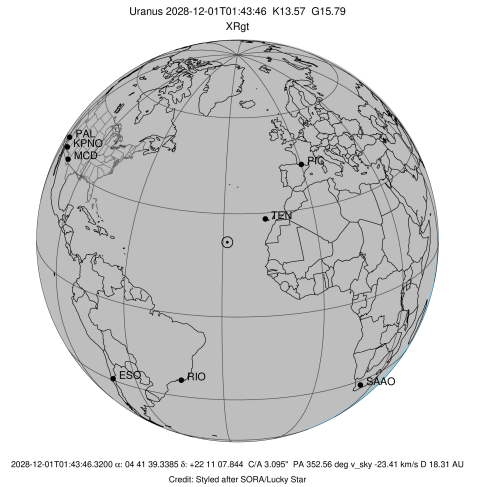


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:22:42.690		16.19	-18.63	51260.01	-15.78		
lambda	I	2028-12-01T01:24:02.773		16.47	-18.91	50026.71	-15.15		
delta	I	2028-12-01T01:25:59.789		16.87	-19.31	48300.35	-14.35		
gamma	I	2028-12-01T01:26:46.985		17.04	-19.48	47631.45	-14.00		
eta	I	2028-12-01T01:27:19.806		17.15	-19.59	47176.12	-13.75		
beta	I	2028-12-01T01:29:12.709		17.54	-19.98	45675.22	-12.83		
alpha	I	2028-12-01T01:30:29.961		17.81	-20.25	44710.64	-12.13		
4	I	2028-12-01T01:33:43.672		18.48	-20.93	42535.80	-10.23		
5	I	2028-12-01T01:34:19.192		18.60	-21.05	42179.20	-9.83		
6	I	2028-12-01T01:34:56.782		18.73	-21.18	41818.85	-9.42		

No planet occultations

6	E	2028-12-01T01:58:33.743		23.68	-26.15	41796.64	9.44		
5	E	2028-12-01T01:59:12.268		23.82	-26.29	42154.97	9.85		
4	E	2028-12-01T01:59:48.685		23.94	-26.42	42527.08	10.25		
alpha	E	2028-12-01T02:03:00.995		24.62	-27.09	44685.70	12.16		
beta	E	2028-12-01T02:04:20.353		24.90	-27.37	45679.95	12.87		
eta	E	2028-12-01T02:06:12.621		25.29	-27.77	47176.12	13.79		
gamma	E	2028-12-01T02:06:45.168		25.41	-27.89	47628.91	14.04		
delta	E	2028-12-01T02:07:32.406		25.58	-28.05	48300.35	14.39		
lambda	E	2028-12-01T02:09:29.054		25.99	-28.47	50026.71	15.20		
epsilon	E	2028-12-01T02:11:07.213		26.33	-28.81	51549.11	15.84		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:43:03.900
 Event type : XRgt
 : No Uranus occs
 : 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 : 146370084562725632
 2Mass ID (if available) : 04413934+2211080
 ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
 RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 15.50
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.057
 C/A sky separation (km) : 40600.8
 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

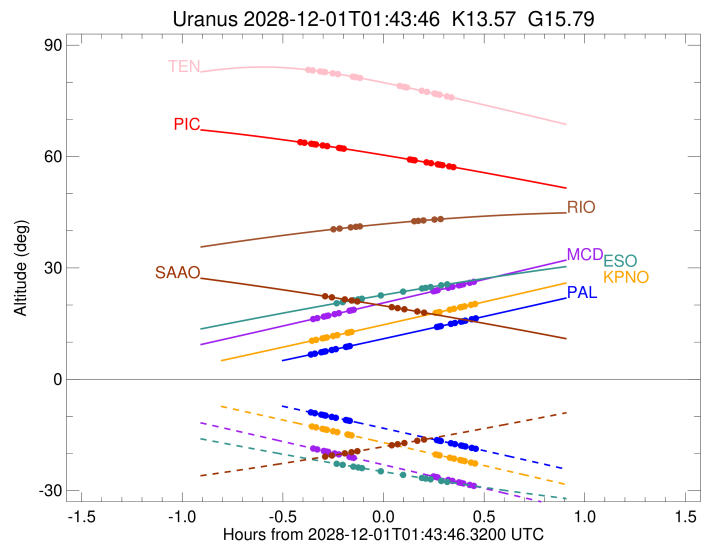
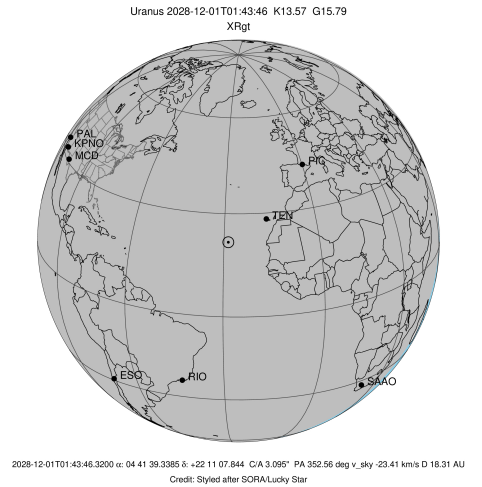


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:21:11.667		83.36	-81.37	51293.45	-14.53		
lambda	I	2028-12-01T01:22:41.769		83.20	-81.14	50026.71	-13.72		
delta	I	2028-12-01T01:24:52.545		82.94	-80.78	48300.35	-12.66		
gamma	I	2028-12-01T01:25:46.355		82.82	-80.63	47631.54	-12.19		
eta	I	2028-12-01T01:26:24.236		82.74	-80.53	47176.12	-11.85		
beta	I	2028-12-01T01:28:37.902		82.43	-80.14	45676.88	-10.57		
alpha	I	2028-12-01T01:30:14.357		82.20	-79.86	44706.24	-9.54		
4	I	2028-12-01T01:34:45.308		81.49	-79.04	42531.23	-6.39		
5	I	2028-12-01T01:35:45.382		81.33	-78.85	42168.93	-5.62		
6	I	2028-12-01T01:36:55.384		81.13	-78.64	41810.98	-4.71		

No planet occultations

6	E	2028-12-01T01:48:23.445		79.05	-76.40	41800.11	4.71		
5	E	2028-12-01T01:49:34.536		78.83	-76.16	42155.47	5.62		
4	E	2028-12-01T01:50:35.506		78.63	-75.96	42525.99	6.39		
alpha	E	2028-12-01T01:55:05.534		77.75	-75.04	44687.01	9.54		
beta	E	2028-12-01T01:56:44.246		77.42	-74.70	45680.63	10.57		
eta	E	2028-12-01T01:58:57.628		76.97	-74.24	47176.12	11.85		
gamma	E	2028-12-01T01:59:35.338		76.84	-74.11	47629.34	12.19		
delta	E	2028-12-01T02:00:29.344		76.66	-73.92	48300.35	12.66		
lambda	E	2028-12-01T02:02:40.160		76.22	-73.47	50026.71	13.72		
epsilon	E	2028-12-01T02:04:28.279		75.85	-73.09	51553.31	14.53		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:45:16.150
 Event type : XRgt
 : No Uranus occs
 : 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 : 146370084562725632
 2Mass ID (if available) : 04413934+2211080
 ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
 RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 15.15
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.412
 C/A sky separation (km) : 45315.7
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

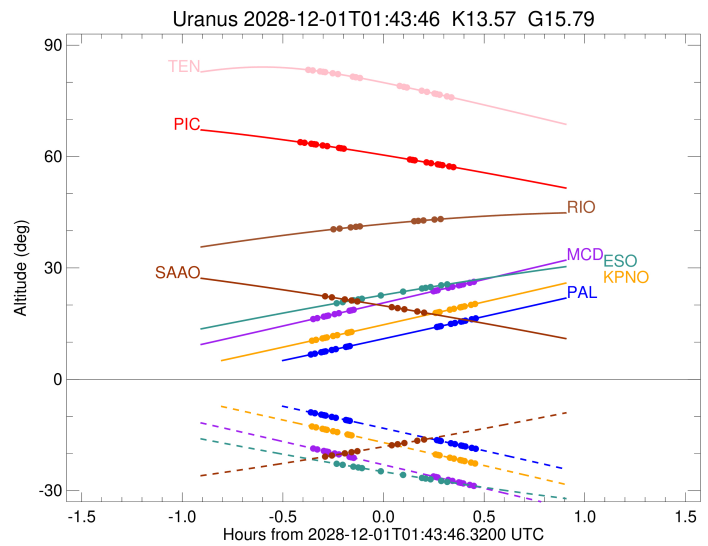
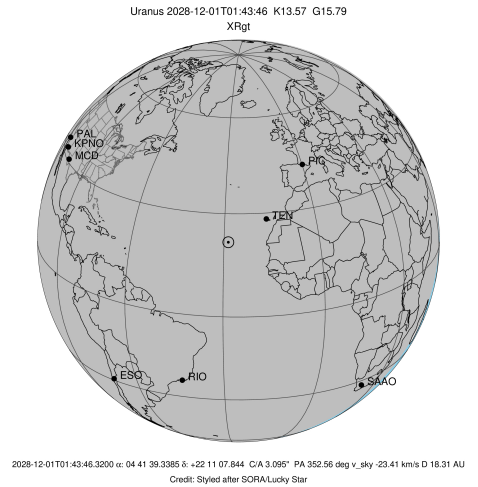


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:28:33.728		40.37	-41.94	51355.89	-11.02		
lambda	I	2028-12-01T01:30:42.924		40.59	-42.13	50026.71	-9.69		
delta	I	2028-12-01T01:34:01.264		40.92	-42.42	48300.35	-7.69		
gamma	I	2028-12-01T01:35:34.352		41.07	-42.55	47631.53	-6.68		
eta	I	2028-12-01T01:36:46.979		41.19	-42.65	47176.12	-5.86		

No planet occultations

eta	E	2028-12-01T01:52:53.613		42.57	-43.81	47176.12	5.86		
gamma	E	2028-12-01T01:54:06.027		42.66	-43.89	47630.33	6.68		
delta	E	2028-12-01T01:55:39.246		42.78	-43.98	48300.35	7.69		
lambda	E	2028-12-01T01:58:57.458		43.02	-44.17	50026.71	9.69		
epsilon	E	2028-12-01T02:01:24.629		43.19	-44.31	51554.07	11.03		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2028-12-01T01:46:43.650
 Event type : XRgt
 : No Uranus occs
 : 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 : 146370084562725632
 2Mass ID (if available) : 04413934+2211080
 ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
 RUWE (>1.4 is poor) : 1.26
 K magnitude : 13.573
 G magnitude : 15.787
 RP magnitude : 15.057
 BP magnitude : 16.327
 DUPflag : 0
 Distance (au) : 18.310
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.41
 Sun-Target sep (deg) : 177.07
 Sun-Moon sep (deg) : 14.78
 B (ring opening deg) : 80.42
 PA of pole (deg) : -44.15
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.390
 C/A sky separation (km) : 45011.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.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



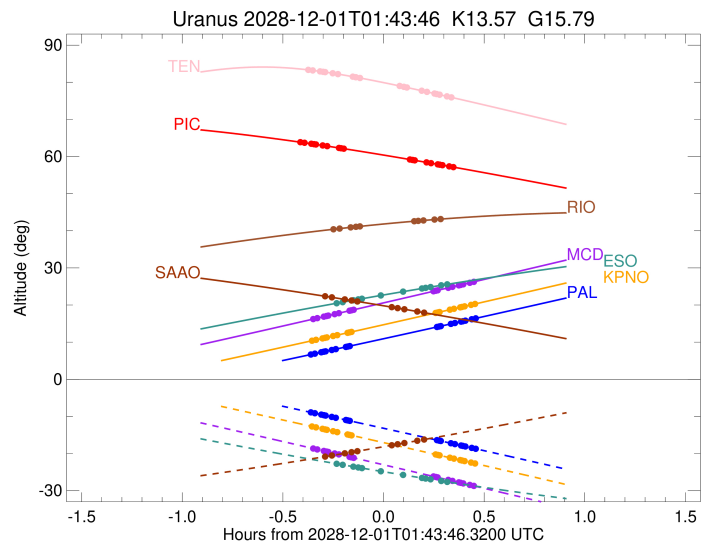
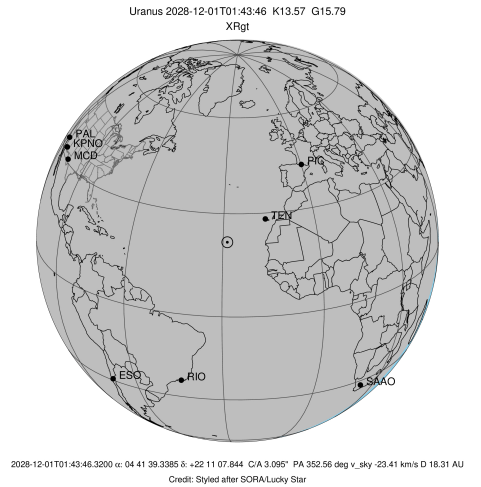
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-01T01:29:31.567		20.43	-22.72	51350.75	-11.23		
lambda	I	2028-12-01T01:31:37.330		20.77	-23.05	50026.71	-9.96		
delta	I	2028-12-01T01:34:48.433		21.29	-23.54	48300.35	-8.08		
gamma	I	2028-12-01T01:36:16.251		21.52	-23.77	47631.55	-7.15		
eta	I	2028-12-01T01:37:23.406		21.70	-23.94	47176.12	-6.41		
beta	I	2028-12-01T01:42:57.387		22.58	-24.78	45680.20	-2.49		

No planet occultations

beta	E	2028-12-01T01:49:38.618		23.61	-25.78	45681.11	2.49		
eta	E	2028-12-01T01:55:12.056		24.45	-26.58	47176.12	6.42		
gamma	E	2028-12-01T01:56:18.963		24.62	-26.74	47630.26	7.16		
delta	E	2028-12-01T01:57:46.860		24.84	-26.95	48300.35	8.09		
lambda	E	2028-12-01T02:00:57.695		25.31	-27.39	50026.71	9.97		
epsilon	E	2028-12-01T02:03:21.457		25.66	-27.73	51554.39	11.25		


```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2028-12-01T01:41:33.120
Event type          : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code       : SAAO
Location            : So. Afr. Astro. Obs. (Sutherland)
Latitude (deg)      : -32.37953
E. Longitude (deg)  : 20.81070
Altitude (km)       : 1.768
Gaia source ID      : 146370084562725632
2Mass ID (if available) : 04413934+2211080
ICRS Star Coord at Epoch: 04h 41m 39.33853s +22:11:07.84364s
RUWE (>1.4 is poor) : 1.26
K magnitude          : 13.573
G magnitude          : 15.787
RP magnitude         : 15.057
BP magnitude         : 16.327
DUPflag             : 0
Distance (au)       : 18.310
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.41
Sun-Target sep (deg) : 177.07
Sun-Moon sep (deg)  : 15.87
B (ring opening deg) : 80.42
PA of pole (deg)    : -44.15
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.478
C/A sky separation (km) : 46185.9
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLvl1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrfr93_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	2028-12-01T01:26:00.582		22.41	-20.89	51371.75	-10.15		
lambda	I	2028-12-01T01:28:24.721		22.06	-20.53	50026.71	-8.64		
delta	I	2028-12-01T01:32:16.320		21.51	-19.94	48300.35	-6.23		
gamma	I	2028-12-01T01:34:16.650		21.22	-19.64	47631.45	-4.88		
eta	I	2028-12-01T01:36:03.375		20.95	-19.37	47176.12	-3.65		

No planet occultations

eta	E	2028-12-01T01:46:10.297		19.44	-17.79	47176.12	3.64		
gamma	E	2028-12-01T01:47:56.900		19.17	-17.51	47630.56	4.88		
delta	E	2028-12-01T01:49:57.506		18.86	-17.19	48300.35	6.22		
lambda	E	2028-12-01T01:53:49.346		18.26	-16.57	50026.71	8.63		
epsilon	E	2028-12-01T01:56:31.661		17.84	-16.13	51552.86	10.14		