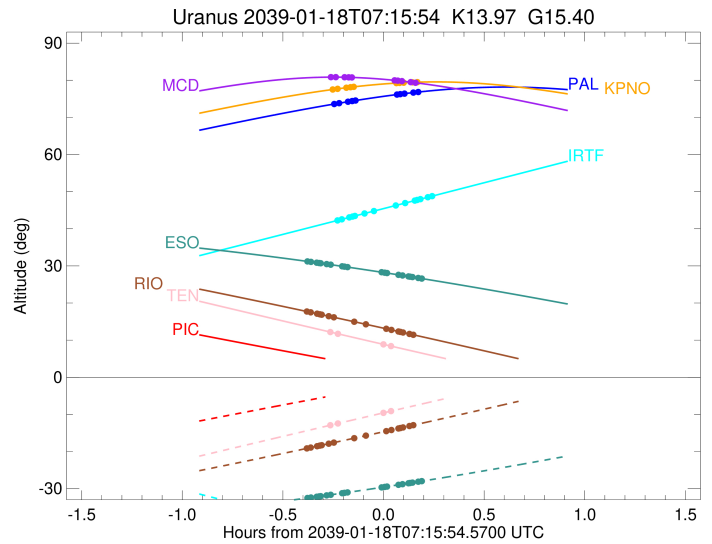
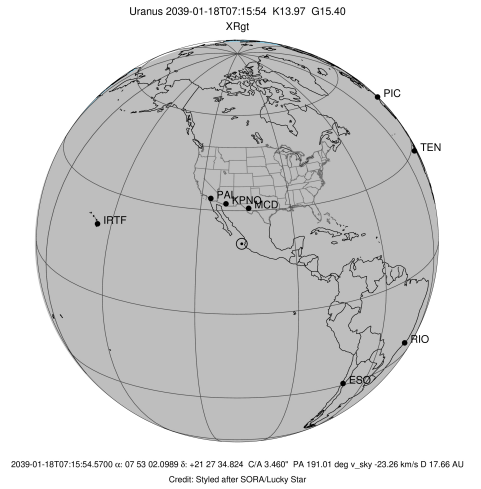



```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-01-18T07:16:36.350
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       : 673770937273169536
2Mass ID (if available) : 07530211+2127349
ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
RUWE (>1.4 is poor) : 0.95
K magnitude           : 13.973
G magnitude           : 15.403
RP magnitude          : 14.891
BP magnitude          : 15.741
DUPflag              : 0
Distance (au)         : 17.661
f0 (km)               : 0.000
g0 (km)               : 0.000
skyplane vel. (km/s) : -23.26
Sun-Target sep (deg) : 178.54
Sun-Moon sep (deg)   : 99.05
B (ring opening deg) : 50.73
PA of pole (deg)     : 87.91
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.541
C/A sky separation (km) : 45356.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itrff93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

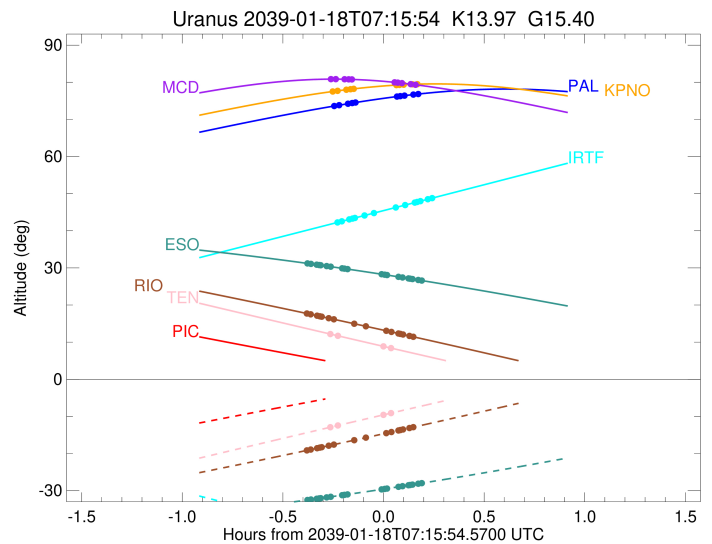
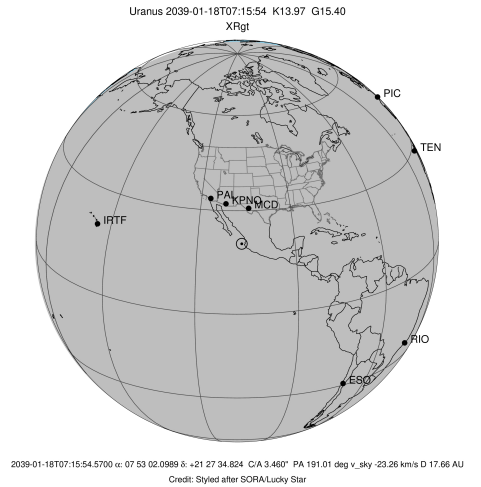
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-18T07:01:44.750		73.69	-72.29	50743.55	-12.97		
lambda	I	2039-01-18T07:02:41.901		73.83	-72.44	50026.71	-12.11		
delta	I	2039-01-18T07:05:21.100		74.23	-72.84	48300.35	-9.53		
gamma	I	2039-01-18T07:06:37.541		74.42	-73.03	47622.25	-8.20		
eta	I	2039-01-18T07:07:35.638		74.55	-73.18	47176.12	-7.15		

No planet occultations

eta	E	2039-01-18T07:19:53.915		76.15	-74.84	47176.12	7.15		
gamma	E	2039-01-18T07:20:51.857		76.26	-74.96	47621.03	8.20		
delta	E	2039-01-18T07:22:08.437		76.41	-75.11	48300.35	9.53		
lambda	E	2039-01-18T07:24:47.612		76.69	-75.41	50026.71	12.11		
epsilon	E	2039-01-18T07:25:56.510		76.80	-75.54	50897.07	12.97		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-01-18T07:16:13.820
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      : 673770937273169536
2Mass ID (if available) : 07530211+2127349
ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
RUWE (>1.4 is poor) : 0.95
K magnitude         : 13.973
G magnitude         : 15.403
RP magnitude        : 14.891
BP magnitude        : 15.741
DUPflag            : 0
Distance (au)       : 17.661
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.26
Sun-Target sep (deg) : 178.54
Sun-Moon sep (deg)  : 99.07
B (ring opening deg) : 50.73
PA of pole (deg)    : 87.91
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.535
C/A sky separation (km) : 45281.4
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
    
```



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

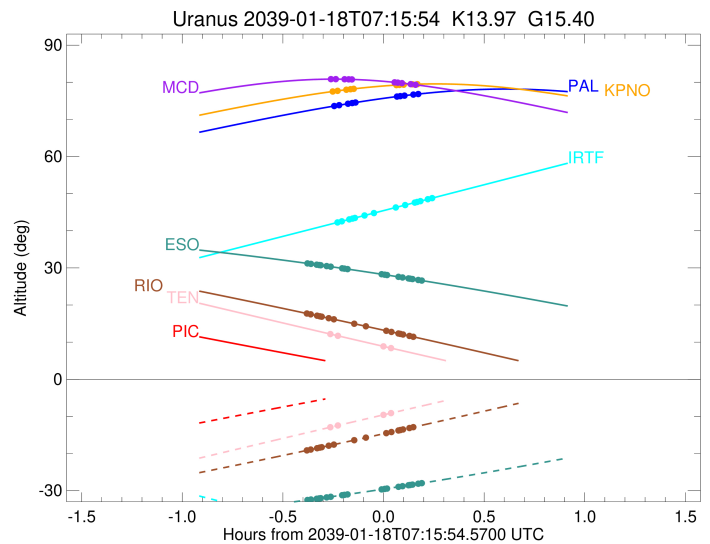
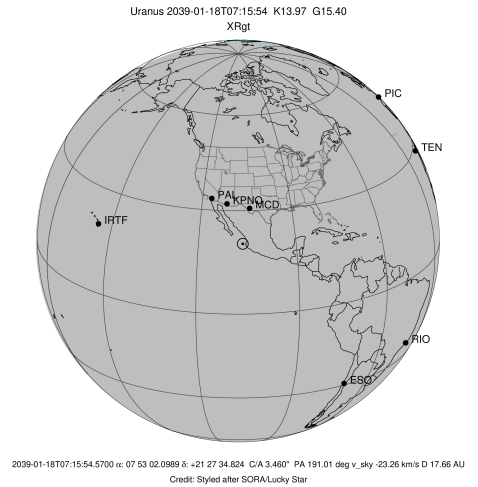
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-18T07:01:17.845		77.59	-76.27	50743.53	-13.07		
lambda	I	2039-01-18T07:02:14.502		77.70	-76.39	50026.71	-12.22		
delta	I	2039-01-18T07:04:51.784		78.00	-76.71	48300.35	-9.68		
gamma	I	2039-01-18T07:06:06.825		78.14	-76.86	47622.27	-8.38		
eta	I	2039-01-18T07:07:03.500		78.24	-76.96	47176.12	-7.36		

No planet occultations

eta	E	2039-01-18T07:19:42.575		79.25	-78.14	47176.12	7.36		
gamma	E	2039-01-18T07:20:39.099		79.29	-78.21	47621.02	8.38		
delta	E	2039-01-18T07:21:54.288		79.35	-78.29	48300.35	9.68		
lambda	E	2039-01-18T07:24:31.565		79.45	-78.44	50026.71	12.23		
epsilon	E	2039-01-18T07:25:39.963		79.49	-78.50	50898.06	13.08		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-01-18T07:15:41.180
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      : 673770937273169536
2Mass ID (if available) : 07530211+2127349
ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
RUWE (>1.4 is poor) : 0.95
K magnitude         : 13.973
G magnitude         : 15.403
RP magnitude        : 14.891
BP magnitude        : 15.741
DUPflag            : 0
Distance (au)       : 17.661
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.26
Sun-Target sep (deg) : 178.54
Sun-Moon sep (deg)  : 99.10
B (ring opening deg) : 50.73
PA of pole (deg)    : 87.91
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.535
C/A sky separation (km) : 45280.5
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_itrff93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

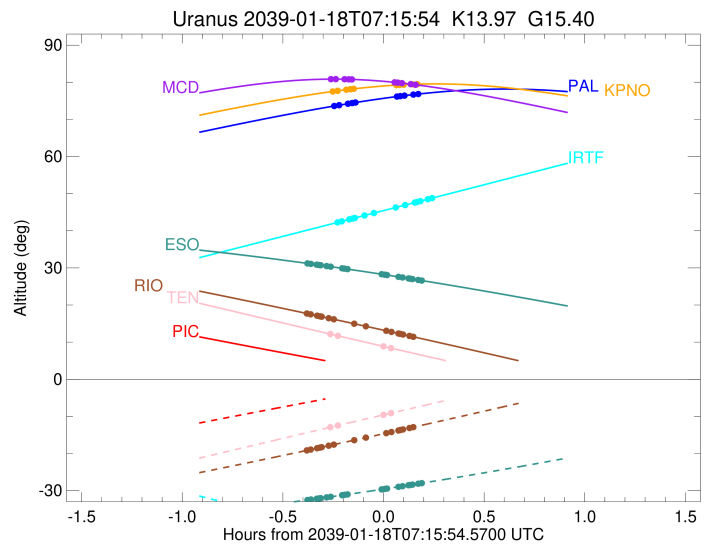
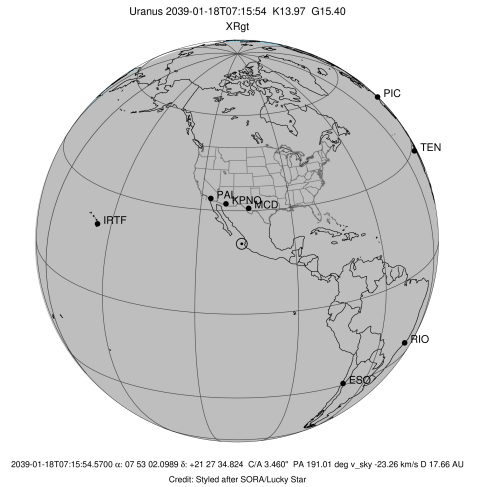
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-18T07:00:45.684		80.85	-79.97	50743.53	-13.08		
lambda	I	2039-01-18T07:01:42.300		80.85	-80.00	50026.71	-12.23		
delta	I	2039-01-18T07:04:19.444		80.82	-80.04	48300.35	-9.69		
gamma	I	2039-01-18T07:05:34.396		80.80	-80.05	47622.28	-8.39		
eta	I	2039-01-18T07:06:30.985		80.77	-80.05	47176.12	-7.37		

No planet occultations

eta	E	2039-01-18T07:19:11.057		79.99	-79.63	47176.12	7.37		
gamma	E	2039-01-18T07:20:07.504		79.90	-79.57	47621.02	8.39		
delta	E	2039-01-18T07:21:22.614		79.78	-79.48	48300.35	9.69		
lambda	E	2039-01-18T07:23:59.783		79.50	-79.28	50026.71	12.23		
epsilon	E	2039-01-18T07:25:08.137		79.38	-79.18	50897.92	13.08		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-01-18T07:12:07.930
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       : 673770937273169536
2Mass ID (if available) : 07530211+2127349
ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
RUWE (>1.4 is poor) : 0.95
K magnitude           : 13.973
G magnitude           : 15.403
RP magnitude          : 14.891
BP magnitude          : 15.741
DUPflag              : 0
Distance (au)        : 17.661
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -23.26
Sun-Target sep (deg) : 178.54
Sun-Moon sep (deg)   : 98.40
B (ring opening deg) : 50.73
PA of pole (deg)     : 87.91
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.752
C/A sky separation (km) : 48064.8
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

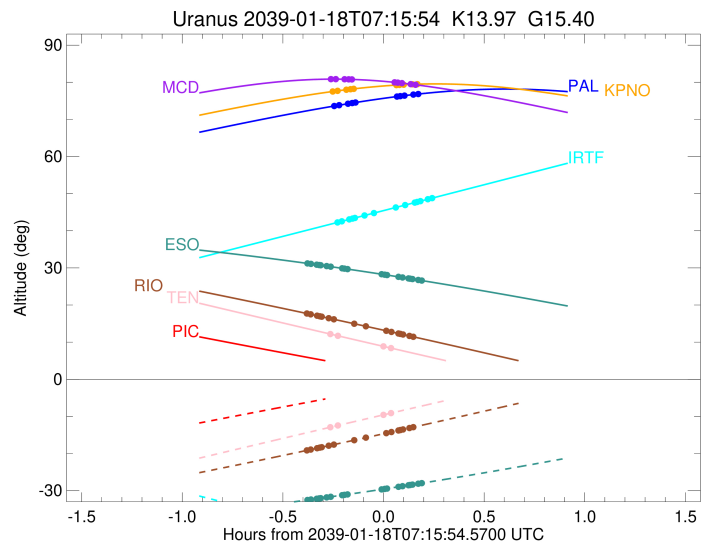
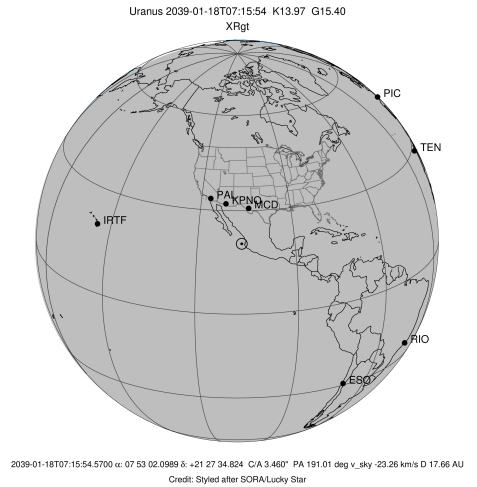
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-18T07:00:49.377		12.02	-12.76	50748.54	-8.68		
lambda	I	2039-01-18T07:02:20.633		11.70	-12.44	50026.71	-7.16		

No planet occultations

lambda	E	2039-01-18T07:15:51.598		8.87	-9.60	50026.71	7.15		
epsilon	E	2039-01-18T07:17:34.857		8.51	-9.24	50852.38	8.67		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-01-18T07:19:08.390
Event type          : XRgt
: No Uranus occs
: 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      : 673770937273169536
2Mass ID (if available) : 07530211+2127349
ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
RUWE (>1.4 is poor) : 0.95
K magnitude         : 13.973
G magnitude         : 15.403
RP magnitude        : 14.891
BP magnitude        : 15.741
DUPflag            : 0
Distance (au)       : 17.661
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.26
Sun-Target sep (deg) : 178.54
Sun-Moon sep (deg)  : 98.72
B (ring opening deg) : 50.73
PA of pole (deg)    : 87.91
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.424
C/A sky separation (km) : 43861.0
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLvl.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
    
```

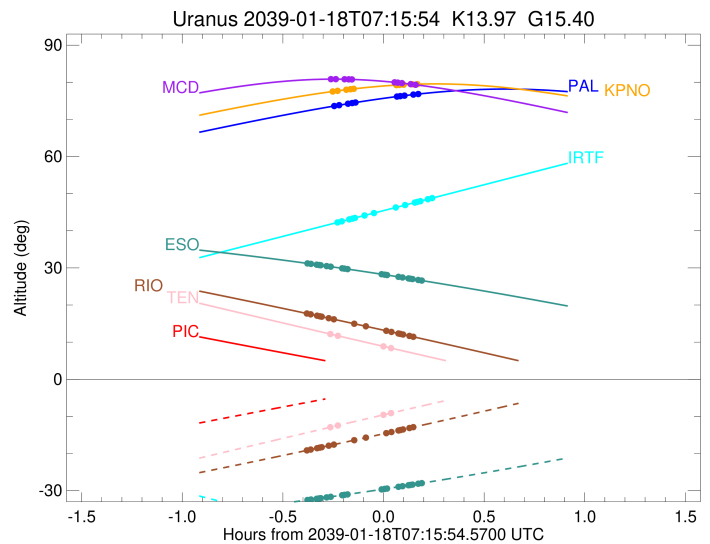
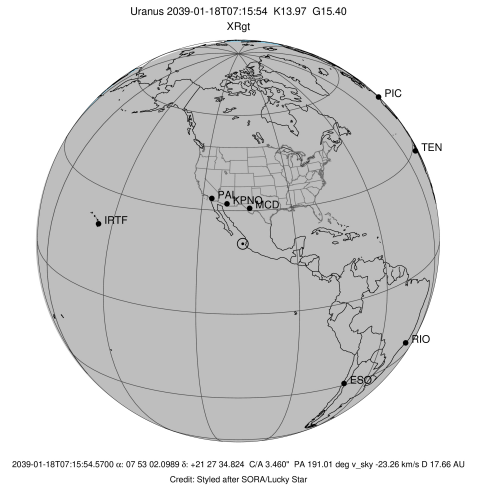


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-18T07:02:39.839		42.36	-41.06	50743.95	-14.63		
lambda	I	2039-01-18T07:03:30.029		42.56	-41.25	50026.71	-13.94		
delta	I	2039-01-18T07:05:43.286		43.07	-41.77	48300.35	-11.94		
gamma	I	2039-01-18T07:06:42.416		43.30	-41.99	47622.60	-10.98		
eta	I	2039-01-18T07:07:24.414		43.46	-42.16	47176.12	-10.28		
beta	I	2039-01-18T07:10:19.471		44.14	-42.83	45646.60	-7.15		
alpha	I	2039-01-18T07:13:12.781		44.81	-43.50	44697.42	-3.79		

No planet occultations

alpha	E	2039-01-18T07:19:26.516		46.25	-44.94	44704.72	3.80		
beta	E	2039-01-18T07:22:18.805		46.92	-45.61	45654.62	7.16		
eta	E	2039-01-18T07:25:12.755		47.59	-46.28	47176.12	10.29		
gamma	E	2039-01-18T07:25:54.561		47.75	-46.44	47620.97	10.99		
delta	E	2039-01-18T07:26:53.771		47.98	-46.67	48300.35	11.95		
lambda	E	2039-01-18T07:29:06.851		48.49	-47.19	50026.71	13.96		
epsilon	E	2039-01-18T07:30:08.844		48.73	-47.43	50919.04	14.65		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2039-01-18T07:11:32.190
 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 : 673770937273169536
 2Mass ID (if available) : 07530211+2127349
 ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.973
 G magnitude : 15.403
 RP magnitude : 14.891
 BP magnitude : 15.741
 DUPflag : 0
 Distance (au) : 17.661
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.26
 Sun-Target sep (deg) : 178.54
 Sun-Moon sep (deg) : 98.48
 B (ring opening deg) : 50.73
 PA of pole (deg) : 87.91
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.282
 C/A sky separation (km) : 42044.8
 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

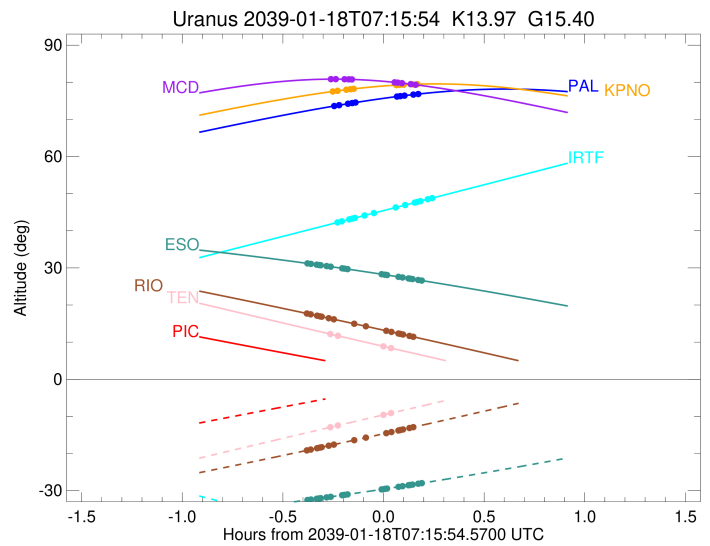
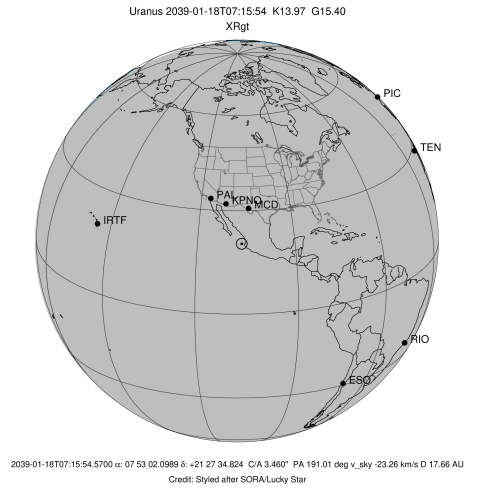


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-18T06:53:28.883		17.64	-19.08	50746.70	-16.39		
lambda	I	2039-01-18T06:54:13.502		17.49	-18.94	50026.71	-15.85		
delta	I	2039-01-18T06:56:07.979		17.12	-18.57	48300.35	-14.28		
gamma	I	2039-01-18T06:56:56.613		16.96	-18.41	47623.02	-13.56		
eta	I	2039-01-18T06:57:30.185		16.86	-18.30	47176.12	-13.05		
beta	I	2039-01-18T06:59:37.394		16.44	-17.89	45644.77	-10.99		
alpha	I	2039-01-18T07:01:10.983		16.14	-17.59	44692.61	-9.34		
4	I	2039-01-18T07:07:29.306		14.90	-16.35	42552.34	-1.77		

No planet occultations

4	E	2039-01-18T07:10:17.078		14.34	-15.80	42547.65	1.77		
alpha	E	2039-01-18T07:16:41.488		13.07	-14.53	44710.59	9.33		
beta	E	2039-01-18T07:18:14.281		12.76	-14.22	45657.10	10.98		
eta	E	2039-01-18T07:20:20.718		12.34	-13.80	47176.12	13.03		
gamma	E	2039-01-18T07:20:54.196		12.23	-13.69	47620.96	13.54		
delta	E	2039-01-18T07:21:43.072		12.06	-13.52	48300.35	14.26		
lambda	E	2039-01-18T07:23:37.784		11.68	-13.14	50026.71	15.82		
epsilon	E	2039-01-18T07:24:34.293		11.49	-12.95	50940.65	16.36		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2039-01-18T07:12:46.910
 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 : 673770937273169536
 2Mass ID (if available) : 07530211+2127349
 ICRS Star Coord at Epoch: 07h 53m 02.09894s +21:27:34.82357s
 RUWE (>1.4 is poor) : 0.95
 K magnitude : 13.973
 G magnitude : 15.403
 RP magnitude : 14.891
 BP magnitude : 15.741
 DUPflag : 0
 Distance (au) : 17.661
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -23.26
 Sun-Target sep (deg) : 178.54
 Sun-Moon sep (deg) : 98.68
 B (ring opening deg) : 50.73
 PA of pole (deg) : 87.91
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.155
 C/A sky separation (km) : 40417.1
 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	2039-01-18T06:53:36.953		31.16	-32.48	50750.12	-17.88		
lambda	I	2039-01-18T06:54:17.883		31.08	-32.39	50026.71	-17.43		
delta	I	2039-01-18T06:56:00.750		30.86	-32.18	48300.35	-16.11		
gamma	I	2039-01-18T06:56:43.545		30.77	-32.10	47623.32	-15.52		
eta	I	2039-01-18T06:57:12.742		30.71	-32.04	47176.12	-15.11		
beta	I	2039-01-18T06:58:59.832		30.48	-31.81	45643.82	-13.48		
alpha	I	2039-01-18T07:00:13.770		30.33	-31.66	44690.53	-12.27		
4	I	2039-01-18T07:03:37.770		29.88	-31.22	42561.96	-8.47		
5	I	2039-01-18T07:04:27.877		29.77	-31.12	42159.77	-7.51		
6	I	2039-01-18T07:05:16.801		29.66	-31.01	41820.69	-6.56		

No planet occultations

6	E	2039-01-18T07:15:20.744		28.30	-29.67	41838.87	6.56		
5	E	2039-01-18T07:16:05.589		28.19	-29.56	42182.46	7.50		
4	E	2039-01-18T07:16:50.844		28.09	-29.46	42539.52	8.47		
alpha	E	2039-01-18T07:20:20.754		27.60	-28.98	44714.01	12.26		
beta	E	2039-01-18T07:21:33.862		27.42	-28.80	45658.86	13.47		
eta	E	2039-01-18T07:23:20.108		27.17	-28.55	47176.12	15.09		
gamma	E	2039-01-18T07:23:49.192		27.10	-28.49	47620.98	15.50		
delta	E	2039-01-18T07:24:32.195		26.99	-28.38	48300.35	16.09		
lambda	E	2039-01-18T07:26:15.212		26.75	-28.14	50026.71	17.40		
epsilon	E	2039-01-18T07:27:07.943		26.62	-28.01	50960.83	17.85		