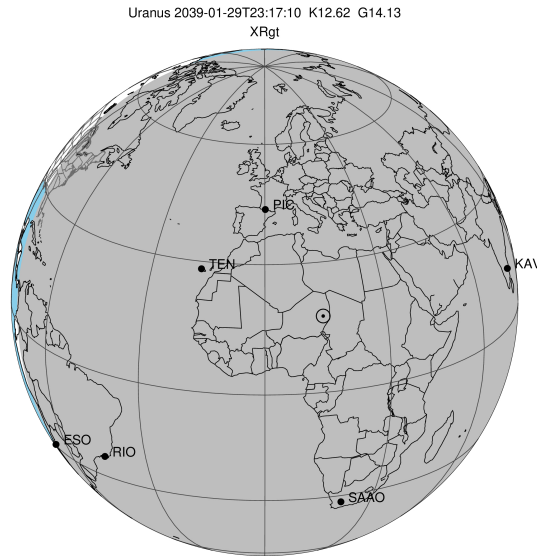


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-01-29T23:17:10.930  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 673812478196757248  
 2Mass ID (if available) : 07505496+2133141

ICRS Star Coord at Epoch: 07h 50m 54.97855s +21:33:13.80171s

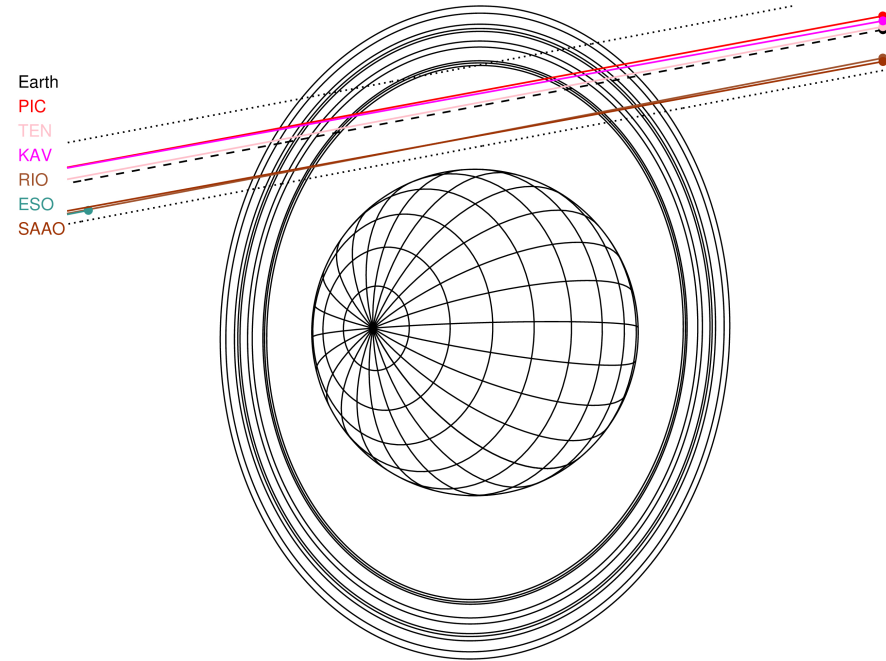
RUWE (>1.4 is poor) : 1.06  
 K magnitude : 12.619  
 G magnitude : 14.134  
 RP magnitude : 13.622  
 BP magnitude : 14.477  
 DUPflag : 0  
 Distance (au) : 17.684  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.42  
 Sun-Target sep (deg) : 166.27  
 Sun-Moon sep (deg) : 100.81  
 B (ring opening deg) : 51.22  
 PA of pole (deg) : 87.58

#	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



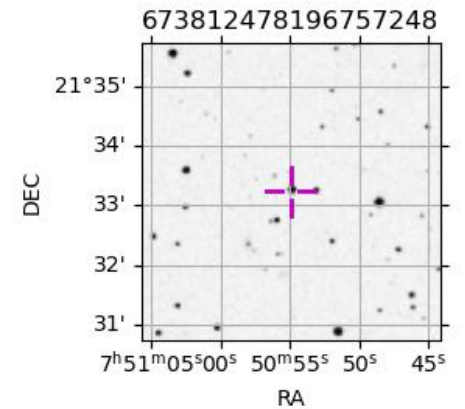
2039-01-29T23:17:10.9300 ra: 07 50 54.9785 s: +21 33 13.802 C/A 2.719° PA 190.67 deg v\_sky -22.42 km/s D 17.68 AU  
 Credit: Styled after SORA/Lucky Star

Uranus 2039-01-29T23:17:10 K12.62 G14.13 XRgt

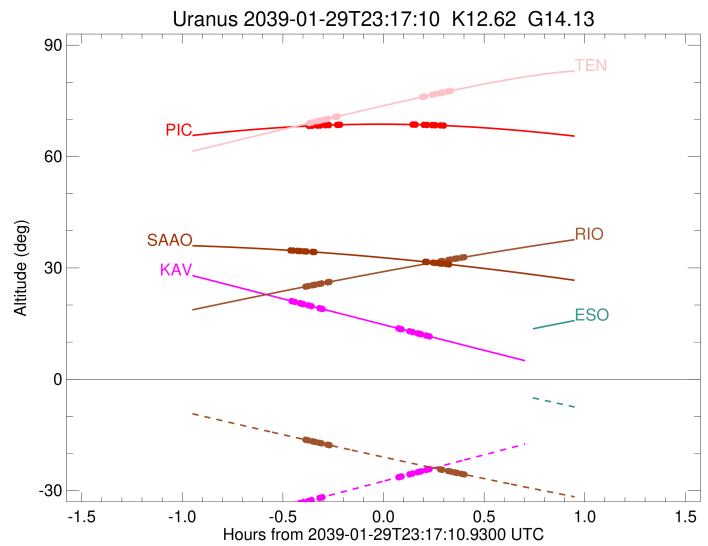
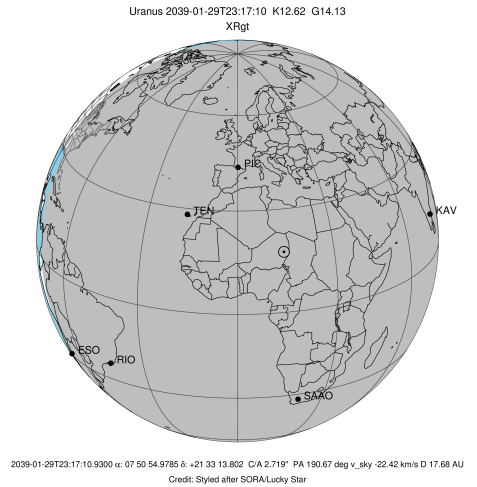


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	JAN 29 22:55 - JAN 29 23:34	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5	+++++		+++++	JAN 29 22:55 - JAN 29 23:37	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	JAN 29 22:50 - JAN 29 23:30	PnnRie
RIO	Rio de Janeiro	-22.9	316.8	+++++		+++++	JAN 29 22:54 - JAN 29 23:41	PnnRie
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++		+++++	JAN 29 22:49 - JAN 29 23:36	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-01-29T23:17:24.710  
 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 : 673812478196757248  
 2Mass ID (if available) : 07505496+2133141  
 ICRS Star Coord at Epoch: 07h 50m 54.97855s +21:33:13.80171s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 12.619  
 G magnitude : 14.134  
 RP magnitude : 13.622  
 BP magnitude : 14.477  
 DUPflag : 0  
 Distance (au) : 17.684  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.42  
 Sun-Target sep (deg) : 166.27  
 Sun-Moon sep (deg) : 101.66  
 B (ring opening deg) : 51.22  
 PA of pole (deg) : 87.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.888  
 C/A sky separation (km) : 37044.5  
 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

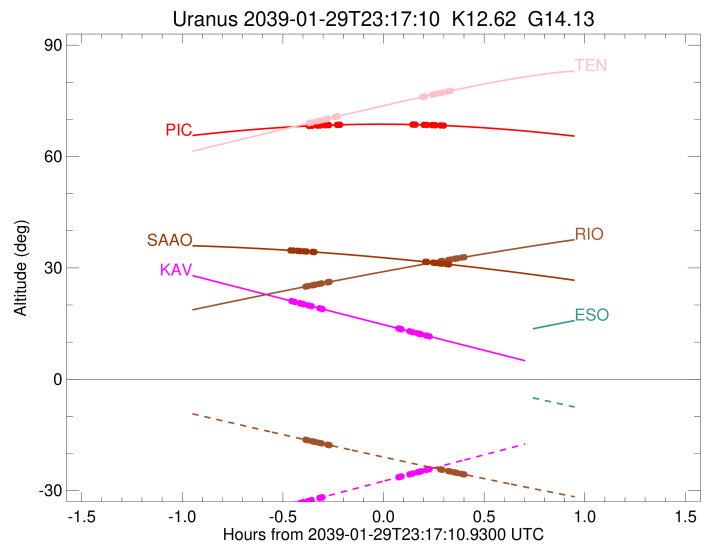
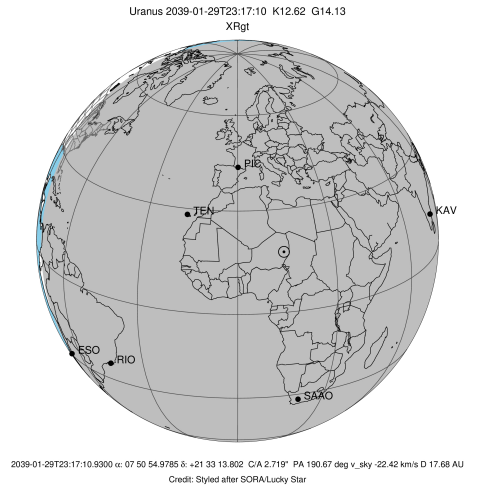


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-29T22:55:14.527		68.25	-60.13	50805.80	-19.46		
lambda	I	2039-01-29T22:55:54.756		68.28	-60.20	50026.71	-19.18		
delta	I	2039-01-29T22:57:26.905		68.34	-60.38	48300.35	-18.27		
gamma	I	2039-01-29T22:58:04.229		68.37	-60.45	47625.70	-17.87		
eta	I	2039-01-29T22:58:29.576		68.38	-60.50	47176.12	-17.60		
beta	I	2039-01-29T22:59:59.419		68.43	-60.66	45641.06	-16.54		
alpha	I	2039-01-29T23:00:58.518		68.47	-60.77	44684.61	-15.79		
4	I	2039-01-29T23:03:19.247		68.53	-61.03	42594.29	-13.77		
5	I	2039-01-29T23:03:50.892		68.55	-61.08	42161.65	-13.27		
6	I	2039-01-29T23:04:20.187		68.56	-61.14	41797.57	-12.88		

No planet occultations

6	E	2039-01-29T23:25:49.246		68.61	-63.12	41825.45	12.88		
5	E	2039-01-29T23:26:13.465		68.61	-63.15	42166.16	13.27		
4	E	2039-01-29T23:26:41.925		68.60	-63.19	42551.18	13.77		
alpha	E	2039-01-29T23:29:08.255		68.54	-63.37	44704.72	15.78		
beta	E	2039-01-29T23:30:06.470		68.51	-63.44	45653.67	16.54		
eta	E	2039-01-29T23:31:35.747		68.47	-63.55	47176.12	17.59		
gamma	E	2039-01-29T23:32:00.838		68.45	-63.58	47621.00	17.87		
delta	E	2039-01-29T23:32:38.435		68.43	-63.62	48300.35	18.27		
lambda	E	2039-01-29T23:34:10.609		68.38	-63.72	50026.71	19.18		
epsilon	E	2039-01-29T23:34:55.753		68.35	-63.77	50901.74	19.45		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-01-29T23:18:23.920  
 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 : 673812478196757248  
 2Mass ID (if available) : 07505496+2133141  
 ICRS Star Coord at Epoch: 07h 50m 54.97855s +21:33:13.80171s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 12.619  
 G magnitude : 14.134  
 RP magnitude : 13.622  
 BP magnitude : 14.477  
 DUPflag : 0  
 Distance (au) : 17.684  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.42  
 Sun-Target sep (deg) : 166.27  
 Sun-Moon sep (deg) : 101.72  
 B (ring opening deg) : 51.22  
 PA of pole (deg) : 87.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.751  
 C/A sky separation (km) : 35281.2  
 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\_itrfr93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

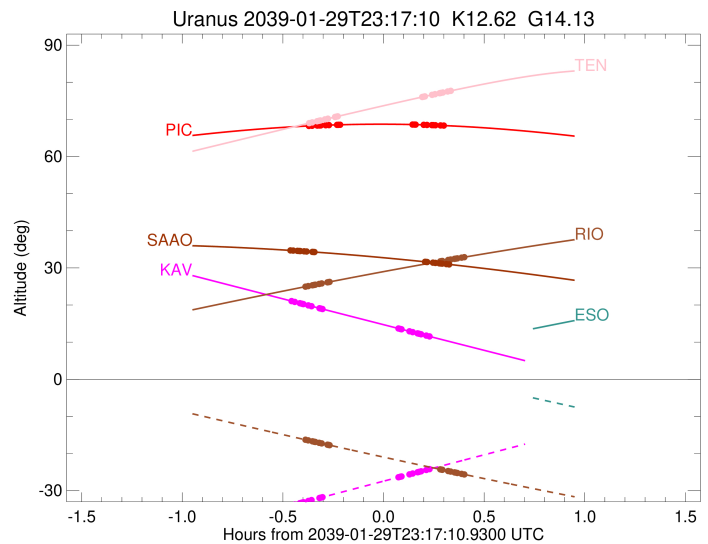
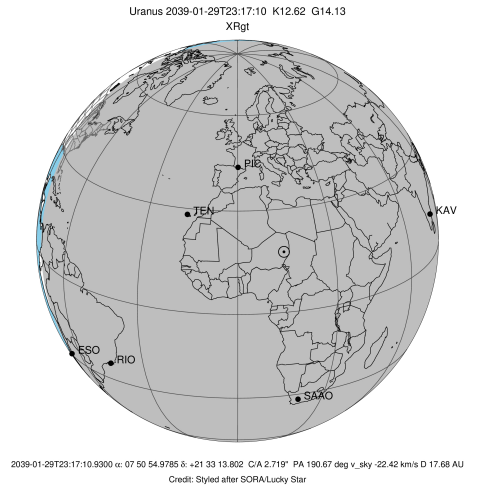


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-29T22:55:18.812		69.06	-55.47	50816.81	-20.55		
lambda	I	2039-01-29T22:55:57.387		69.20	-55.61	50026.71	-20.32		
delta	I	2039-01-29T22:57:23.971		69.51	-55.93	48300.35	-19.54		
gamma	I	2039-01-29T22:57:58.775		69.63	-56.05	47626.00	-19.20		
eta	I	2039-01-29T22:58:22.342		69.72	-56.14	47176.12	-18.97		
beta	I	2039-01-29T22:59:45.120		70.01	-56.44	45641.14	-18.08		
alpha	I	2039-01-29T23:00:38.848		70.20	-56.63	44684.70	-17.46		
4	I	2039-01-29T23:02:43.660		70.65	-57.08	42597.35	-15.83		
5	I	2039-01-29T23:03:10.967		70.74	-57.18	42164.61	-15.43		
6	I	2039-01-29T23:03:36.653		70.83	-57.27	41796.40	-15.13		

No planet occultations

6	E	2039-01-29T23:28:43.647		76.04	-62.65	41829.10	15.14		
5	E	2039-01-29T23:29:04.421		76.11	-62.72	42169.93	15.44		
4	E	2039-01-29T23:29:28.514		76.18	-62.81	42547.90	15.83		
alpha	E	2039-01-29T23:31:38.779		76.61	-63.27	44706.92	17.47		
beta	E	2039-01-29T23:32:31.605		76.79	-63.45	45654.92	18.09		
eta	E	2039-01-29T23:33:53.747		77.05	-63.74	47176.12	18.98		
gamma	E	2039-01-29T23:34:17.041		77.13	-63.82	47620.97	19.21		
delta	E	2039-01-29T23:34:52.088		77.24	-63.94	48300.35	19.55		
lambda	E	2039-01-29T23:36:18.625		77.52	-64.25	50026.71	20.33		
epsilon	E	2039-01-29T23:37:02.098		77.66	-64.40	50918.53	20.56		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-01-29T23:12:38.220  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 673812478196757248  
 2Mass ID (if available) : 07505496+2133141  
 ICRS Star Coord at Epoch: 07h 50m 54.97855s +21:33:13.80171s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 12.619  
 G magnitude : 14.134  
 RP magnitude : 13.622  
 BP magnitude : 14.477  
 DUPflag : 0  
 Distance (au) : 17.684  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -22.42  
 Sun-Target sep (deg) : 166.27  
 Sun-Moon sep (deg) : 100.88  
 B (ring opening deg) : 51.22  
 PA of pole (deg) : 87.58  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.862  
 C/A sky separation (km) : 36704.9  
 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



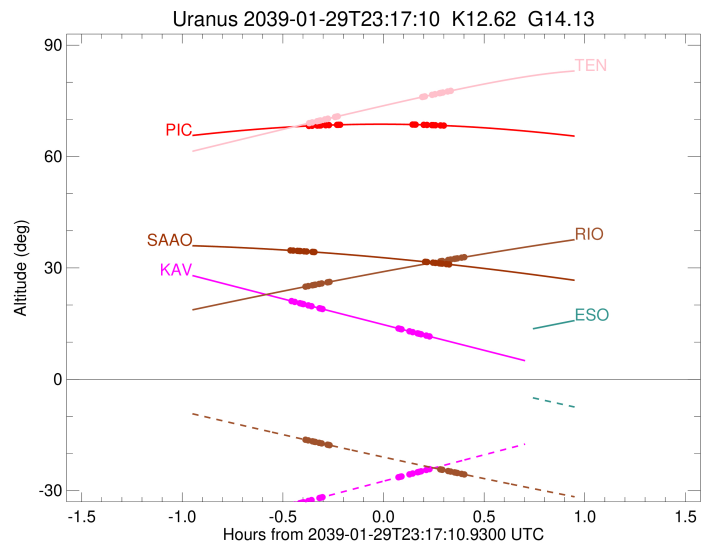
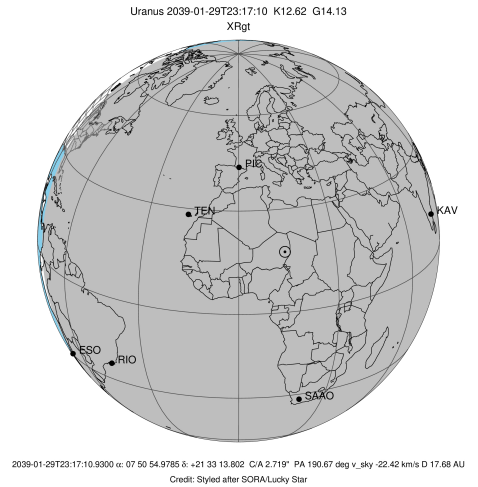
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-29T22:50:04.190		20.99	-33.89	50808.99	-19.49		
lambda	I	2039-01-29T22:50:44.512		20.84	-33.73	50026.71	-19.22		
delta	I	2039-01-29T22:52:16.376		20.48	-33.37	48300.35	-18.35		
gamma	I	2039-01-29T22:52:53.523		20.34	-33.22	47625.78	-17.96		
eta	I	2039-01-29T22:53:18.736		20.24	-33.12	47176.12	-17.70		
beta	I	2039-01-29T22:54:47.920		19.89	-32.77	45641.08	-16.69		
alpha	I	2039-01-29T22:55:46.407		19.67	-32.53	44684.62	-15.97		
4	I	2039-01-29T22:58:04.851		19.13	-31.99	42595.12	-14.06		
5	I	2039-01-29T22:58:35.779		19.01	-31.86	42162.39	-13.59		
6	I	2039-01-29T22:59:04.535		18.90	-31.75	41797.23	-13.23		

No planet occultations

6	E	2039-01-29T23:21:37.877		13.68	-26.40	41826.07	13.20		
5	E	2039-01-29T23:22:01.546		13.59	-26.30	42166.76	13.57		
4	E	2039-01-29T23:22:29.337		13.48	-26.20	42550.63	14.03		
alpha	E	2039-01-29T23:24:53.753		12.93	-25.62	44705.06	15.93		
beta	E	2039-01-29T23:25:51.507		12.71	-25.40	45653.85	16.64		
eta	E	2039-01-29T23:27:20.368		12.37	-25.05	47176.12	17.65		
gamma	E	2039-01-29T23:27:45.394		12.27	-24.95	47621.00	17.91		
delta	E	2039-01-29T23:28:22.931		12.12	-24.80	48300.35	18.29		
lambda	E	2039-01-29T23:29:55.118		11.77	-24.44	50026.71	19.15		
epsilon	E	2039-01-29T23:30:40.448		11.60	-24.26	50903.88	19.41		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2039-01-29T23:19:35.030
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      : 673812478196757248
2Mass ID (if available) : 07505496+2133141
ICRS Star Coord at Epoch: 07h 50m 54.97855s +21:33:13.80171s
RUWE (>1.4 is poor) : 1.06
K magnitude         : 12.619
G magnitude         : 14.134
RP magnitude        : 13.622
BP magnitude        : 14.477
DUPflag            : 0
Distance (au)       : 17.684
f0 (km)            : 0.000
g0 (km)            : 0.000
skyplane vel. (km/s) : -22.42
Sun-Target sep (deg) : 166.27
Sun-Moon sep (deg)  : 101.35
B (ring opening deg) : 51.22
PA of pole (deg)    : 87.58
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.355
C/A sky separation (km) : 30208.5
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_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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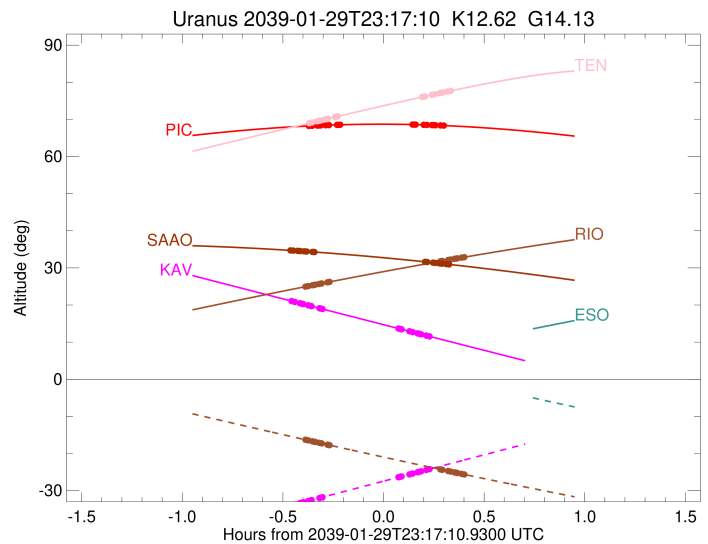
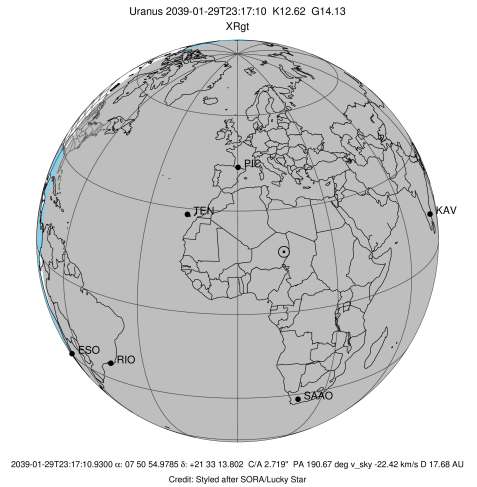
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-29T22:54:08.757		24.99	-16.34	50849.74	-22.97		
lambda	I	2039-01-29T22:54:44.604		25.10	-16.46	50026.71	-22.85		
delta	I	2039-01-29T22:56:00.972		25.33	-16.72	48300.35	-22.35		
gamma	I	2039-01-29T22:56:31.248		25.42	-16.82	47626.78	-22.14		
eta	I	2039-01-29T22:56:51.672		25.48	-16.89	47176.12	-21.99		
beta	I	2039-01-29T22:58:02.286		25.68	-17.13	45641.69	-21.44		
alpha	I	2039-01-29T22:58:47.133		25.82	-17.28	44685.58	-21.06		
4	I	2039-01-29T23:00:27.833		26.11	-17.62	42603.87	-20.10		
5	I	2039-01-29T23:00:48.930		26.18	-17.69	42173.38	-19.86		
6	I	2039-01-29T23:01:09.813		26.24	-17.76	41794.89	-19.71		

No planet occultations

6	E	2039-01-29T23:34:06.601		31.77	-24.27	41837.76	19.74		
5	E	2039-01-29T23:34:22.999		31.81	-24.32	42180.55	19.90		
4	E	2039-01-29T23:34:40.792		31.86	-24.38	42540.81	20.13		
alpha	E	2039-01-29T23:36:26.683		32.14	-24.72	44712.61	21.10		
beta	E	2039-01-29T23:37:10.615		32.25	-24.86	45658.16	21.48		
eta	E	2039-01-29T23:38:20.469		32.43	-25.08	47176.12	22.04		
gamma	E	2039-01-29T23:38:40.589		32.49	-25.14	47620.97	22.18		
delta	E	2039-01-29T23:39:11.066		32.56	-25.24	48300.35	22.40		
lambda	E	2039-01-29T23:40:27.270		32.76	-25.48	50026.71	22.90		
epsilon	E	2039-01-29T23:41:08.048		32.87	-25.61	50965.66	23.03		

```

target                : Uranus
target radius (km)    : 25559.00
C/A epoch              : 2039-01-29T23:14:59.640
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         : 673812478196757248
2Mass ID (if available) : 07505496+2133141
ICRS Star Coord at Epoch: 07h 50m 54.97855s +21:33:13.80171s
RUWE (>1.4 is poor)  : 1.06
K magnitude            : 12.619
G magnitude            : 14.134
RP magnitude           : 13.622
BP magnitude           : 14.477
DUPflag                : 0
Distance (au)          : 17.684
f0 (km)                : 0.000
g0 (km)                : 0.000
skyplane vel. (km/s)  : -22.42
Sun-Target sep (deg)   : 166.27
Sun-Moon sep (deg)     : 101.23
B (ring opening deg)  : 51.22
PA of pole (deg)       : 87.58
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.355
C/A sky separation (km) : 30201.1
NAIF SPICE kernels     : RAJobs_U111+rgf15.spk
URKALLvl1.bsp
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
    
```



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-01-29T22:49:40.095		34.70	-40.03	50851.50	-23.07		
lambda	I	2039-01-29T22:50:15.870		34.66	-40.03	50026.71	-22.94		
delta	I	2039-01-29T22:51:31.925		34.59	-40.03	48300.35	-22.44		
gamma	I	2039-01-29T22:52:02.077		34.56	-40.03	47626.81	-22.23		
eta	I	2039-01-29T22:52:22.419		34.54	-40.02	47176.12	-22.08		
beta	I	2039-01-29T22:53:32.747		34.47	-40.02	45641.73	-21.53		
alpha	I	2039-01-29T22:54:17.409		34.42	-40.02	44685.64	-21.14		
4	I	2039-01-29T22:55:57.693		34.31	-40.01	42604.08	-20.18		
5	I	2039-01-29T22:56:18.693		34.29	-40.01	42173.72	-19.95		
6	I	2039-01-29T22:56:39.523		34.27	-40.00	41794.86	-19.79		

No planet occultations

6	E	2039-01-29T23:29:34.864		31.64	-39.14	41837.56	19.77		
5	E	2039-01-29T23:29:51.228		31.61	-39.12	42180.28	19.92		
4	E	2039-01-29T23:30:09.022		31.58	-39.11	42540.96	20.16		
alpha	E	2039-01-29T23:31:54.784		31.42	-39.03	44712.45	21.12		
beta	E	2039-01-29T23:32:38.683		31.34	-38.99	45658.06	21.50		
eta	E	2039-01-29T23:33:48.491		31.23	-38.94	47176.12	22.05		
gamma	E	2039-01-29T23:34:08.599		31.20	-38.92	47620.97	22.20		
delta	E	2039-01-29T23:34:39.058		31.15	-38.90	48300.35	22.41		
lambda	E	2039-01-29T23:35:55.229		31.02	-38.83	50026.71	22.91		
epsilon	E	2039-01-29T23:36:35.918		30.96	-38.80	50963.90	23.03		