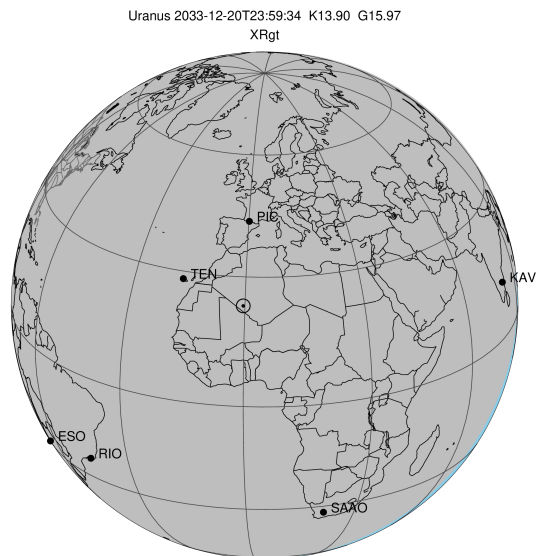


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-20T23:59:34.220  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3425571907045778048  
 2Mass ID (if available) : 06163008+2339238

ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.904  
 G magnitude : 15.973  
 RP magnitude : 15.262  
 BP magnitude : 16.549  
 DUPflag : 0  
 Distance (au) : 17.974  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.31  
 Sun-Target sep (deg) : 175.16  
 Sun-Moon sep (deg) : 165.16  
 B (ring opening deg) : 72.04  
 PA of pole (deg) : 64.87

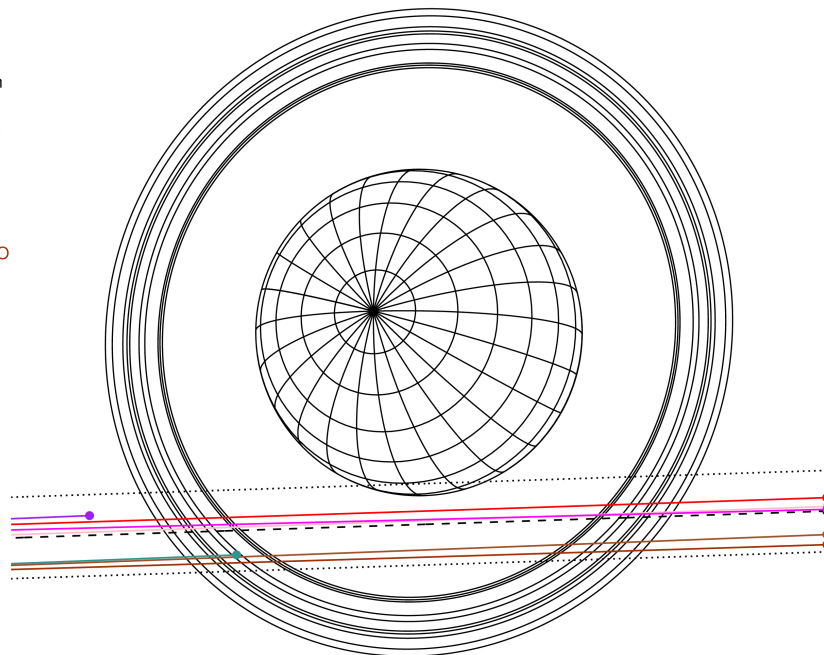
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2033-12-20T23:59:34.2200 a: 06 16 30.0913 s: +23 39 23.507 C/A 2.298° PA 1.88 deg v\_sky -23.31 km/s D 17.97 AU  
 Credit: Styled after SORA/Lucky Star

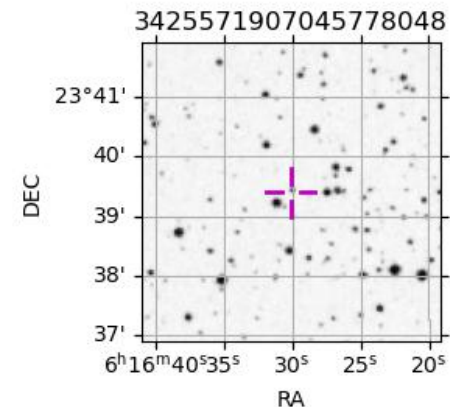
Uranus 2033-12-20T23:59:34 K13.90 G15.97 XRgt

Earth  
 PIC  
 MCD  
 TEN  
 KAV  
 RIO  
 ESO  
 SAAO

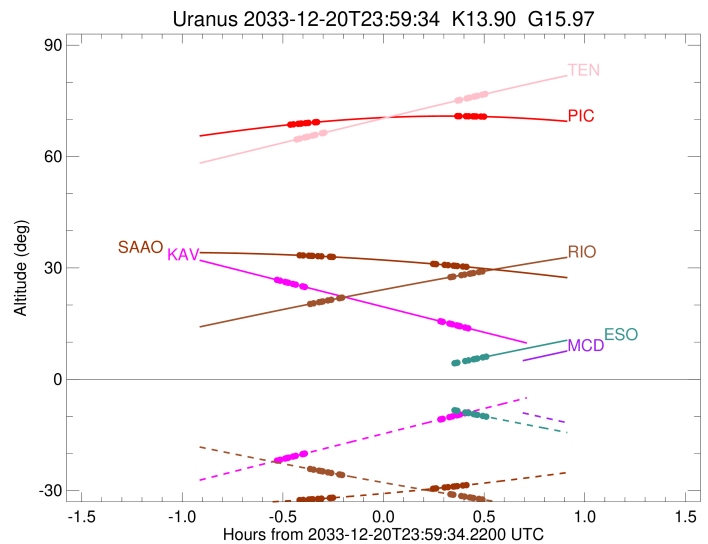
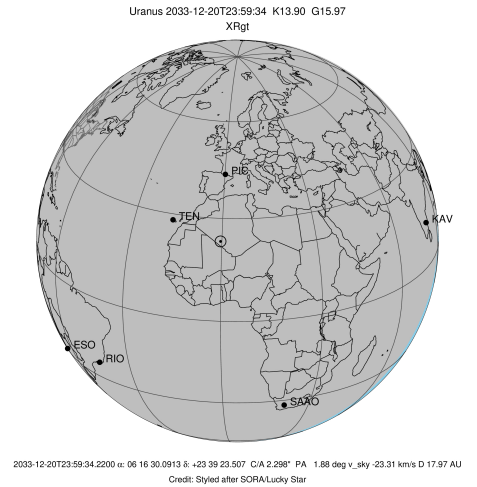


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++		+++++	DEC 20 23:31 - DEC 21 00:29	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	+++++		+++++	DEC 20 23:33 - DEC 21 00:30	PnnRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++		+++++	DEC 20 23:27 - DEC 21 00:25	PnnRie
RIO	Rio de Janeiro	-22.9	316.8	+++++		+++++	DEC 20 23:37 - DEC 21 00:29	PnnRie
ESO	European Southern Obs	-29.3	289.3			+++++	DEC 21 00:24 - DEC 21 00:30	PnnRne
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++		+++++	DEC 20 23:34 - DEC 21 00:24	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-20T23:59:53.790  
 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 : 3425571907045778048  
 2Mass ID (if available) : 06163008+2339238  
 ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.904  
 G magnitude : 15.973  
 RP magnitude : 15.262  
 BP magnitude : 16.549  
 DUPflag : 0  
 Distance (au) : 17.974  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.31  
 Sun-Target sep (deg) : 175.16  
 Sun-Moon sep (deg) : 165.42  
 B (ring opening deg) : 72.04  
 PA of pole (deg) : 64.87  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.147  
 C/A sky separation (km) : 27982.6  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

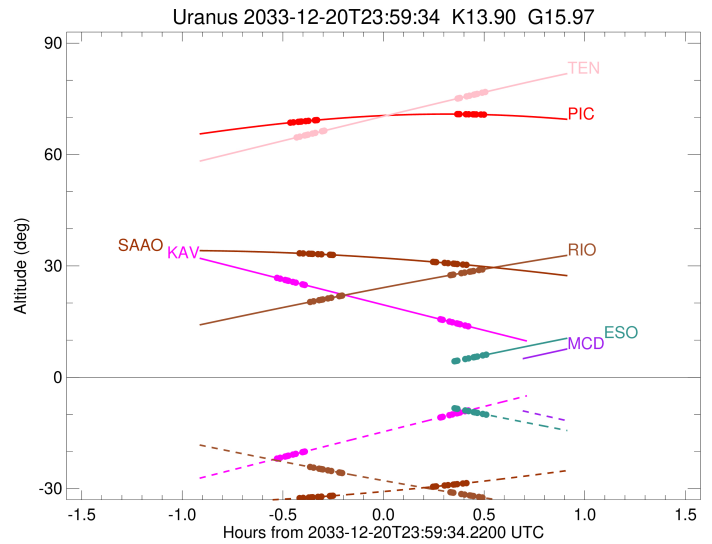
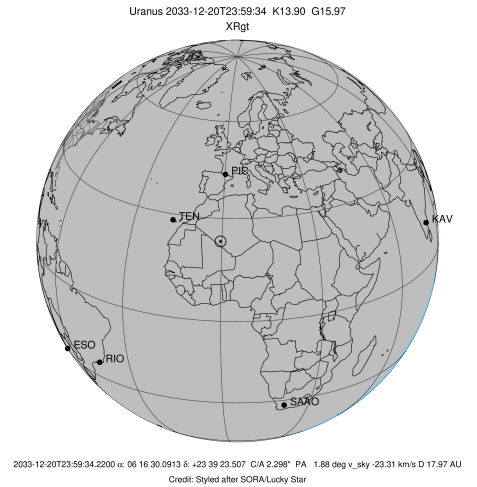


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-20T23:31:48.772		68.59	-69.98	51136.70	-20.60		
lambda	I	2033-12-20T23:32:43.205		68.67	-70.02	50026.71	-20.29		
delta	I	2033-12-20T23:34:09.019		68.80	-70.10	48300.35	-19.94		
gamma	I	2033-12-20T23:34:42.735		68.85	-70.13	47630.53	-19.79		
eta	I	2033-12-20T23:35:05.755		68.89	-70.14	47176.12	-19.69		
beta	I	2033-12-20T23:36:23.284		69.00	-70.20	45662.92	-19.30		
alpha	I	2033-12-20T23:37:14.371		69.07	-70.24	44687.08	-19.04		
4	I	2033-12-20T23:39:08.667		69.23	-70.32	42545.32	-18.39		
5	I	2033-12-20T23:39:20.560		69.25	-70.33	42315.17	-18.29		
6	I	2033-12-20T23:39:48.904		69.29	-70.35	41800.20	-18.10		

No planet occultations

6	E	2033-12-21T00:21:32.216		70.88	-70.05	41819.68	18.11		
5	E	2033-12-21T00:21:54.285		70.88	-70.03	42222.62	18.30		
4	E	2033-12-21T00:22:15.181		70.88	-70.01	42611.27	18.40		
alpha	E	2033-12-21T00:24:07.507		70.86	-69.91	44712.39	19.05		
beta	E	2033-12-21T00:24:55.869		70.85	-69.86	45641.28	19.31		
eta	E	2033-12-21T00:26:14.556		70.83	-69.78	47176.12	19.69		
gamma	E	2033-12-21T00:26:37.441		70.82	-69.76	47628.02	19.80		
delta	E	2033-12-21T00:27:11.271		70.81	-69.72	48300.35	19.95		
lambda	E	2033-12-21T00:28:37.052		70.78	-69.63	50026.71	20.30		
epsilon	E	2033-12-21T00:29:50.396		70.75	-69.55	51525.49	20.61		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-21T00:00:59.260  
 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 : 3425571907045778048  
 2Mass ID (if available) : 06163008+2339238  
 ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.904  
 G magnitude : 15.973  
 RP magnitude : 15.262  
 BP magnitude : 16.549  
 DUPflag : 0  
 Distance (au) : 17.974  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.31  
 Sun-Target sep (deg) : 175.16  
 Sun-Moon sep (deg) : 165.14  
 B (ring opening deg) : 72.04  
 PA of pole (deg) : 64.87  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.262  
 C/A sky separation (km) : 29483.6  
 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

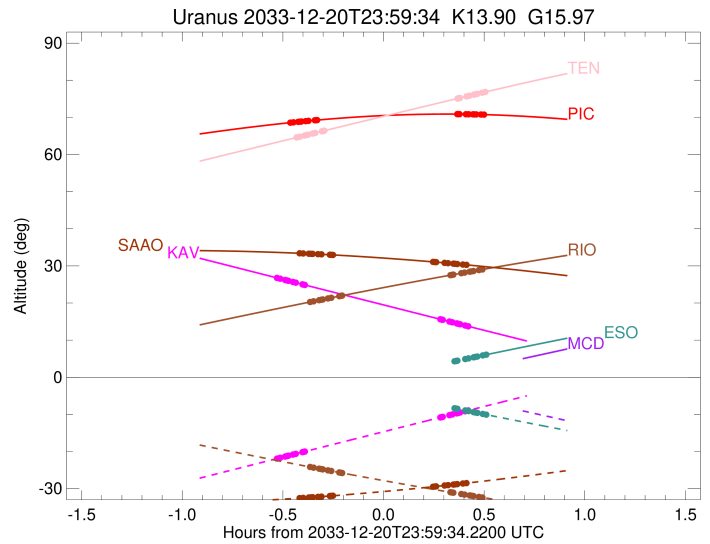
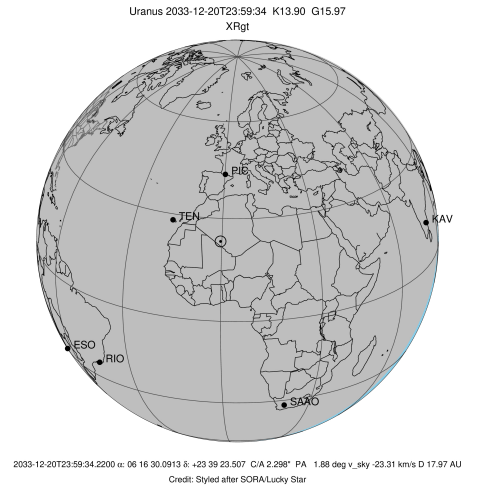


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-20T23:33:41.144		64.60	-69.19	51150.48	-20.13		
lambda	I	2033-12-20T23:34:37.617		64.81	-69.40	50026.71	-19.78		
delta	I	2033-12-20T23:36:05.765		65.14	-69.72	48300.35	-19.38		
gamma	I	2033-12-20T23:36:40.468		65.26	-69.84	47630.65	-19.21		
eta	I	2033-12-20T23:37:04.200		65.35	-69.93	47176.12	-19.09		
beta	I	2033-12-20T23:38:24.325		65.65	-70.22	45662.10	-18.65		
alpha	I	2033-12-20T23:39:17.249		65.84	-70.41	44686.57	-18.35		
4	I	2033-12-20T23:41:16.111		66.28	-70.84	42547.09	-17.60		
5	I	2033-12-20T23:41:28.708		66.32	-70.89	42314.90	-17.48		
6	I	2033-12-20T23:41:58.445		66.43	-71.00	41799.23	-17.26		

No planet occultations

6	E	2033-12-21T00:21:38.283		75.08	-79.39	41817.68	17.28		
5	E	2033-12-21T00:22:01.741		75.17	-79.47	42226.69	17.50		
4	E	2033-12-21T00:22:23.328		75.25	-79.54	42610.15	17.62		
alpha	E	2033-12-21T00:24:20.121		75.66	-79.93	44710.85	18.37		
beta	E	2033-12-21T00:25:10.263		75.84	-80.10	45641.16	18.68		
eta	E	2033-12-21T00:26:31.465		76.13	-80.36	47176.12	19.12		
gamma	E	2033-12-21T00:26:55.036		76.21	-80.44	47628.23	19.24		
delta	E	2033-12-21T00:27:29.814		76.34	-80.55	48300.35	19.41		
lambda	E	2033-12-21T00:28:57.828		76.65	-80.84	50026.71	19.81		
epsilon	E	2033-12-21T00:30:13.154		76.91	-81.08	51530.98	20.16		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-20T23:55:29.380  
 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 : 3425571907045778048  
 2Mass ID (if available) : 06163008+2339238  
 ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.904  
 G magnitude : 15.973  
 RP magnitude : 15.262  
 BP magnitude : 16.549  
 DUPflag : 0  
 Distance (au) : 17.974  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.31  
 Sun-Target sep (deg) : 175.16  
 Sun-Moon sep (deg) : 166.06  
 B (ring opening deg) : 72.04  
 PA of pole (deg) : 64.87  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.249  
 C/A sky separation (km) : 29311.3  
 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

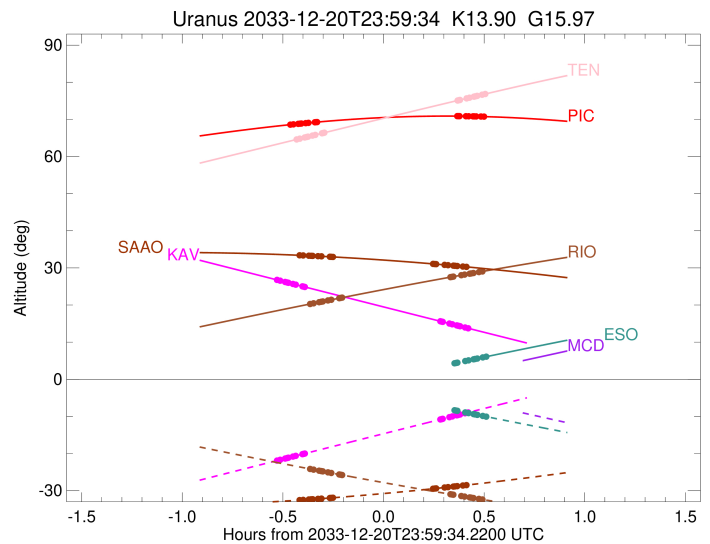
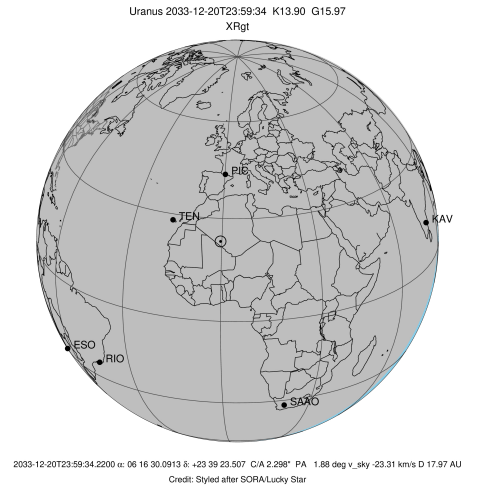


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-20T23:27:50.202		26.76	-21.90	51152.49	-20.04		
lambda	I	2033-12-20T23:28:47.009		26.55	-21.69	50026.71	-19.70		
delta	I	2033-12-20T23:30:15.505		26.21	-21.35	48300.35	-19.31		
gamma	I	2033-12-20T23:30:50.339		26.08	-21.22	47630.66	-19.14		
eta	I	2033-12-20T23:31:14.159		25.98	-21.13	47176.12	-19.02		
beta	I	2033-12-20T23:32:34.567		25.68	-20.82	45662.02	-18.59		
alpha	I	2033-12-20T23:33:27.659		25.47	-20.62	44686.52	-18.29		
4	I	2033-12-20T23:35:26.829		25.02	-20.17	42547.22	-17.56		
5	I	2033-12-20T23:35:39.466		24.97	-20.12	42314.87	-17.44		
6	I	2033-12-20T23:36:09.267		24.86	-20.00	41799.17	-17.23		

No planet occultations

6	E	2033-12-21T00:16:29.275		15.63	-10.83	41818.25	17.17		
5	E	2033-12-21T00:16:52.778		15.54	-10.74	42225.50	17.39		
4	E	2033-12-21T00:17:14.581		15.46	-10.66	42610.49	17.50		
alpha	E	2033-12-21T00:19:12.251		15.01	-10.22	44711.32	18.23		
beta	E	2033-12-21T00:20:02.778		14.82	-10.02	45641.19	18.52		
eta	E	2033-12-21T00:21:24.685		14.51	-9.72	47176.12	18.95		
gamma	E	2033-12-21T00:21:48.467		14.42	-9.63	47628.16	19.07		
delta	E	2033-12-21T00:22:23.572		14.29	-9.49	48300.35	19.23		
lambda	E	2033-12-21T00:23:52.439		13.95	-9.16	50026.71	19.62		
epsilon	E	2033-12-21T00:25:08.438		13.66	-8.87	51529.11	19.96		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-21T00:02:26.470  
 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 : 3425571907045778048  
 2Mass ID (if available) : 06163008+2339238  
 ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.904  
 G magnitude : 15.973  
 RP magnitude : 15.262  
 BP magnitude : 16.549  
 DUPflag : 0  
 Distance (au) : 17.974  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.31  
 Sun-Target sep (deg) : 175.16  
 Sun-Moon sep (deg) : 164.51  
 B (ring opening deg) : 72.04  
 PA of pole (deg) : 64.87  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.614  
 C/A sky separation (km) : 34070.0  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk

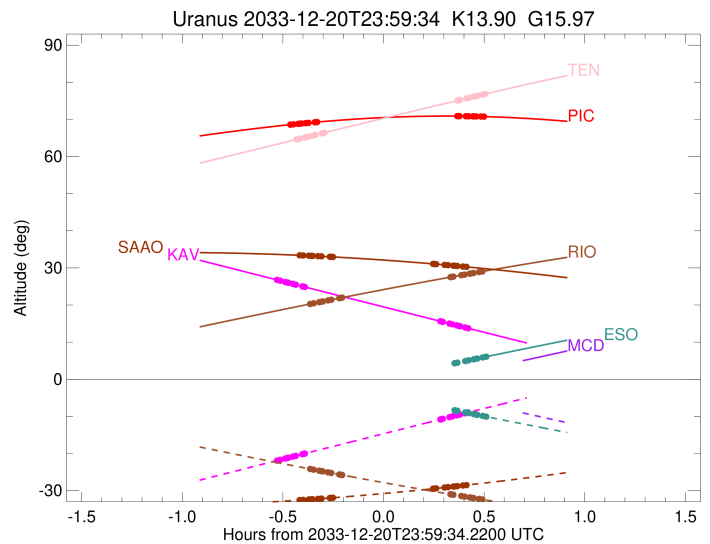
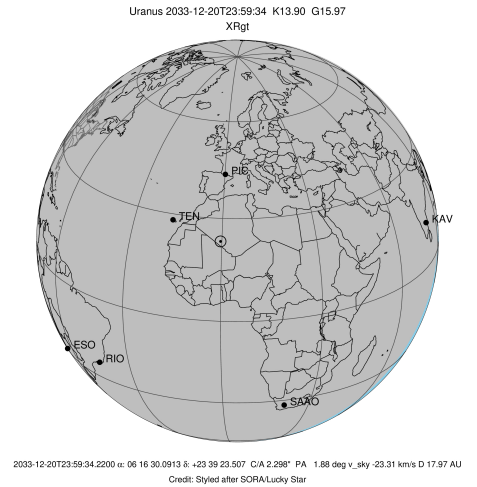


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-20T23:37:39.599		20.27	-24.16	51196.32	-18.27		
lambda	I	2033-12-20T23:38:44.706		20.47	-24.34	50026.71	-17.78		
delta	I	2033-12-20T23:40:23.390		20.76	-24.63	48300.35	-17.19		
gamma	I	2033-12-20T23:41:02.607		20.88	-24.74	47631.00	-16.94		
eta	I	2033-12-20T23:41:29.601		20.96	-24.82	47176.12	-16.76		
beta	I	2033-12-20T23:43:01.809		21.24	-25.08	45659.27	-16.09		
alpha	I	2033-12-20T23:44:03.455		21.42	-25.25	44685.25	-15.63		
4	I	2033-12-20T23:46:24.968		21.85	-25.65	42553.68	-14.43		
5	I	2033-12-20T23:46:41.207		21.89	-25.70	42312.54	-14.24		
6	I	2033-12-20T23:47:17.976		22.00	-25.80	41796.54	-13.89		

No planet occultations

6	E	2033-12-21T00:19:28.967		27.50	-30.96	41811.32	13.92		
5	E	2033-12-21T00:19:59.398		27.58	-31.04	42240.54	14.27		
4	E	2033-12-21T00:20:24.697		27.65	-31.10	42605.65	14.46		
alpha	E	2033-12-21T00:22:44.016		28.03	-31.45	44705.91	15.66		
beta	E	2033-12-21T00:23:42.757		28.19	-31.60	45641.08	16.14		
eta	E	2033-12-21T00:25:15.939		28.44	-31.83	47176.12	16.80		
gamma	E	2033-12-21T00:25:42.737		28.51	-31.89	47628.88	16.99		
delta	E	2033-12-21T00:26:21.972		28.61	-31.99	48300.35	17.24		
lambda	E	2033-12-21T00:28:00.376		28.87	-32.23	50026.71	17.84		
epsilon	E	2033-12-21T00:29:24.379		29.09	-32.43	51544.70	18.33		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2033-12-21T00:03:09.820  
 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 : 3425571907045778048  
 2Mass ID (if available) : 06163008+2339238  
 ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s  
 RUWE (>1.4 is poor) : 1.00  
 K magnitude : 13.904  
 G magnitude : 15.973  
 RP magnitude : 15.262  
 BP magnitude : 16.549  
 DUPflag : 0  
 Distance (au) : 17.974  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -23.31  
 Sun-Target sep (deg) : 175.16  
 Sun-Moon sep (deg) : 164.30  
 B (ring opening deg) : 72.04  
 PA of pole (deg) : 64.87  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.584  
 C/A sky separation (km) : 33683.0  
 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



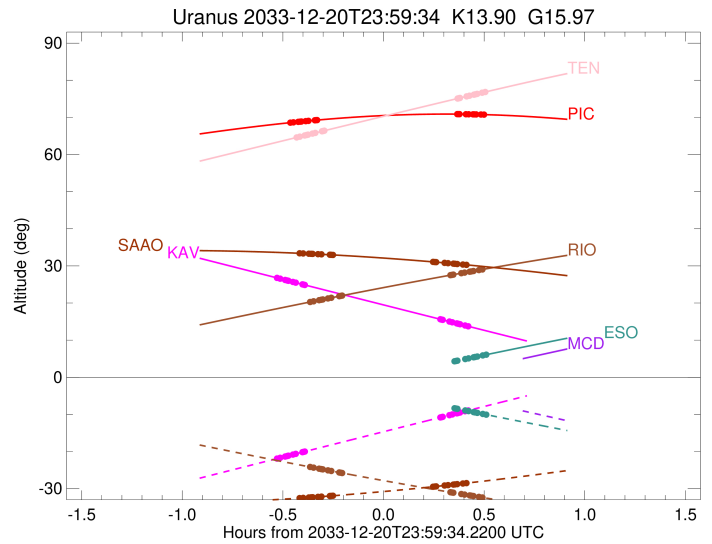
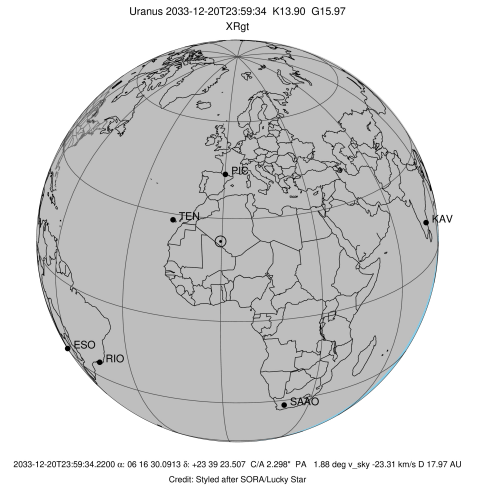
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-12-20T23:37:56.631	-4.01x	-0.25x	51191.65	-18.29			
lambda	I	2033-12-20T23:39:01.376	-3.80x	-0.46x	50026.71	-17.82			
delta	I	2033-12-20T23:40:39.791	-3.47x	-0.78x	48300.35	-17.25			
gamma	I	2033-12-20T23:41:18.859	-3.34x	-0.90x	47630.97	-17.01			
eta	I	2033-12-20T23:41:45.733	-3.26x	-0.99x	47176.12	-16.84			
beta	I	2033-12-20T23:43:17.405	-2.95x	-1.29x	45659.56	-16.20			
alpha	I	2033-12-20T23:44:18.607	-2.75x	-1.48x	44685.35	-15.75			
4	I	2033-12-20T23:46:38.713	-2.29x	-1.93x	42552.98	-14.62			
5	I	2033-12-20T23:46:54.645	-2.24x	-1.98x	42312.88	-14.44			
6	I	2033-12-20T23:47:30.891	-2.12x	-2.10x	41796.76	-14.11			

No planet occultations

6	E	2033-12-21T00:20:42.260	4.30x	-8.34	41811.82	14.14			
5	E	2033-12-21T00:21:12.119	4.39x	-8.43	42239.41	14.48			
4	E	2033-12-21T00:21:37.162	4.47x	-8.51	42606.05	14.66			
alpha	E	2033-12-21T00:23:54.968	4.90x	-8.93	44706.28	15.80			
beta	E	2033-12-21T00:24:53.211	5.09	-9.10	45641.07	16.25			
eta	E	2033-12-21T00:26:25.806	5.38	-9.39	47176.12	16.90			
gamma	E	2033-12-21T00:26:52.464	5.46	-9.47	47628.83	17.07			
delta	E	2033-12-21T00:27:31.523	5.58	-9.58	48300.35	17.31			
lambda	E	2033-12-21T00:29:09.583	5.89	-9.88	50026.71	17.89			
epsilon	E	2033-12-21T00:30:33.353	6.15	-10.13	51543.91	18.36			

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-12-20T23:58:27.240
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      : 3425571907045778048
2Mass ID (if available) : 06163008+2339238
ICRS Star Coord at Epoch: 06h 16m 30.09130s +23:39:23.50688s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 13.904
G magnitude          : 15.973
RP magnitude         : 15.262
BP magnitude         : 16.549
DUPflag             : 0
Distance (au)       : 17.974
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -23.31
Sun-Target sep (deg) : 175.16
Sun-Moon sep (deg)  : 165.24
B (ring opening deg) : 72.04
PA of pole (deg)    : 64.87
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.700
C/A sky separation (km) : 35196.5
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	2033-12-20T23:34:30.499		33.40	-32.56	51211.17	-17.87		
lambda	I	2033-12-20T23:35:38.026		33.35	-32.49	50026.71	-17.34		
delta	I	2033-12-20T23:37:19.486		33.28	-32.39	48300.35	-16.68		
gamma	I	2033-12-20T23:37:59.947		33.25	-32.35	47631.10	-16.40		
eta	I	2033-12-20T23:38:27.862		33.23	-32.32	47176.12	-16.20		
beta	I	2033-12-20T23:40:03.638		33.16	-32.21	45658.37	-15.45		
alpha	I	2033-12-20T23:41:07.976		33.12	-32.14	44684.98	-14.92		
4	I	2033-12-20T23:43:37.097		33.00	-31.98	42555.94	-13.56		
5	I	2033-12-20T23:43:54.738		32.98	-31.96	42311.29	-13.34		
6	I	2033-12-20T23:44:34.054		32.95	-31.91	41795.92	-12.94		

No planet occultations

6	E	2033-12-21T00:14:17.679		31.09	-29.49	41809.92	12.94		
5	E	2033-12-21T00:14:50.705		31.04	-29.44	42243.79	13.33		
4	E	2033-12-21T00:15:17.450		31.01	-29.40	42604.46	13.56		
alpha	E	2033-12-21T00:17:44.819		30.82	-29.16	44704.86	14.91		
beta	E	2033-12-21T00:18:46.424		30.74	-29.06	45641.11	15.44		
eta	E	2033-12-21T00:20:23.464		30.60	-28.90	47176.12	16.19		
gamma	E	2033-12-21T00:20:51.272		30.57	-28.86	47629.01	16.39		
delta	E	2033-12-21T00:21:31.890		30.51	-28.79	48300.35	16.67		
lambda	E	2033-12-21T00:23:13.430		30.37	-28.62	50026.71	17.32		
epsilon	E	2033-12-21T00:24:39.889		30.25	-28.48	51546.71	17.86		