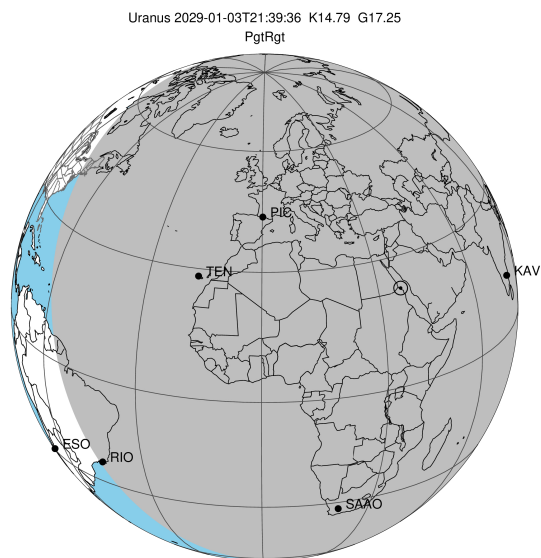


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-03T21:39:36.420
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 144911715532041728
 2Mass ID (if available) : 04355504+2200250

ICRS Star Coord at Epoch: 04h 35m 55.03782s +22:00:24.93312s

RUWE (>1.4 is poor) : 1.12
 K magnitude : 14.791
 G magnitude : 17.254
 RP magnitude : 16.475
 BP magnitude : 17.869
 DUPflag : 0
 Distance (au) : 18.455
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.70
 Sun-Target sep (deg) : 147.17
 Sun-Moon sep (deg) : 74.41
 B (ring opening deg) : 79.56
 PA of pole (deg) : -50.54

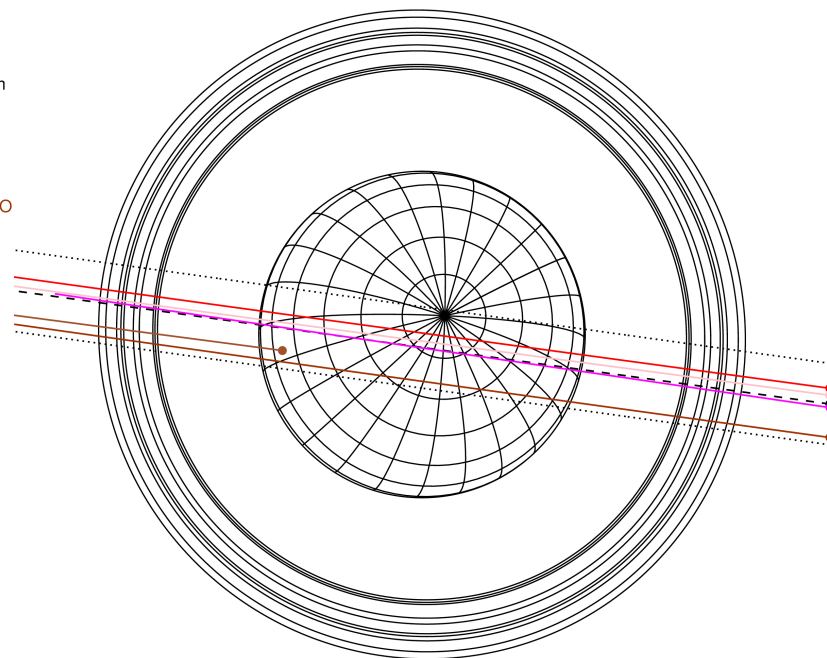
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2029-01-03T21:39:36.420000: 04 35 55.03782 s +22 00 24.933 C/A 0.145° PA 352.11 deg v_sky -18.70 km/s D 18.45 AU
 Credit: Styled after SORA/Lucky Star

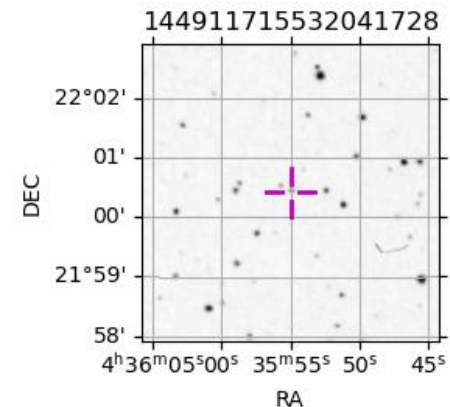
Uranus 2029-01-03T21:39:36 K14.79 G17.25 PgtRgt

Earth
 PIC
 TEN
 KAV
 RIO
 SAAO

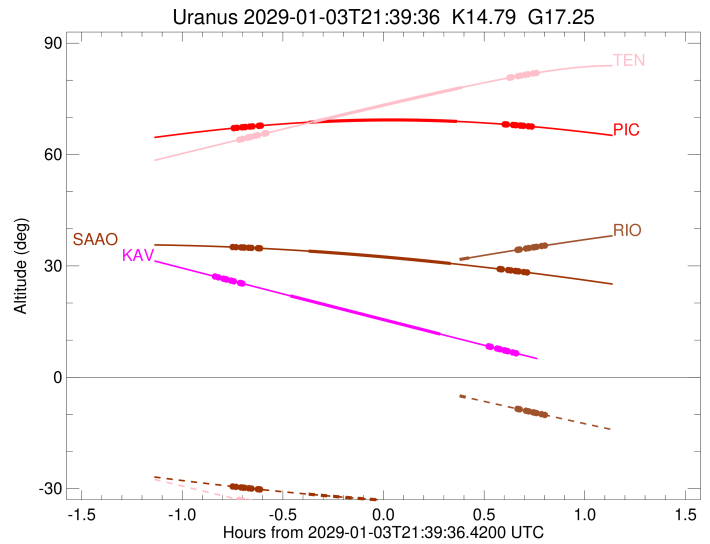
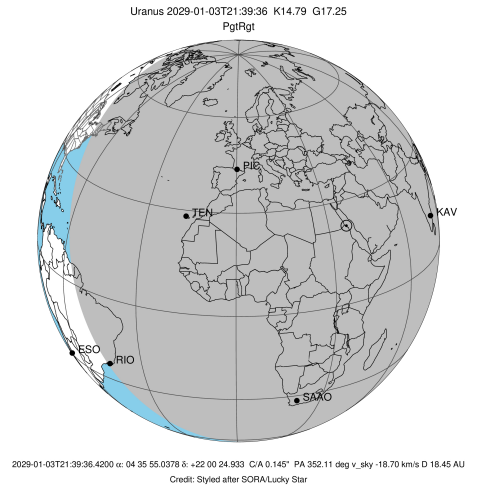


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	+++++	+ +	+++++	JAN 03 20:54 - JAN 03 22:23	PieRie
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 03 20:56 - JAN 03 22:25	PieRie
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	JAN 03 20:49 - JAN 03 22:19	PieRie
RIO	Rio de Janeiro	-22.9	316.8		+	+++++	JAN 03 22:05 - JAN 03 22:27	PneRne
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 03 20:54 - JAN 03 22:22	PieRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

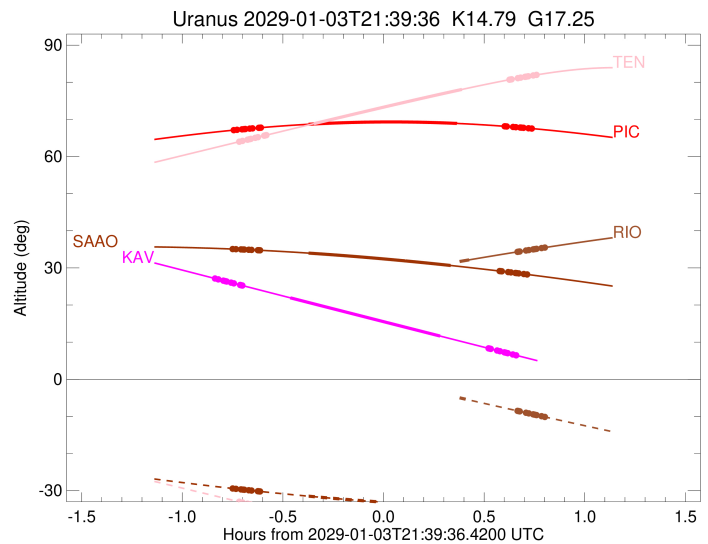
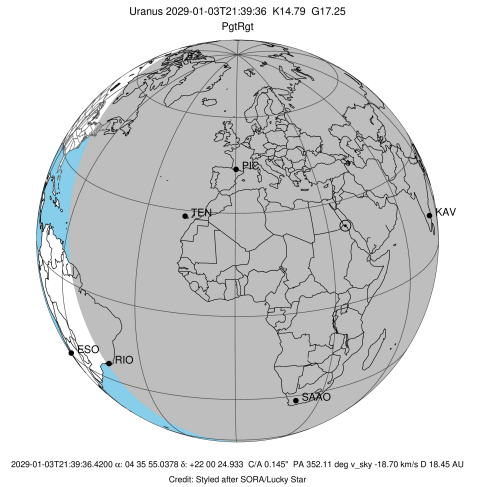


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-03T21:39:22.980
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PIC
 Location : Pic du Midi
 Latitude (deg) : 42.93656
 E. Longitude (deg) : 0.14231
 Altitude (km) : 2.890
 Gaia source ID : 144911715532041728
 2Mass ID (if available) : 04355504+2200250
 ICRS Star Coord at Epoch: 04h 35m 55.03782s +22:00:24.93312s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 14.791
 G magnitude : 17.254
 RP magnitude : 16.475
 BP magnitude : 17.869
 DUPflag : 0
 Distance (au) : 18.455
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.70
 Sun-Target sep (deg) : 147.17
 Sun-Moon sep (deg) : 75.30
 B (ring opening deg) : 79.56
 PA of pole (deg) : -50.54
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.017
 C/A sky separation (km) : 230.8
 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



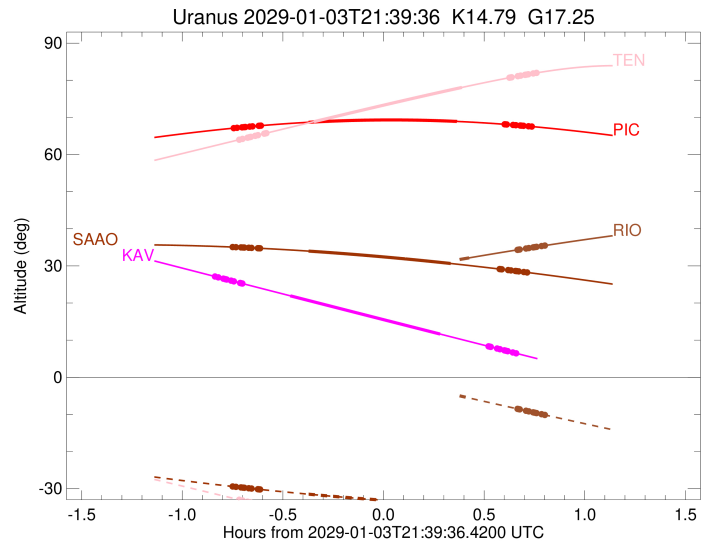
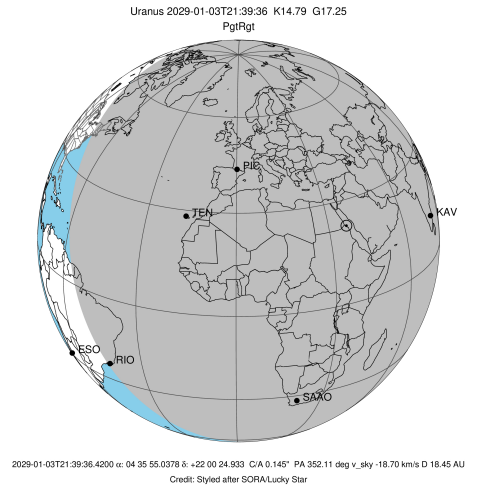
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-01-03T20:54:53.544		67.11	-46.16	51243.62	-19.18		
lambda	I	2029-01-03T20:55:56.983		67.20	-46.35	50026.71	-19.18		
delta	I	2029-01-03T20:57:26.981		67.33	-46.62	48300.35	-19.18		
gamma	I	2029-01-03T20:58:01.848		67.38	-46.72	47631.53	-19.18		
eta	I	2029-01-03T20:58:25.590		67.41	-46.79	47176.12	-19.18		
beta	I	2029-01-03T20:59:43.727		67.52	-47.03	45677.80	-19.18		
alpha	I	2029-01-03T21:00:34.547		67.59	-47.18	44702.50	-19.18		
4	I	2029-01-03T21:02:27.869		67.74	-47.51	42527.50	-19.18		
5	I	2029-01-03T21:02:46.903		67.76	-47.57	42160.17	-19.18		
6	I	2029-01-03T21:03:05.886		67.79	-47.63	41803.55	-19.18		
Uranus	I	2029-01-03T21:17:14.997		68.69	-50.14	25287.65		7.14	7.47
Uranus	E	2029-01-03T22:01:31.692		68.92	-57.64	25298.35		-6.99	-7.32
6	E	2029-01-03T22:15:44.496		68.14	-59.88	41871.28	19.17		
5	E	2029-01-03T22:16:07.784		68.12	-59.94	42310.28	19.17		
4	E	2029-01-03T22:16:23.566		68.10	-59.98	42615.16	19.17		
alpha	E	2029-01-03T22:18:14.063		67.97	-60.26	44734.91	19.17		
beta	E	2029-01-03T22:19:01.470		67.91	-60.38	45644.34	19.17		
eta	E	2029-01-03T22:20:21.391		67.81	-60.59	47176.12	19.17		
gamma	E	2029-01-03T22:20:44.595		67.78	-60.64	47620.99	19.17		
delta	E	2029-01-03T22:21:20.030		67.74	-60.73	48300.35	19.17		
lambda	E	2029-01-03T22:22:50.075		67.62	-60.96	50026.71	19.17		
epsilon	E	2029-01-03T22:23:43.161		67.55	-61.09	51044.47	19.17		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-03T21:40:57.120
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 144911715532041728
 2Mass ID (if available) : 04355504+2200250
 ICRS Star Coord at Epoch: 04h 35m 55.03782s +22:00:24.93312s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 14.791
 G magnitude : 17.254
 RP magnitude : 16.475
 BP magnitude : 17.869
 DUPflag : 0
 Distance (au) : 18.455
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.70
 Sun-Target sep (deg) : 147.17
 Sun-Moon sep (deg) : 75.39
 B (ring opening deg) : 79.56
 PA of pole (deg) : -50.54
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.077
 C/A sky separation (km) : 1028.1
 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



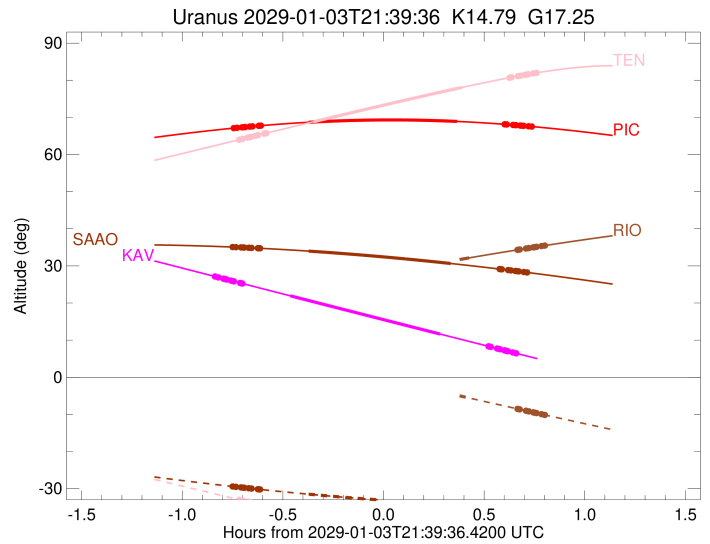
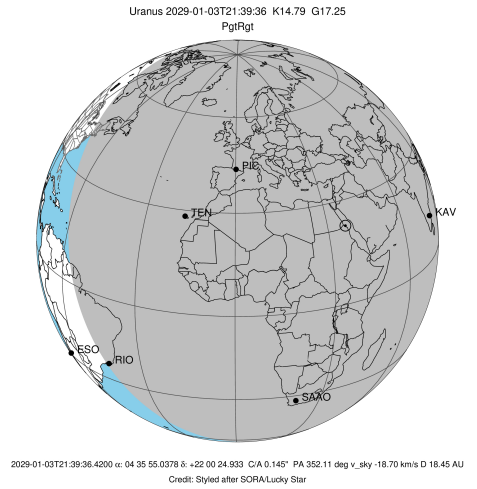
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-01-03T20:56:31.410		63.98	-32.97	51252.37	-19.20		
lambda	I	2029-01-03T20:57:35.244		64.21	-33.20	50026.71	-19.20		
delta	I	2029-01-03T20:59:05.153		64.54	-33.53	48300.35	-19.20		
gamma	I	2029-01-03T20:59:39.984		64.67	-33.66	47631.55	-19.20		
eta	I	2029-01-03T21:00:03.703		64.76	-33.74	47176.12	-19.20		
beta	I	2029-01-03T21:01:21.745		65.04	-34.02	45678.08	-19.20		
alpha	I	2029-01-03T21:02:12.564		65.23	-34.21	44701.73	-19.20		
4	I	2029-01-03T21:04:05.749		65.64	-34.62	42527.19	-19.20		
5	I	2029-01-03T21:04:24.781		65.71	-34.69	42159.41	-19.20		
6	I	2029-01-03T21:04:43.739		65.78	-34.76	41802.85	-19.20		
Uranus	I	2029-01-03T21:18:51.477		68.85	-37.83	25314.29		6.77	7.09
Uranus	E	2029-01-03T22:02:59.756		78.08	-47.51	25268.66		-7.39	-7.74
6	E	2029-01-03T22:17:10.718		80.70	-50.63	41870.43	19.23		
5	E	2029-01-03T22:17:33.930		80.76	-50.71	42309.33	19.23		
4	E	2029-01-03T22:17:49.701		80.81	-50.77	42614.77	19.23		
alpha	E	2029-01-03T22:19:39.821		81.12	-51.17	44733.99	19.23		
beta	E	2029-01-03T22:20:27.147		81.25	-51.35	45644.68	19.23		
eta	E	2029-01-03T22:21:46.799		81.46	-51.64	47176.12	19.23		
gamma	E	2029-01-03T22:22:09.930		81.52	-51.73	47621.01	19.23		
delta	E	2029-01-03T22:22:45.249		81.62	-51.86	48300.35	19.23		
lambda	E	2029-01-03T22:24:15.002		81.85	-52.19	50026.71	19.23		
epsilon	E	2029-01-03T22:25:08.474		81.98	-52.38	51055.24	19.24		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-03T21:34:10.850
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 144911715532041728
 2Mass ID (if available) : 04355504+2200250
 ICRS Star Coord at Epoch: 04h 35m 55.03782s +22:00:24.93312s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 14.791
 G magnitude : 17.254
 RP magnitude : 16.475
 BP magnitude : 17.869
 DUPflag : 0
 Distance (au) : 18.455
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.70
 Sun-Target sep (deg) : 147.17
 Sun-Moon sep (deg) : 74.41
 B (ring opening deg) : 79.56
 PA of pole (deg) : -50.54
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.156
 C/A sky separation (km) : 2086.4
 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



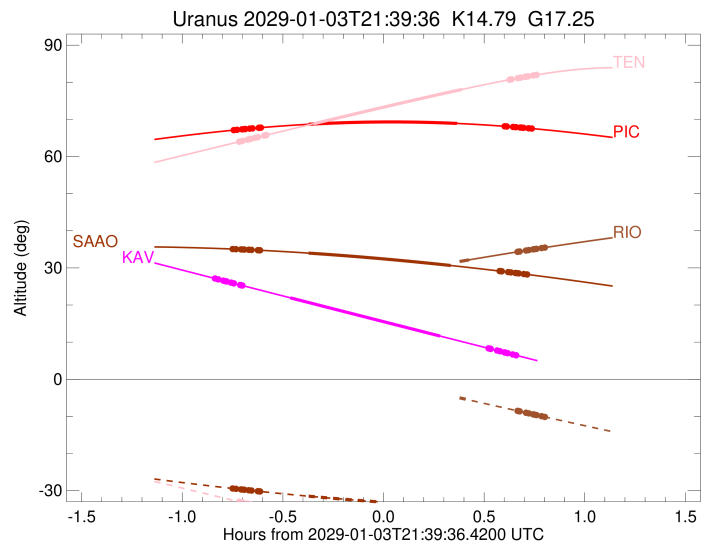
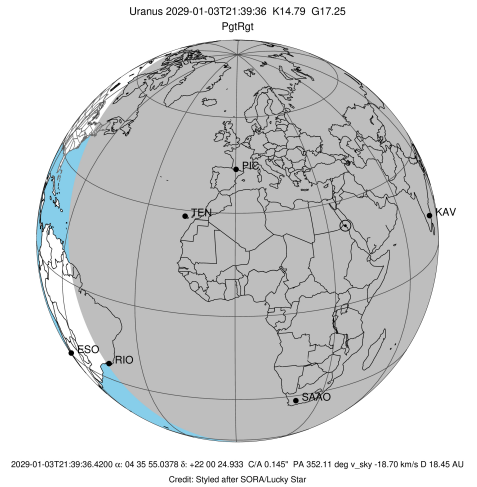
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2029-01-03T20:49:16.553		27.16	-59.75	51265.64	-19.05		
lambda	I	2029-01-03T20:50:21.618		26.91	-59.51	50026.71	-19.04		
delta	I	2029-01-03T20:51:52.299		26.56	-59.17	48300.35	-19.04		
gamma	I	2029-01-03T20:52:27.435		26.43	-59.04	47631.57	-19.03		
eta	I	2029-01-03T20:52:51.364		26.33	-58.95	47176.12	-19.03		
beta	I	2029-01-03T20:54:10.087		26.03	-58.66	45678.46	-19.03		
alpha	I	2029-01-03T20:55:01.449		25.83	-58.47	44700.66	-19.02		
4	I	2029-01-03T20:56:55.679		25.39	-58.04	42526.82	-19.02		
5	I	2029-01-03T20:57:14.919		25.31	-57.97	42158.44	-19.02		
6	I	2029-01-03T20:57:34.058		25.24	-57.90	41801.91	-19.02		
Uranus	I	2029-01-03T21:11:51.027		21.93	-54.68	25344.92		6.33	6.62
Uranus	E	2029-01-03T21:56:29.039		11.64	-44.48	25252.27		-7.60	-7.96
6	E	2029-01-03T22:10:56.510		8.33	-41.16	41870.08	18.86		
5	E	2029-01-03T22:11:20.172		8.24	-41.06	42308.94	18.86		
4	E	2029-01-03T22:11:36.266		8.18	-41.00	42614.61	18.86		
alpha	E	2029-01-03T22:13:28.534		7.75	-40.57	44733.65	18.86		
beta	E	2029-01-03T22:14:16.819		7.56	-40.39	45644.80	18.86		
eta	E	2029-01-03T22:15:38.043		7.26	-40.08	47176.12	18.86		
gamma	E	2029-01-03T22:16:01.634		7.17	-39.98	47621.02	18.86		
delta	E	2029-01-03T22:16:37.658		7.03	-39.85	48300.35	18.86		
lambda	E	2029-01-03T22:18:09.208		6.68	-39.50	50026.71	18.86		
epsilon	E	2029-01-03T22:19:03.927		6.47	-39.29	51058.46	18.86		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-03T21:43:34.460
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 144911715532041728
 2Mass ID (if available) : 04355504+2200250
 ICRS Star Coord at Epoch: 04h 35m 55.03782s +22:00:24.93312s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 14.791
 G magnitude : 17.254
 RP magnitude : 16.475
 BP magnitude : 17.869
 DUPflag : 0
 Distance (au) : 18.455
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.70
 Sun-Target sep (deg) : 147.17
 Sun-Moon sep (deg) : 75.03
 B (ring opening deg) : 79.56
 PA of pole (deg) : -50.54
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.398
 C/A sky separation (km) : 5332.8
 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	2029-01-03T20:59:03.152		20.84	8.30x	51284.39	-19.00		
lambda	I	2029-01-03T21:00:09.418		21.04	8.06x	50026.71	-18.98		
delta	I	2029-01-03T21:01:40.405		21.32	7.74x	48300.35	-18.97		
gamma	I	2029-01-03T21:02:15.661		21.43	7.61x	47631.58	-18.97		
eta	I	2029-01-03T21:02:39.674		21.51	7.53x	47176.12	-18.97		
beta	I	2029-01-03T21:03:58.648		21.75	7.24x	45679.01	-18.96		
alpha	I	2029-01-03T21:04:50.314		21.91	7.06x	44699.02	-18.95		
4	I	2029-01-03T21:06:44.945		22.26	6.65x	42526.36	-18.94		
5	I	2029-01-03T21:07:04.303		22.31	6.58x	42157.10	-18.94		
6	I	2029-01-03T21:07:23.516		22.37	6.51x	41800.49	-18.94		
Uranus	I	2029-01-03T21:21:46.110		24.96	3.45x	25405.17		5.35	5.60
Uranus	E	2029-01-03T22:05:08.578		32.16	-5.58	25171.89		-8.57	-8.97
6	E	2029-01-03T22:19:34.958		34.32	-8.51	41867.40	19.02		
5	E	2029-01-03T22:19:58.383		34.38	-8.59	42305.71	19.02		
4	E	2029-01-03T22:20:14.464		34.42	-8.65	42613.20	19.02		
alpha	E	2029-01-03T22:22:05.622		34.69	-9.02	44730.88	19.04		
beta	E	2029-01-03T22:22:53.651		34.80	-9.18	45645.89	19.05		
eta	E	2029-01-03T22:24:13.998		34.99	-9.45	47176.12	19.06		
gamma	E	2029-01-03T22:24:37.347		35.04	-9.53	47621.11	19.06		
delta	E	2029-01-03T22:25:12.980		35.13	-9.65	48300.35	19.06		
lambda	E	2029-01-03T22:26:43.513		35.34	-9.95	50026.71	19.07		
epsilon	E	2029-01-03T22:27:39.269		35.47	-10.13	51090.37	19.10		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2029-01-03T21:38:35.850
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 144911715532041728
 2Mass ID (if available) : 04355504+2200250
 ICRS Star Coord at Epoch: 04h 35m 55.03782s +22:00:24.93312s
 RUWE (>1.4 is poor) : 1.12
 K magnitude : 14.791
 G magnitude : 17.254
 RP magnitude : 16.475
 BP magnitude : 17.869
 DUPflag : 0
 Distance (au) : 18.455
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -18.70
 Sun-Target sep (deg) : 147.17
 Sun-Moon sep (deg) : 74.86
 B (ring opening deg) : 79.56
 PA of pole (deg) : -50.54
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 0.542
 C/A sky separation (km) : 7260.2
 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_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	2029-01-03T20:54:30.494		35.08	-29.41	51301.76	-19.06		
lambda	I	2029-01-03T20:55:37.468		35.04	-29.52	50026.71	-19.03		
delta	I	2029-01-03T20:57:08.211		34.98	-29.67	48300.35	-19.02		
gamma	I	2029-01-03T20:57:43.386		34.96	-29.73	47631.57	-19.01		
eta	I	2029-01-03T20:58:07.348		34.94	-29.77	47176.12	-19.00		
beta	I	2029-01-03T20:59:26.153		34.89	-29.90	45679.45	-18.99		
alpha	I	2029-01-03T21:00:17.845		34.85	-29.98	44697.61	-18.97		
4	I	2029-01-03T21:02:12.339		34.77	-30.16	42526.09	-18.95		
5	I	2029-01-03T21:02:31.724		34.75	-30.19	42156.19	-18.94		
6	I	2029-01-03T21:02:50.931		34.74	-30.22	41799.38	-18.94		
Uranus	I	2029-01-03T21:17:17.660		33.98	-31.50	25446.55		4.57	4.78
Uranus	E	2029-01-03T21:59:37.993		30.65	-34.17	25135.67		-8.97	-9.39
6	E	2029-01-03T22:14:14.432		29.15	-34.69	41866.20	18.89		
5	E	2029-01-03T22:14:37.990		29.11	-34.70	42304.19	18.89		
4	E	2029-01-03T22:14:54.235		29.08	-34.71	42612.52	18.90		
alpha	E	2029-01-03T22:16:46.071		28.87	-34.76	44729.74	18.92		
beta	E	2029-01-03T22:17:34.480		28.78	-34.78	45646.35	18.93		
eta	E	2029-01-03T22:18:55.275		28.64	-34.81	47176.12	18.95		
gamma	E	2029-01-03T22:19:18.759		28.59	-34.82	47621.15	18.95		
delta	E	2029-01-03T22:19:54.591		28.52	-34.84	48300.35	18.96		
lambda	E	2029-01-03T22:21:25.617		28.35	-34.87	50026.71	18.97		
epsilon	E	2029-01-03T22:22:22.307		28.24	-34.89	51102.49	19.00		