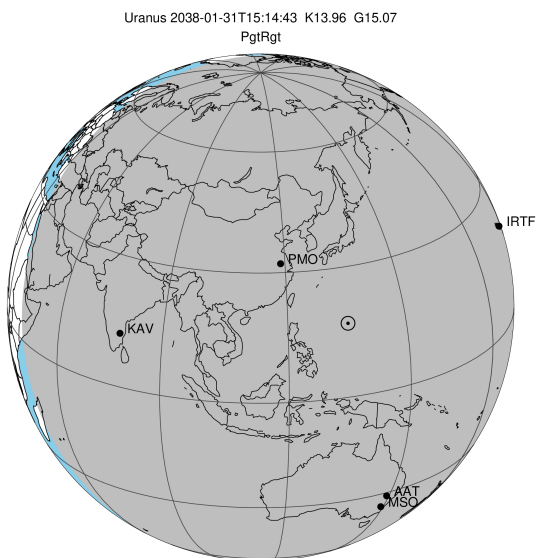


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-01-31T15:14:43.330
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 866393554709704960
 2Mass ID (if available) : 07301638+2219253

ICRS Star Coord at Epoch: 07h 30m 16.38236s +22:19:25.26391s

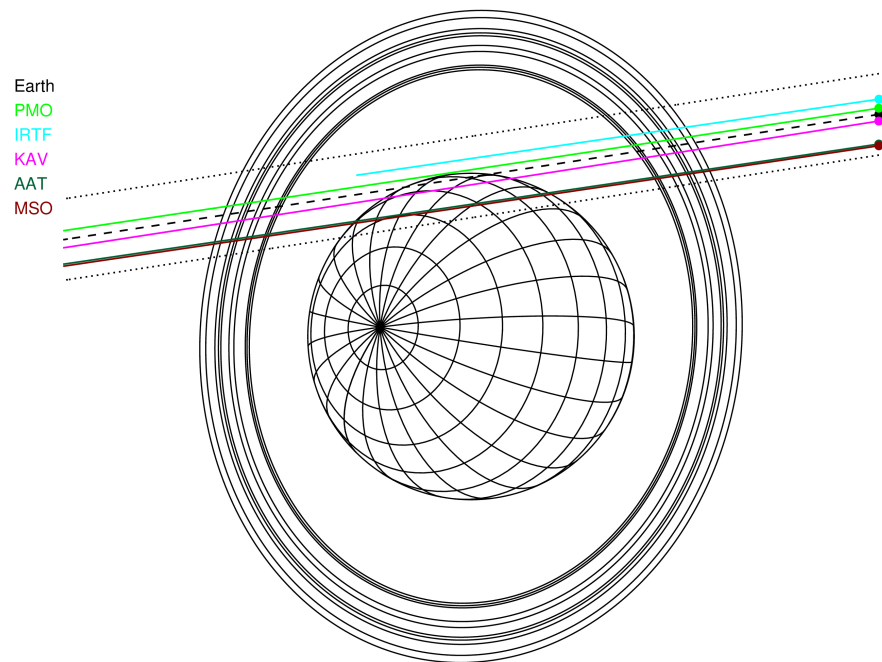
RUWE (>1.4 is poor) : 3.21
 K magnitude : 13.957
 G magnitude : 15.067
 RP magnitude : 14.664
 BP magnitude : 15.286
 DUPflag : 0
 Distance (au) : 17.775
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.42
 Sun-Target sep (deg) : 159.48
 Sun-Moon sep (deg) : 157.48
 B (ring opening deg) : 55.94
 PA of pole (deg) : 84.14

#	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



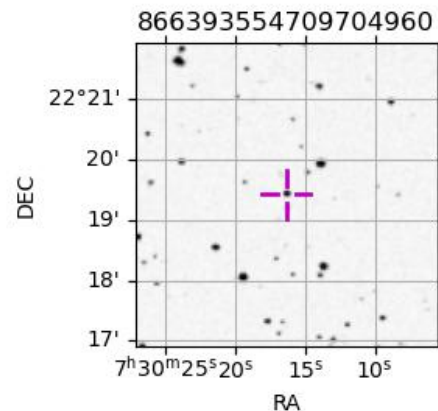
2038-01-31T15:14:43.3300 ra: 07 30 16.3824 ra: +22 19 25.264 C/A 1.922 PA 188.74 deg v_sky -21.42 km/s D 17.77 AU
 Credit: Styled after SORA/Lucky Star

Uranus 2038-01-31T15:14:43 K13.96 G15.07 PgtRgt

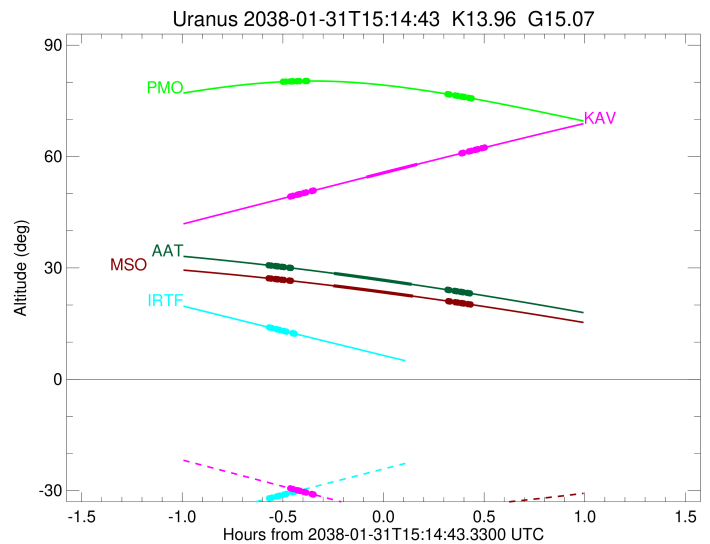
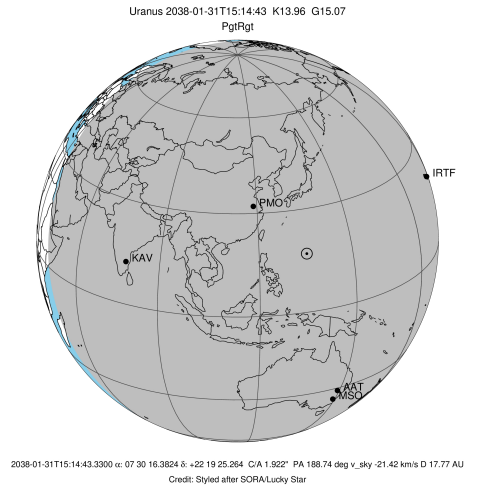


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	+++++		+++++	JAN 31 14:44 - JAN 31 15:41	PnnRie
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					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+++++			JAN 31 14:40 - JAN 31 14:48	PnnRin
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	JAN 31 14:46 - JAN 31 15:45	PieRie
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1	+++++	+ +	+++++	JAN 31 14:40 - JAN 31 15:40	PieRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	JAN 31 14:40 - JAN 31 15:40	PieRie



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-01-31T15:14:24.200
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 866393554709704960
 2Mass ID (if available) : 07301638+2219253
 ICRS Star Coord at Epoch: 07h 30m 16.38236s +22:19:25.26391s
 RUWE (>1.4 is poor) : 3.21
 K magnitude : 13.957
 G magnitude : 15.067
 RP magnitude : 14.664
 BP magnitude : 15.286
 DUPflag : 0
 Distance (au) : 17.775
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.42
 Sun-Target sep (deg) : 159.48
 Sun-Moon sep (deg) : 157.89
 B (ring opening deg) : 55.94
 PA of pole (deg) : 84.14
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.003
 C/A sky separation (km) : 25821.8
 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

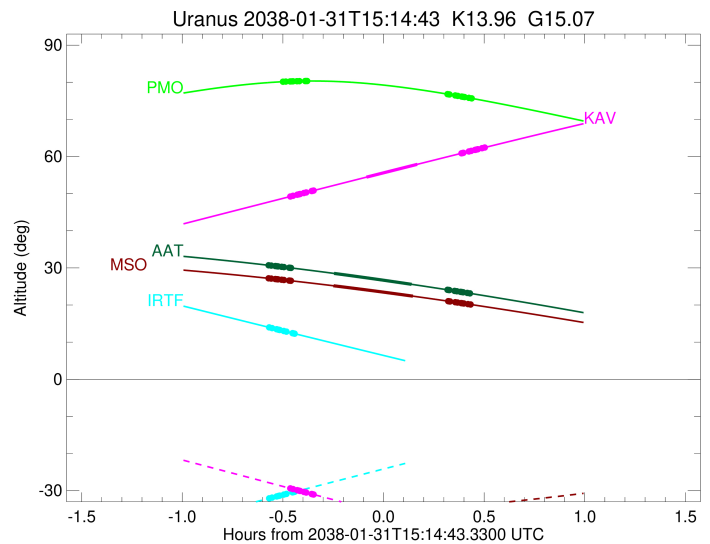
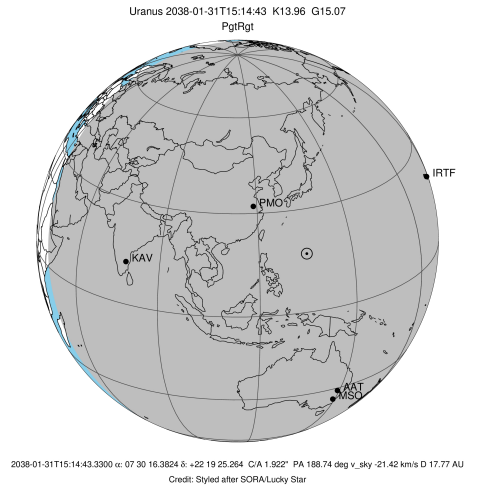


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-01-31T14:44:47.379		80.16	-64.32	51119.40	-22.53		
lambda	I	2038-01-31T14:45:36.304		80.19	-64.47	50026.71	-22.25		
delta	I	2038-01-31T14:46:54.435		80.24	-64.71	48300.35	-21.94		
gamma	I	2038-01-31T14:47:25.006		80.25	-64.80	47631.55	-21.81		
eta	I	2038-01-31T14:47:45.929		80.26	-64.87	47176.12	-21.72		
beta	I	2038-01-31T14:48:57.143		80.29	-65.08	45641.10	-21.39		
alpha	I	2038-01-31T14:49:41.215		80.31	-65.22	44697.93	-21.17		
4	I	2038-01-31T14:51:23.809		80.34	-65.53	42563.08	-20.61		
5	I	2038-01-31T14:51:36.163		80.34	-65.57	42309.24	-20.51		
6	I	2038-01-31T14:52:00.129		80.34	-65.64	41830.12	-20.37		

No planet occultations

6	E	2038-01-31T15:33:44.139		76.82	-72.23	41797.91	20.36		
5	E	2038-01-31T15:34:05.419		76.77	-72.28	42187.87	20.49		
4	E	2038-01-31T15:34:25.773		76.72	-72.32	42616.45	20.60		
alpha	E	2038-01-31T15:36:07.329		76.46	-72.53	44750.61	21.16		
beta	E	2038-01-31T15:36:50.320		76.34	-72.62	45666.75	21.37		
eta	E	2038-01-31T15:38:00.495		76.16	-72.76	47176.12	21.70		
gamma	E	2038-01-31T15:38:21.121		76.10	-72.80	47624.68	21.79		
delta	E	2038-01-31T15:38:52.033		76.02	-72.86	48300.35	21.92		
lambda	E	2038-01-31T15:40:10.234		75.81	-73.01	50026.71	22.23		
epsilon	E	2038-01-31T15:41:16.913		75.63	-73.14	51516.63	22.51		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-01-31T15:10:10.880
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : 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 : 866393554709704960
 2Mass ID (if available) : 07301638+2219253
 ICRS Star Coord at Epoch: 07h 30m 16.38236s +22:19:25.26391s
 RUWE (>1.4 is poor) : 3.21
 K magnitude : 13.957
 G magnitude : 15.067
 RP magnitude : 14.664
 BP magnitude : 15.286
 DUPflag : 0
 Distance (au) : 17.775
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.42
 Sun-Target sep (deg) : 159.48
 Sun-Moon sep (deg) : 158.33
 B (ring opening deg) : 55.94
 PA of pole (deg) : 84.14
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 2.139
 C/A sky separation (km) : 27578.2
 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_itr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk

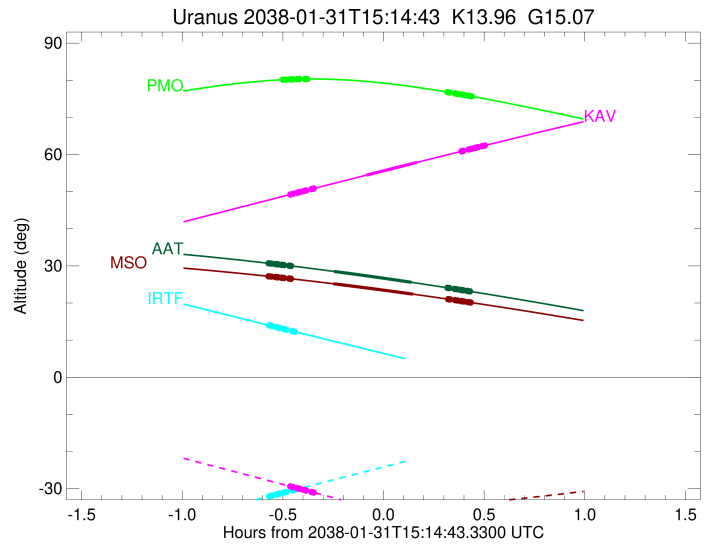
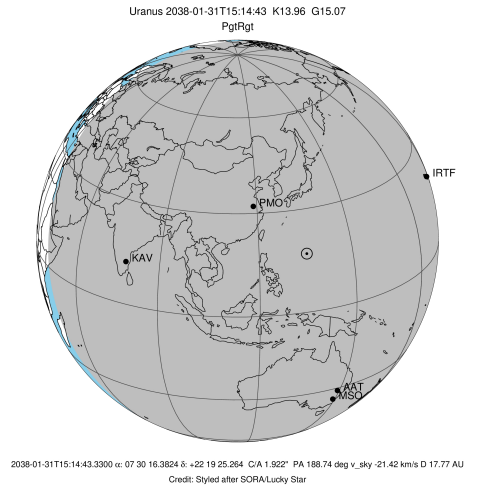


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-01-31T14:40:39.610		13.97	-32.07	51134.15	-21.62		
lambda	I	2038-01-31T14:41:31.343		13.78	-31.87	50026.71	-21.30		
delta	I	2038-01-31T14:42:53.052		13.47	-31.56	48300.35	-20.95		
gamma	I	2038-01-31T14:43:25.091		13.35	-31.43	47631.57	-20.80		
eta	I	2038-01-31T14:43:47.044		13.27	-31.35	47176.12	-20.69		
beta	I	2038-01-31T14:45:01.921		12.99	-31.06	45641.06	-20.31		
alpha	I	2038-01-31T14:45:48.347		12.82	-30.88	44699.18	-20.06		
4	I	2038-01-31T14:47:36.972		12.42	-30.46	42565.30	-19.39		
5	I	2038-01-31T14:47:50.327		12.37	-30.40	42307.61	-19.27		
6	I	2038-01-31T14:48:15.763		12.27	-30.31	41827.98	-19.11		

No planet occultations

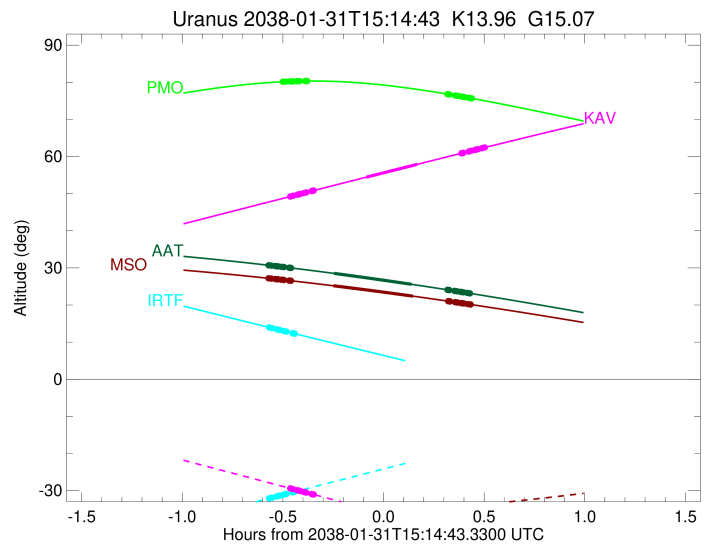
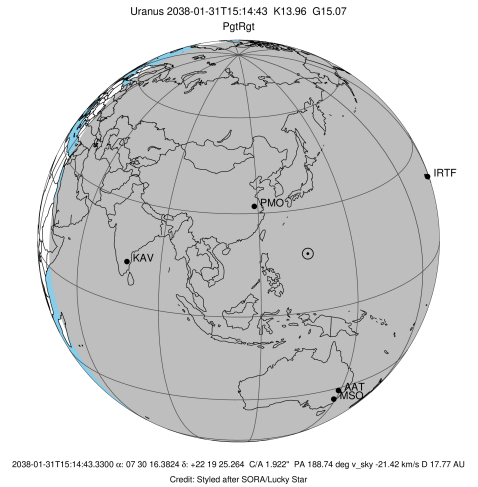
6	E	2038-01-31T15:28:50.728		3.33x	-20.91	41797.04	19.04		
5	E	2038-01-31T15:29:13.622		3.25x	-20.82	42191.67	19.19		
4	E	2038-01-31T15:29:35.158		3.17x	-20.73	42616.56	19.32		
alpha	E	2038-01-31T15:31:23.034		2.78x	-20.32	44749.99	19.97		
beta	E	2038-01-31T15:32:08.540		2.61x	-20.15	45665.76	20.22		
eta	E	2038-01-31T15:33:22.660		2.34x	-19.86	47176.12	20.59		
gamma	E	2038-01-31T15:33:44.400		2.26x	-19.78	47624.92	20.70		
delta	E	2038-01-31T15:34:16.919		2.14x	-19.65	48300.35	20.84		
lambda	E	2038-01-31T15:35:39.050		1.85x	-19.34	50026.71	21.19		
epsilon	E	2038-01-31T15:36:49.248		1.59x	-19.07	51523.80	21.50		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-01-31T15:17:20.860
 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 : 866393554709704960
 2Mass ID (if available) : 07301638+2219253
 ICRS Star Coord at Epoch: 07h 30m 16.38236s +22:19:25.26391s
 RUWE (>1.4 is poor) : 3.21
 K magnitude : 13.957
 G magnitude : 15.067
 RP magnitude : 14.664
 BP magnitude : 15.286
 DUPflag : 0
 Distance (au) : 17.775
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.42
 Sun-Target sep (deg) : 159.48
 Sun-Moon sep (deg) : 157.30
 B (ring opening deg) : 55.94
 PA of pole (deg) : 84.14
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.821
 C/A sky separation (km) : 23470.8
 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



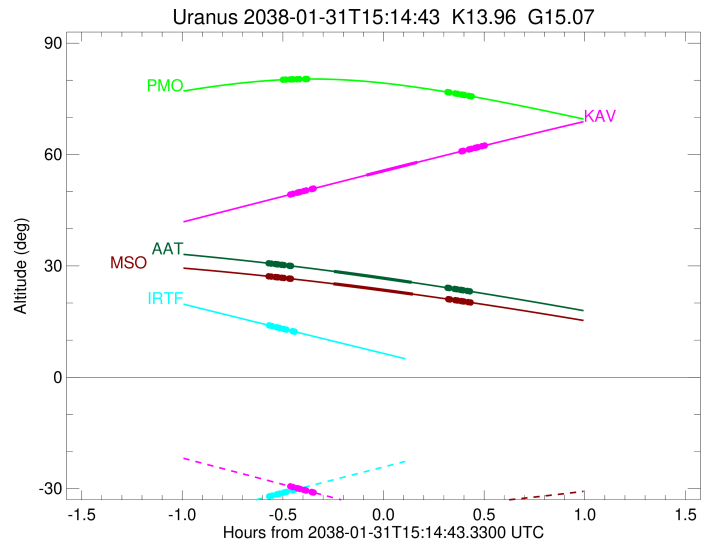
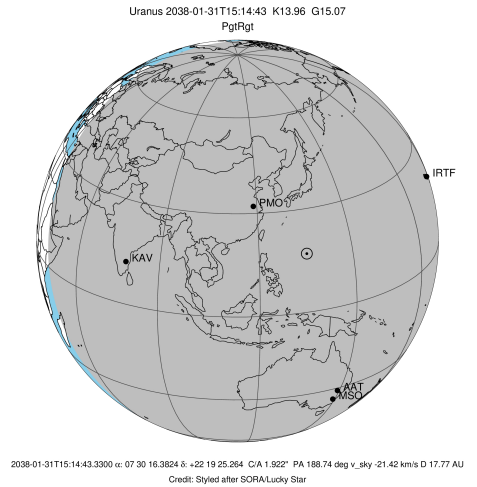
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2038-01-31T14:46:58.776		49.24	-29.40	51099.85	-23.14		
lambda	I	2038-01-31T14:47:45.486		49.42	-29.58	50026.71	-22.91		
delta	I	2038-01-31T14:49:01.247		49.71	-29.89	48300.35	-22.66		
gamma	I	2038-01-31T14:49:30.825		49.83	-30.00	47631.51	-22.56		
eta	I	2038-01-31T14:49:51.041		49.91	-30.08	47176.12	-22.49		
beta	I	2038-01-31T14:50:59.699		50.17	-30.35	45641.22	-22.23		
alpha	I	2038-01-31T14:51:42.120		50.33	-30.52	44696.37	-22.06		
4	I	2038-01-31T14:53:20.321		50.71	-30.91	42560.24	-21.62		
5	I	2038-01-31T14:53:31.852		50.75	-30.96	42311.06	-21.53		
6	I	2038-01-31T14:53:54.750		50.84	-31.05	41832.91	-21.43		
Uranus	I	2038-01-31T15:09:37.944		54.45	-34.79	25549.89		-4.79	-5.02
Uranus	E	2038-01-31T15:24:47.176		57.90	-38.41	25410.21		19.80	20.66
6	E	2038-01-31T15:37:54.627		60.86	-41.54	41799.22	21.47		
5	E	2038-01-31T15:38:14.628		60.94	-41.62	42183.24	21.57		
4	E	2038-01-31T15:38:34.165		61.01	-41.69	42616.11	21.66		
alpha	E	2038-01-31T15:40:11.160		61.37	-42.08	44751.28	22.10		
beta	E	2038-01-31T15:40:52.369		61.52	-42.24	45668.01	22.28		
eta	E	2038-01-31T15:41:59.772		61.78	-42.51	47176.12	22.54		
gamma	E	2038-01-31T15:42:19.628		61.85	-42.59	47624.37	22.61		
delta	E	2038-01-31T15:42:49.456		61.96	-42.71	48300.35	22.71		
lambda	E	2038-01-31T15:44:05.044		62.24	-43.01	50026.71	22.96		
epsilon	E	2038-01-31T15:45:09.215		62.48	-43.27	51506.21	23.19		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-01-31T15:11:39.270
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : AAT
 Location : Siding Spring (AAT)
 Latitude (deg) : -31.27703
 E. Longitude (deg) : 149.06608
 Altitude (km) : 1.164
 Gaia source ID : 866393554709704960
 2Mass ID (if available) : 07301638+2219253
 ICRS Star Coord at Epoch: 07h 30m 16.38236s +22:19:25.26391s
 RUWE (>1.4 is poor) : 3.21
 K magnitude : 13.957
 G magnitude : 15.067
 RP magnitude : 14.664
 BP magnitude : 15.286
 DUPflag : 0
 Distance (au) : 17.775
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.42
 Sun-Target sep (deg) : 159.48
 Sun-Moon sep (deg) : 158.10
 B (ring opening deg) : 55.94
 PA of pole (deg) : 84.14
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.589
 C/A sky separation (km) : 20479.3
 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	2038-01-31T14:40:32.218		30.70	-41.33	51070.82	-23.87		
lambda	I	2038-01-31T14:41:16.208		30.62	-41.31	50026.71	-23.68		
delta	I	2038-01-31T14:42:29.370		30.49	-41.27	48300.35	-23.50		
gamma	I	2038-01-31T14:42:57.874		30.44	-41.26	47631.43	-23.43		
eta	I	2038-01-31T14:43:17.329		30.41	-41.25	47176.12	-23.38		
beta	I	2038-01-31T14:44:23.272		30.29	-41.21	45641.49	-23.18		
alpha	I	2038-01-31T14:45:03.989		30.22	-41.19	44694.27	-23.06		
4	I	2038-01-31T14:46:37.698		30.05	-41.14	42556.33	-22.74		
5	I	2038-01-31T14:46:48.355		30.03	-41.13	42313.07	-22.67		
6	I	2038-01-31T14:47:10.198		29.99	-41.12	41836.82	-22.60		
Uranus	I	2038-01-31T15:00:00.345		28.51	-40.57	25499.99		-12.28	-12.85
Uranus	E	2038-01-31T15:23:04.632		25.58	-39.13	25319.83		25.51	26.55
6	E	2038-01-31T15:33:44.405		24.11	-38.28	41800.85	22.55		
5	E	2038-01-31T15:34:03.252		24.07	-38.25	42178.62	22.61		
4	E	2038-01-31T15:34:22.077		24.02	-38.22	42615.47	22.68		
alpha	E	2038-01-31T15:35:55.127		23.80	-38.09	44751.83	22.99		
beta	E	2038-01-31T15:36:34.800		23.71	-38.03	45669.31	23.12		
eta	E	2038-01-31T15:37:39.813		23.55	-37.94	47176.12	23.31		
gamma	E	2038-01-31T15:37:59.012		23.51	-37.91	47624.05	23.36		
delta	E	2038-01-31T15:38:27.919		23.44	-37.86	48300.35	23.43		
lambda	E	2038-01-31T15:39:41.311		23.26	-37.75	50026.71	23.61		
epsilon	E	2038-01-31T15:40:43.285		23.11	-37.66	51494.12	23.79		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2038-01-31T15:11:44.270
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : MSO
 Location : Mt. Stromlo Observatory
 Latitude (deg) : -35.32000
 E. Longitude (deg) : 149.00833
 Altitude (km) : 0.770
 Gaia source ID : 866393554709704960
 2Mass ID (if available) : 07301638+2219253
 ICRS Star Coord at Epoch: 07h 30m 16.38236s +22:19:25.26391s
 RUWE (>1.4 is poor) : 3.21
 K magnitude : 13.957
 G magnitude : 15.067
 RP magnitude : 14.664
 BP magnitude : 15.286
 DUPflag : 0
 Distance (au) : 17.775
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -21.42
 Sun-Target sep (deg) : 159.48
 Sun-Moon sep (deg) : 158.06
 B (ring opening deg) : 55.94
 PA of pole (deg) : 84.14
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.566
 C/A sky separation (km) : 20189.4
 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_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	2038-01-31T14:40:32.022		27.19	-37.33	51068.44	-23.91		
lambda	I	2038-01-31T14:41:15.819		27.12	-37.32	50026.71	-23.74		
delta	I	2038-01-31T14:42:28.814		27.00	-37.28	48300.35	-23.56		
gamma	I	2038-01-31T14:42:57.249		26.95	-37.27	47631.42	-23.49		
eta	I	2038-01-31T14:43:16.654		26.92	-37.26	47176.12	-23.44		
beta	I	2038-01-31T14:44:22.415		26.81	-37.23	45641.53	-23.25		
alpha	I	2038-01-31T14:45:03.017		26.74	-37.21	44694.10	-23.13		
4	I	2038-01-31T14:46:36.417		26.59	-37.16	42556.00	-22.82		
5	I	2038-01-31T14:46:47.013		26.57	-37.16	42313.21	-22.76		
6	I	2038-01-31T14:47:08.782		26.53	-37.15	41837.15	-22.69		
Uranus	I	2038-01-31T14:59:47.656		25.19	-36.67	25494.65		-12.84	-13.43
Uranus	E	2038-01-31T15:23:27.498		22.39	-35.33	25312.36		25.94	26.99
6	E	2038-01-31T15:33:57.559		21.04	-34.57	41801.03	22.63		
5	E	2038-01-31T15:34:16.309		21.00	-34.54	42178.16	22.70		
4	E	2038-01-31T15:34:35.081		20.96	-34.52	42615.39	22.76		
alpha	E	2038-01-31T15:36:07.825		20.76	-34.40	44751.87	23.07		
beta	E	2038-01-31T15:36:47.376		20.67	-34.34	45669.45	23.19		
eta	E	2038-01-31T15:37:52.199		20.52	-34.26	47176.12	23.37		
gamma	E	2038-01-31T15:38:11.345		20.48	-34.23	47624.01	23.42		
delta	E	2038-01-31T15:38:40.179		20.42	-34.19	48300.35	23.49		
lambda	E	2038-01-31T15:39:53.395		20.25	-34.09	50026.71	23.66		
epsilon	E	2038-01-31T15:40:55.175		20.11	-34.00	51492.73	23.84		