

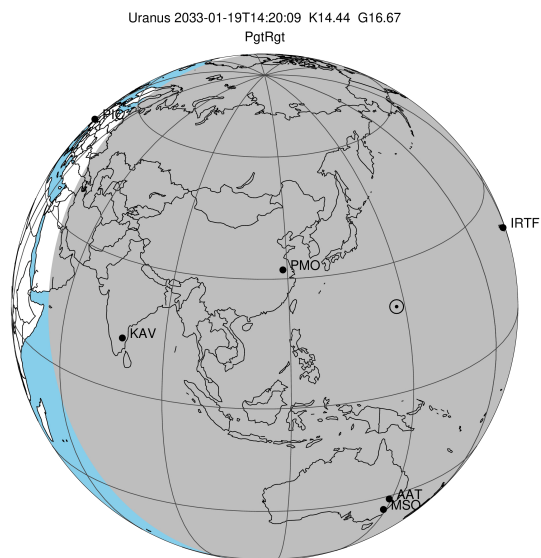
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-19T14:20:09.970
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Gaia source ID : 3427506635195280384
 2Mass ID (if available) : 05510800+2338239

Uranus 2033-01-19T14:20:09 K14.44 G16.67 PgtRgt

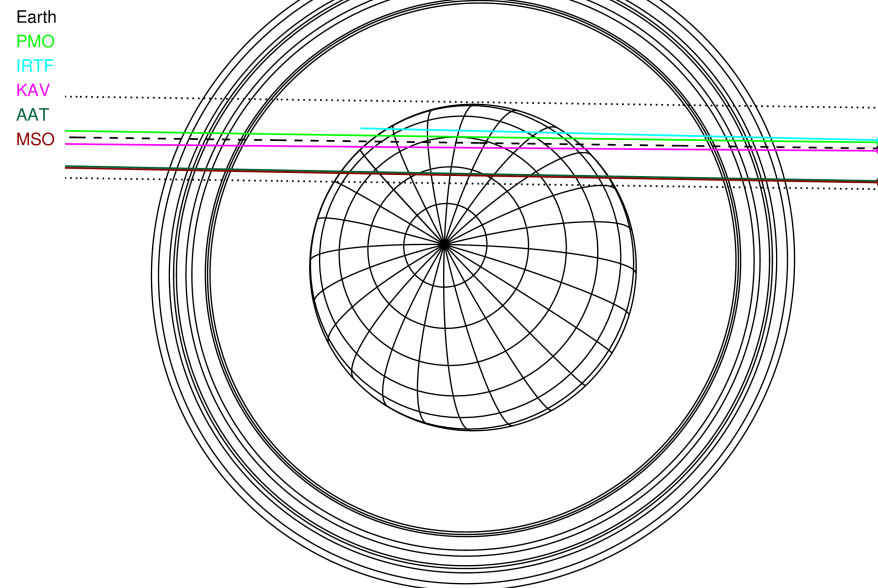
ICRS Star Coord at Epoch: 05h 51m 08.01455s +23:38:24.10191s

RUWE (>1.4 is poor) : 1.04
 K magnitude : 14.439
 G magnitude : 16.670
 RP magnitude : 15.944
 BP magnitude : 17.233
 DUPflag : 0
 Distance (au) : 18.167
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.07
 Sun-Target sep (deg) : 148.61
 Sun-Moon sep (deg) : 76.45
 B (ring opening deg) : 77.00
 PA of pole (deg) : 51.26

#	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

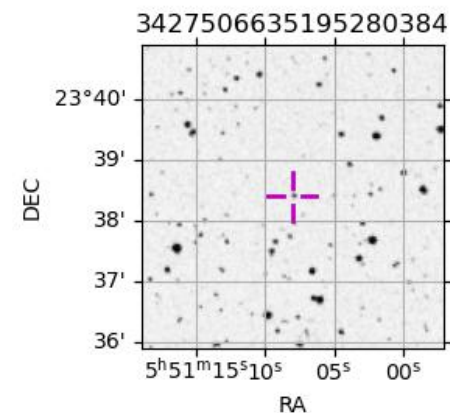


2033-01-19T14:20:09.9700 ex: 05 51 08.0146 s: +23 38 24.102 C/A 1.488° PA 179.21 deg v_sky -19.07 km/s D 18.17 AU
 Credit: Styled after SORA/Lucky Star

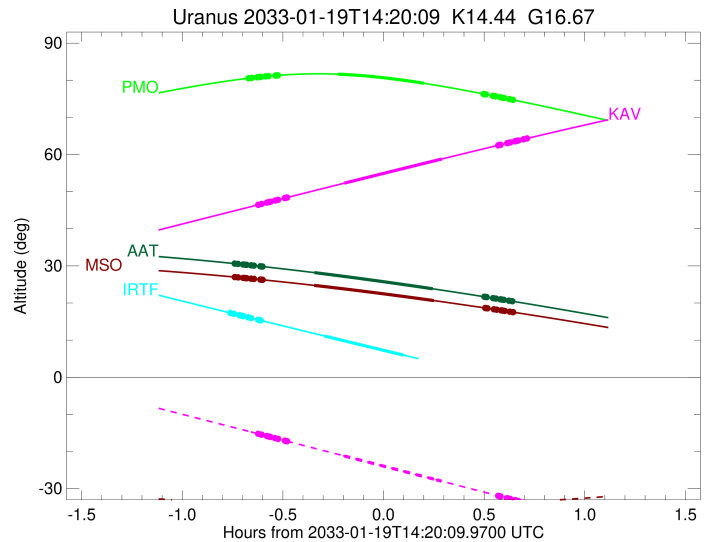
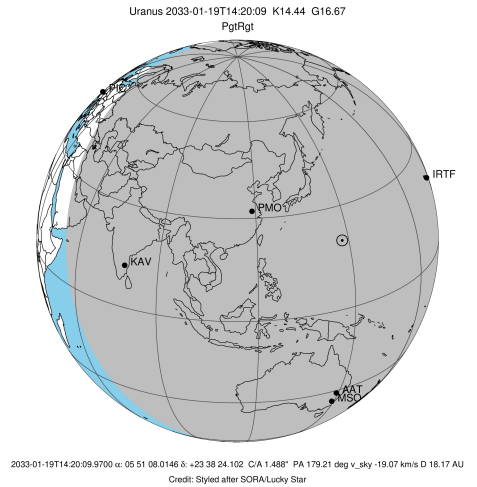


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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 19 13:40 - JAN 19 14:59	PieRie
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 19 13:34 - JAN 19 14:26	PieRin
KAV	Kavalur Observatory	12.6	78.8	+++++	+ +	+++++	JAN 19 13:42 - JAN 19 15:03	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 19 13:36 - JAN 19 14:58	PieRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	+++++	+ +	+++++	JAN 19 13:36 - JAN 19 14:59	PieRie



target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-19T14:19:45.370
 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 : 3427506635195280384
 2Mass ID (if available) : 05510800+2338239
 ICRS Star Coord at Epoch: 05h 51m 08.01455s +23:38:24.10191s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 14.439
 G magnitude : 16.670
 RP magnitude : 15.944
 BP magnitude : 17.233
 DUPflag : 0
 Distance (au) : 18.167
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.07
 Sun-Target sep (deg) : 148.61
 Sun-Moon sep (deg) : 77.31
 B (ring opening deg) : 77.00
 PA of pole (deg) : 51.26
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.551
 C/A sky separation (km) : 20430.7
 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

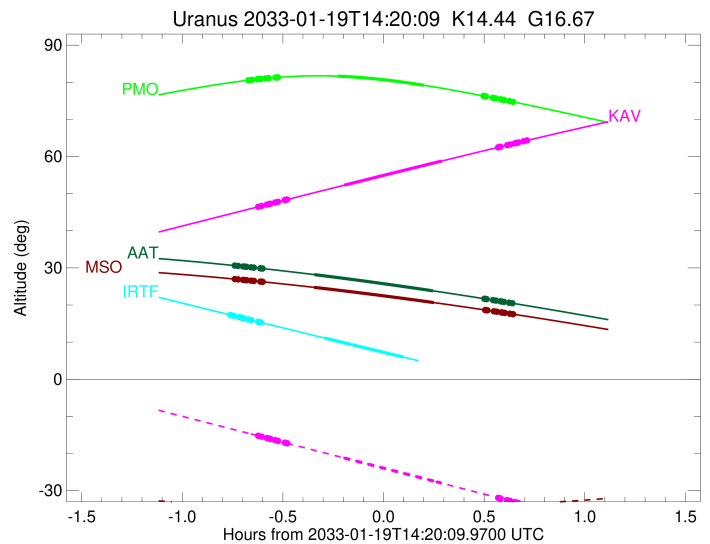
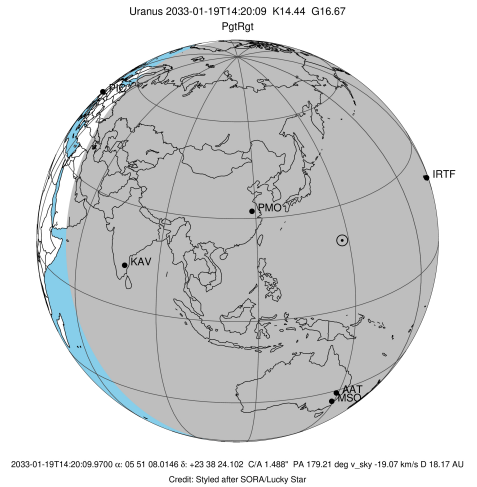


b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-19T13:40:04.004		80.57	-53.40	50981.46	-18.15		
lambda	I	2033-01-19T13:40:56.872		80.66	-53.59	50026.71	-18.02		
delta	I	2033-01-19T13:42:33.006		80.82	-53.92	48300.35	-17.89		
gamma	I	2033-01-19T13:43:10.501		80.88	-54.06	47630.67	-17.83		
eta	I	2033-01-19T13:43:36.020		80.92	-54.14	47176.12	-17.79		
beta	I	2033-01-19T13:45:00.931		81.05	-54.44	45671.56	-17.65		
alpha	I	2033-01-19T13:45:54.667		81.12	-54.63	44725.31	-17.56		
4	I	2033-01-19T13:47:55.580		81.28	-55.05	42615.36	-17.31		
5	I	2033-01-19T13:48:19.848		81.31	-55.13	42200.38	-17.28		
6	I	2033-01-19T13:48:42.536		81.33	-55.21	41811.18	-17.20		
Uranus	I	2033-01-19T14:06:36.493		81.65	-58.92	25558.83		0.23	0.24
Uranus	E	2033-01-19T14:32:09.900		79.20	-64.10	25047.74		12.44	13.01
6	E	2033-01-19T14:49:57.056		76.33	-67.56	41821.60	17.18		
5	E	2033-01-19T14:50:25.515		76.25	-67.65	42314.83	17.26		
4	E	2033-01-19T14:50:40.288		76.20	-67.70	42556.73	17.29		
alpha	E	2033-01-19T14:52:45.436		75.83	-68.09	44741.86	17.54		
beta	E	2033-01-19T14:53:38.287		75.67	-68.26	45668.87	17.63		
eta	E	2033-01-19T14:55:03.418		75.41	-68.52	47176.12	17.77		
gamma	E	2033-01-19T14:55:28.696		75.34	-68.60	47625.85	17.81		
delta	E	2033-01-19T14:56:06.505		75.22	-68.72	48300.35	17.87		
lambda	E	2033-01-19T14:57:42.755		74.93	-69.02	50026.71	18.00		
epsilon	E	2033-01-19T14:59:06.254		74.67	-69.27	51534.36	18.13		

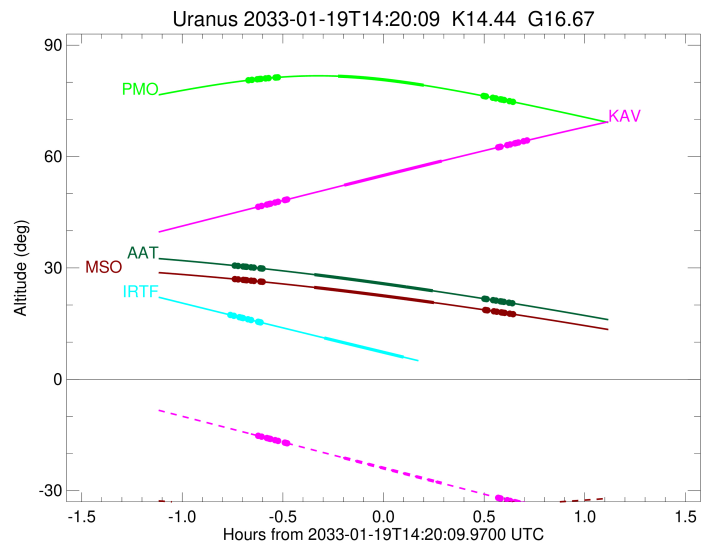
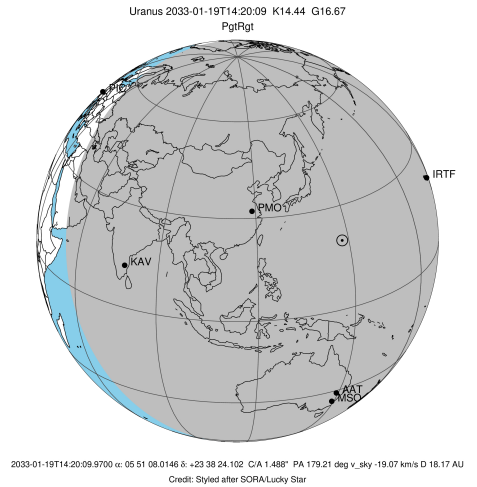
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target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2033-01-19T14:14:43.620
Event type          : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code       : IRTF
Location            : Mauna Kea/IRTF
Latitude (deg)      : 19.82622
E. Longitude (deg)  : 204.52800
Altitude (km)       : 4.168
Gaia source ID      : 3427506635195280384
2Mass ID (if available) : 05510800+2338239
ICRS Star Coord at Epoch: 05h 51m 08.01455s +23:38:24.10191s
RUWE (>1.4 is poor) : 1.04
K magnitude          : 14.439
G magnitude          : 16.670
RP magnitude         : 15.944
BP magnitude         : 17.233
DUPflag             : 0
Distance (au)       : 18.167
f0 (km)             : 0.000
g0 (km)             : 0.000
skyplane vel. (km/s) : -19.07
Sun-Target sep (deg) : 148.61
Sun-Moon sep (deg)  : 76.37
B (ring opening deg) : 77.00
PA of pole (deg)    : 51.26
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.623
C/A sky separation (km) : 21390.2
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_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	2033-01-19T13:34:40.257		17.29	-47.37	50985.73	-17.70		
lambda	I	2033-01-19T13:35:34.738		17.09	-47.16	50026.71	-17.56		
delta	I	2033-01-19T13:37:13.445		16.72	-46.77	48300.35	-17.41		
gamma	I	2033-01-19T13:37:51.971		16.58	-46.62	47630.71	-17.35		
eta	I	2033-01-19T13:38:18.205		16.48	-46.52	47176.12	-17.31		
beta	I	2033-01-19T13:39:45.536		16.16	-46.18	45671.82	-17.15		
alpha	I	2033-01-19T13:40:40.851		15.95	-45.97	44725.82	-17.05		
4	I	2033-01-19T13:42:45.547		15.49	-45.49	42615.53	-16.77		
5	I	2033-01-19T13:43:10.521		15.40	-45.39	42201.65	-16.73		
6	I	2033-01-19T13:43:34.063		15.31	-45.30	41810.59	-16.65		
Uranus	I	2033-01-19T14:02:31.017		11.13	-40.90	25555.85		0.96	1.00
Uranus	E	2033-01-19T14:26:09.824		5.96	-35.43	25073.18		12.11	12.67
6	E	2033-01-19T14:45:04.098	1.88x	-31.08	41820.24	16.54			
5	E	2033-01-19T14:45:33.743	1.77x	-30.96	42315.07	16.62			
4	E	2033-01-19T14:45:49.153	1.71x	-30.90	42558.20	16.65			
alpha	E	2033-01-19T14:47:58.959	1.25x	-30.41	44742.65	16.92			
beta	E	2033-01-19T14:48:53.727	1.06x	-30.20	45669.45	17.02			
eta	E	2033-01-19T14:50:21.855	0.74x	-29.86	47176.12	17.17			
gamma	E	2033-01-19T14:50:48.029	0.65x	-29.76	47626.01	17.21			
delta	E	2033-01-19T14:51:27.144	0.51x	-29.61	48300.35	17.27			
lambda	E	2033-01-19T14:53:06.688	0.15x	-29.23	50026.71	17.41			
epsilon	E	2033-01-19T14:54:33.188	-0.15x	-28.90	51537.88	17.54			

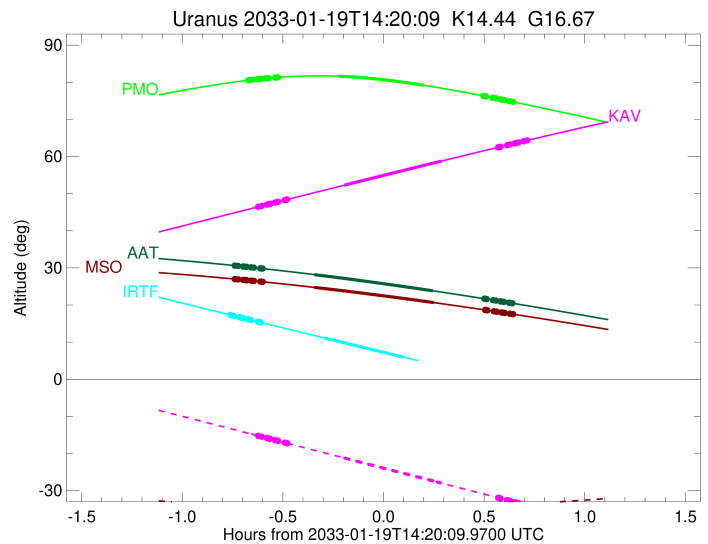
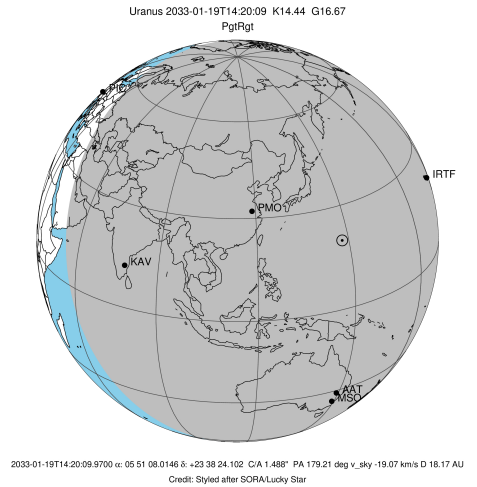
target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-19T14:23:19.940
 Event type : PgtRgt
 : Uranus occs: geocentric, topocentric
 : Ring occs: geocentric, topocentric
 Observer code : KAV
 Location : Kavalur Observatory
 Latitude (deg) : 12.57556
 E. Longitude (deg) : 78.83167
 Altitude (km) : 0.722
 Gaia source ID : 3427506635195280384
 2Mass ID (if available) : 05510800+2338239
 ICRS Star Coord at Epoch: 05h 51m 08.01455s +23:38:24.10191s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 14.439
 G magnitude : 16.670
 RP magnitude : 15.944
 BP magnitude : 17.233
 DUPflag : 0
 Distance (au) : 18.167
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.07
 Sun-Target sep (deg) : 148.61
 Sun-Moon sep (deg) : 77.28
 B (ring opening deg) : 77.00
 PA of pole (deg) : 51.26
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.423
 C/A sky separation (km) : 18751.3
 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



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

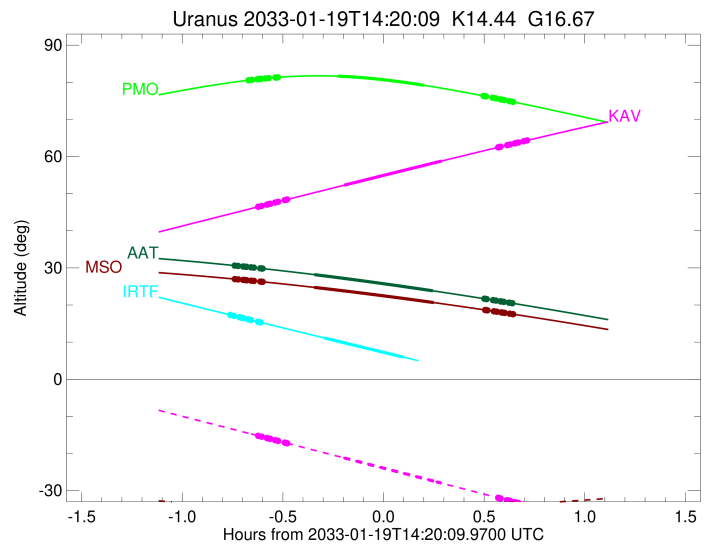
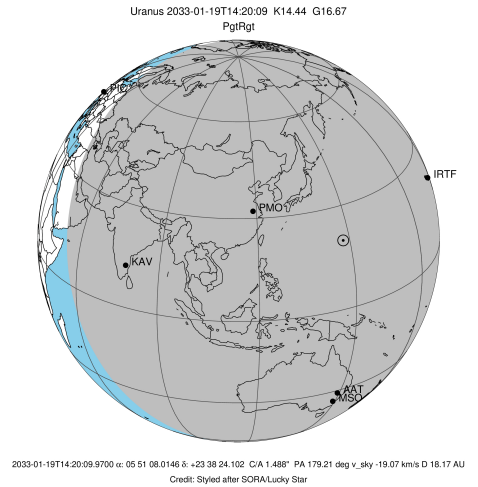
Ring	I/E	UTC	b? alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2033-01-19T13:42:59.143	46.50	-15.27	50970.43	-18.35		
lambda	I	2033-01-19T13:43:50.791	46.69	-15.47	50026.71	-18.24		
delta	I	2033-01-19T13:45:25.698	47.06	-15.84	48300.35	-18.13		
gamma	I	2033-01-19T13:46:02.680	47.20	-15.98	47630.57	-18.09		
eta	I	2033-01-19T13:46:27.827	47.29	-16.08	47176.12	-18.06		
beta	I	2033-01-19T13:47:51.468	47.61	-16.40	45670.95	-17.94		
alpha	I	2033-01-19T13:48:44.342	47.81	-16.61	44724.10	-17.87		
4	I	2033-01-19T13:50:42.950	48.26	-17.07	42614.92	-17.66		
5	I	2033-01-19T13:51:06.891	48.35	-17.16	42197.55	-17.64		
6	I	2033-01-19T13:51:28.869	48.43	-17.24	41812.55	-17.57		
Uranus	I	2033-01-19T14:08:26.655	52.28	-21.20	25555.44		-1.02	-1.06
Uranus	E	2033-01-19T14:37:31.564	58.79	-27.99	25020.17		12.79	13.37
6	E	2033-01-19T14:54:20.171	62.48	-31.93	41823.67	17.63		
5	E	2033-01-19T14:54:47.799	62.58	-32.04	42314.31	17.69		
4	E	2033-01-19T14:55:02.127	62.63	-32.10	42554.57	17.72		
alpha	E	2033-01-19T14:57:04.470	63.07	-32.57	44740.65	17.93		
beta	E	2033-01-19T14:57:56.217	63.26	-32.78	45667.98	18.00		
eta	E	2033-01-19T14:59:19.705	63.55	-33.10	47176.12	18.12		
gamma	E	2033-01-19T14:59:44.489	63.64	-33.20	47625.62	18.15		
delta	E	2033-01-19T15:00:21.609	63.78	-33.34	48300.35	18.20		
lambda	E	2033-01-19T15:01:56.160	64.11	-33.71	50026.71	18.31		
epsilon	E	2033-01-19T15:03:17.968	64.41	-34.03	51528.66	18.42		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-19T14:17:27.260
 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 : 3427506635195280384
 2Mass ID (if available) : 05510800+2338239
 ICRS Star Coord at Epoch: 05h 51m 08.01455s +23:38:24.10191s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 14.439
 G magnitude : 16.670
 RP magnitude : 15.944
 BP magnitude : 17.233
 DUPflag : 0
 Distance (au) : 18.167
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.07
 Sun-Target sep (deg) : 148.61
 Sun-Moon sep (deg) : 76.73
 B (ring opening deg) : 77.00
 PA of pole (deg) : 51.26
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.113
 C/A sky separation (km) : 14660.8
 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	2033-01-19T13:36:00.458		30.60	-37.88	50936.60	-18.94		
lambda	I	2033-01-19T13:36:48.630		30.53	-37.91	50026.71	-18.87		
delta	I	2033-01-19T13:38:20.271		30.38	-37.98	48300.35	-18.80		
gamma	I	2033-01-19T13:38:55.935		30.33	-38.00	47630.23	-18.78		
eta	I	2033-01-19T13:39:20.134		30.29	-38.02	47176.12	-18.76		
beta	I	2033-01-19T13:40:40.651		30.16	-38.07	45669.02	-18.69		
alpha	I	2033-01-19T13:41:31.471		30.08	-38.10	44720.40	-18.64		
4	I	2033-01-19T13:43:24.730		29.89	-38.17	42613.24	-18.52		
5	I	2033-01-19T13:43:47.983		29.85	-38.18	42189.56	-18.51		
6	I	2033-01-19T13:44:08.253		29.82	-38.19	41816.79	-18.47		
Uranus	I	2033-01-19T13:59:31.750		28.19	-38.58	25508.85		-3.82	-4.00
Uranus	E	2033-01-19T14:34:51.911		23.83	-38.48	25003.49		12.99	13.58
6	E	2033-01-19T14:50:12.937		21.69	-38.01	41827.70	18.39		
5	E	2033-01-19T14:50:39.177		21.63	-37.99	42312.75	18.43		
4	E	2033-01-19T14:50:52.805		21.60	-37.98	42550.60	18.44		
alpha	E	2033-01-19T14:52:50.729		21.32	-37.90	44738.25	18.56		
beta	E	2033-01-19T14:53:40.773		21.19	-37.87	45666.30	18.61		
eta	E	2033-01-19T14:55:01.772		21.00	-37.81	47176.12	18.67		
gamma	E	2033-01-19T14:55:25.811		20.94	-37.79	47625.18	18.69		
delta	E	2033-01-19T14:56:01.910		20.85	-37.76	48300.35	18.72		
lambda	E	2033-01-19T14:57:33.984		20.63	-37.69	50026.71	18.78		
epsilon	E	2033-01-19T14:58:53.207		20.43	-37.63	51516.63	18.85		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2033-01-19T14:17:35.030
 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 : 3427506635195280384
 2Mass ID (if available) : 05510800+2338239
 ICRS Star Coord at Epoch: 05h 51m 08.01455s +23:38:24.10191s
 RUWE (>1.4 is poor) : 1.04
 K magnitude : 14.439
 G magnitude : 16.670
 RP magnitude : 15.944
 BP magnitude : 17.233
 DUPflag : 0
 Distance (au) : 18.167
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -19.07
 Sun-Target sep (deg) : 148.61
 Sun-Moon sep (deg) : 76.68
 B (ring opening deg) : 77.00
 PA of pole (deg) : 51.26
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 1.093
 C/A sky separation (km) : 14400.2
 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	2033-01-19T13:36:02.598		26.97	-33.92	50934.81	-18.96		
lambda	I	2033-01-19T13:36:50.637		26.90	-33.95	50026.71	-18.89		
delta	I	2033-01-19T13:38:22.195		26.77	-34.01	48300.35	-18.82		
gamma	I	2033-01-19T13:38:57.825		26.72	-34.03	47630.21	-18.80		
eta	I	2033-01-19T13:39:21.997		26.68	-34.04	47176.12	-18.78		
beta	I	2033-01-19T13:40:42.428		26.56	-34.09	45668.91	-18.71		
alpha	I	2033-01-19T13:41:33.190		26.49	-34.12	44720.20	-18.67		
4	I	2033-01-19T13:43:26.278		26.32	-34.18	42613.13	-18.55		
5	I	2033-01-19T13:43:49.516		26.28	-34.19	42189.13	-18.54		
6	I	2033-01-19T13:44:09.716		26.25	-34.20	41817.03	-18.50		
Uranus	I	2033-01-19T13:59:29.599		24.75	-34.56	25504.86		-3.96	-4.15
Uranus	E	2033-01-19T14:35:10.112		20.66	-34.47	25004.02		12.98	13.58
6	E	2033-01-19T14:50:27.523		18.67	-34.04	41827.98	18.43		
5	E	2033-01-19T14:50:53.696		18.61	-34.03	42312.61	18.46		
4	E	2033-01-19T14:51:07.293		18.58	-34.02	42550.33	18.48		
alpha	E	2033-01-19T14:53:05.036		18.31	-33.94	44738.07	18.59		
beta	E	2033-01-19T14:53:55.010		18.20	-33.91	45666.18	18.63		
eta	E	2033-01-19T14:55:15.912		18.02	-33.86	47176.12	18.69		
gamma	E	2033-01-19T14:55:39.920		17.96	-33.84	47625.15	18.71		
delta	E	2033-01-19T14:56:15.978		17.88	-33.82	48300.35	18.74		
lambda	E	2033-01-19T14:57:47.954		17.67	-33.75	50026.71	18.80		
epsilon	E	2033-01-19T14:59:07.051		17.49	-33.70	51515.66	18.87		