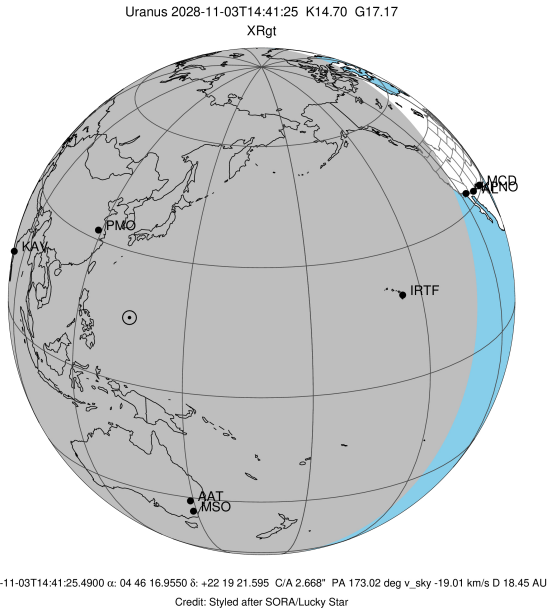
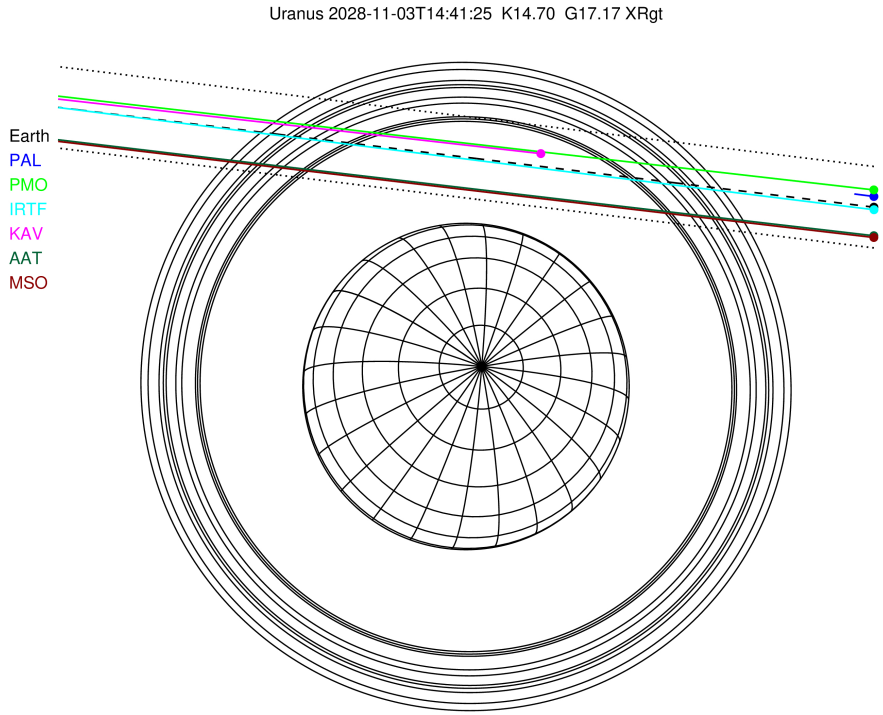
Stellar occultation prediction by rfrench@wellesley.edu Sat Jun 24 23:35:11 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-11-03T14:41:25.490
Event type : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Gaia source ID : 3413045793841019904
2Mass ID (if available) : 04461693+2219216

ICRS Star Coord at Epoch: 04h 46m 16.95502s +22:19:21.59516s
RUWE (>1.4 is poor) : 1.00
K magnitude : 14.700
G magnitude : 17.173
RP magnitude : 16.436
BP magnitude : 17.770
DUPflag : 0
Distance (au) : 18.449
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.01
Sun-Target sep (deg) : 148.31
Sun-Moon sep (deg) : 18.14
B (ring opening deg) : 81.02
PA of pole (deg) : -38.22

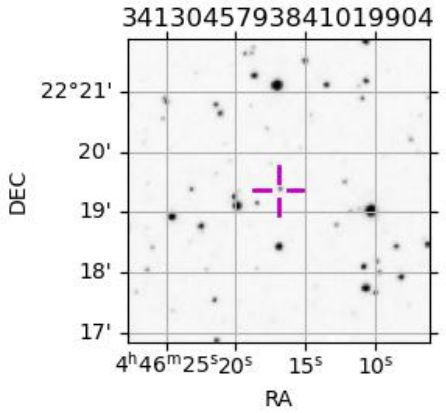
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon





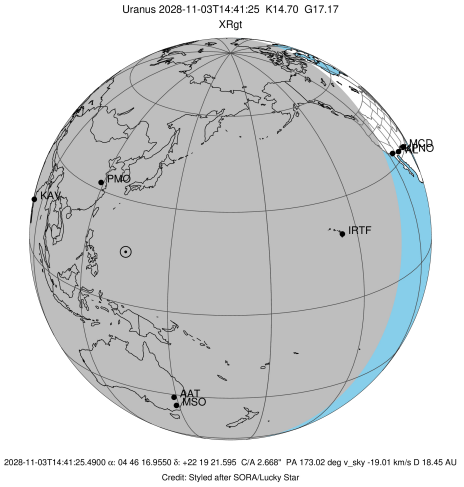
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

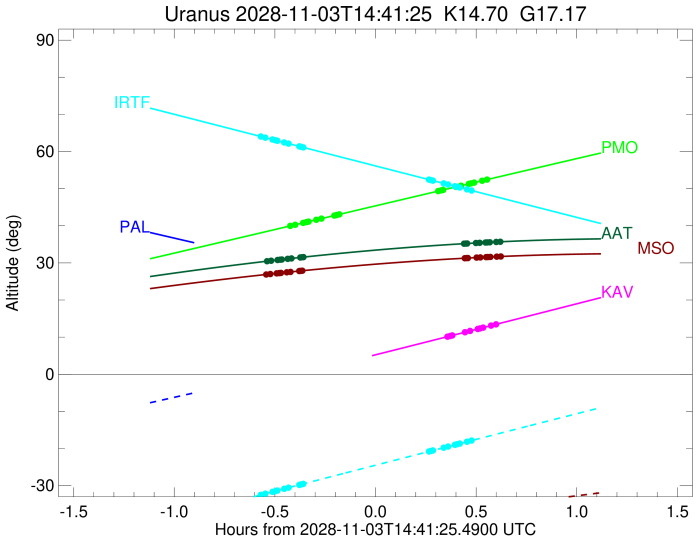
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	++++++++++		++++++++++	NOV 03 14:16 - NOV 03 15:14	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	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	++++++++++		++++++++++	NOV 03 14:07 - NOV 03 15:10	PnnRie
KAV	Kavalur Observatory	12.6	78.8			++++++++++	NOV 03 15:02 - NOV 03 15:17	PnnRne
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	++++++++++		++++++++++	NOV 03 14:09 - NOV 03 15:18	PnnRie
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0	++++++++++		++++++++++	NOV 03 14:09 - NOV 03 15:19	PnnRie



Uranus_2028-11-03T14_41_25.4900_PMO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:19:39 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-11-03T14:45:01.160
Event type : XRgt
: No Uranus occs
: 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 : 3413045793841019904
2Mass ID (if available) : 04461693+2219216
ICRS Star Coord at Epoch: 04h 46m 16.95502s +22:19:21.59516s
RUWE (>1.4 is poor) : 1.00
K magnitude : 14.700
G magnitude : 17.173
RP magnitude : 16.436
BP magnitude : 17.770
DUPflag : 0
Distance (au) : 18.449
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.01
Sun-Target sep (deg) : 148.31
Sun-Moon sep (deg) : 17.76
B (ring opening deg) : 81.02
PA of pole (deg) : -38.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.829
C/A sky separation (km) : 37853.0
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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





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

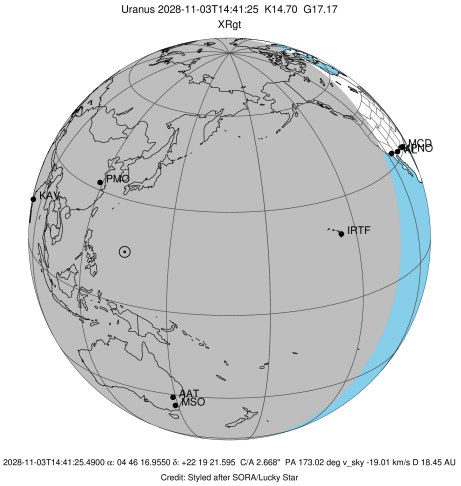
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-11-03T14:16:29.382		40.06	-63.35	50791.68	-12.76		
lambda	I	2028-11-03T14:17:30.216		40.28	-63.53	50026.71	-12.44		
delta	I	2028-11-03T14:19:52.578		40.78	-63.95	48300.35	-11.80		
gamma	I	2028-11-03T14:20:50.861		40.99	-64.12	47621.08	-11.51		
eta	I	2028-11-03T14:21:29.852		41.13	-64.23	47176.12	-11.31		
beta	I	2028-11-03T14:23:49.858		41.62	-64.64	45644.72	-10.56		
alpha	I	2028-11-03T14:25:18.753		41.94	-64.89	44727.66	-10.02		
4	I	2028-11-03T14:29:08.693		42.75	-65.54	42595.23	-8.51		
5	I	2028-11-03T14:29:47.400		42.89	-65.65	42263.19	-8.22		
6	I	2028-11-03T14:30:41.500		43.08	-65.80	41835.21	-7.84		

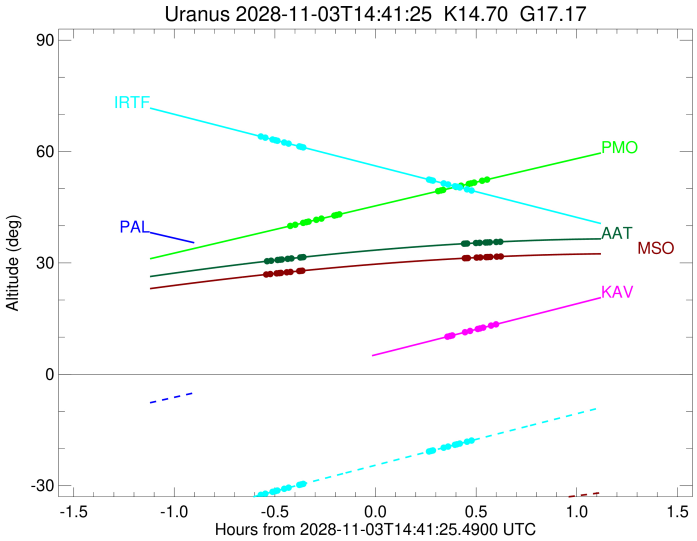
No planet occultations

6	E	2028-11-03T14:59:59.396		49.32	-70.14	41804.40	7.86		
5	E	2028-11-03T15:00:48.985		49.49	-70.24	42195.14	8.24		
4	E	2028-11-03T15:01:31.580		49.64	-70.33	42555.50	8.53		
alpha	E	2028-11-03T15:05:21.629		50.46	-70.79	44693.78	10.05		
beta	E	2028-11-03T15:06:55.674		50.79	-70.97	45665.13	10.59		
eta	E	2028-11-03T15:09:13.256		51.28	-71.22	47176.12	11.36		
gamma	E	2028-11-03T15:09:52.322		51.42	-71.29	47623.70	11.56		
delta	E	2028-11-03T15:10:50.145		51.62	-71.39	48300.35	11.85		
lambda	E	2028-11-03T15:13:11.897		52.12	-71.63	50026.71	12.50		
epsilon	E	2028-11-03T15:14:51.633		52.48	-71.79	51294.82	12.82		

Uranus_2028-11-03T14_41_25.4900_IRTF.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:28:19 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-11-03T14:38:17.430
Event type : XRgt
: No Uranus occs
: 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 : 3413045793841019904
2Mass ID (if available) : 04461693+2219216
ICRS Star Coord at Epoch: 04h 46m 16.95502s +22:19:21.59516s
RUWE (>1.4 is poor) : 1.00
K magnitude : 14.700
G magnitude : 17.173
RP magnitude : 16.436
BP magnitude : 17.770
DUPflag : 0
Distance (au) : 18.449
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.01
Sun-Target sep (deg) : 148.31
Sun-Moon sep (deg) : 18.87
B (ring opening deg) : 81.02
PA of pole (deg) : -38.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.642
C/A sky separation (km) : 35346.8
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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





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

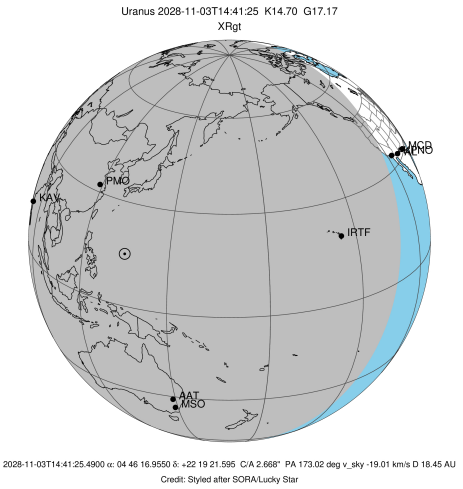
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-11-03T14:07:41.230		63.95	-32.38	50777.27	-13.89		
lambda	I	2028-11-03T14:08:35.820		63.74	-32.17	50026.71	-13.64		
delta	I	2028-11-03T14:10:44.780		63.24	-31.66	48300.35	-13.12		
gamma	I	2028-11-03T14:11:36.998		63.04	-31.46	47621.20	-12.89		
eta	I	2028-11-03T14:12:11.737		62.90	-31.32	47176.12	-12.73		
beta	I	2028-11-03T14:14:14.937		62.43	-30.84	45643.61	-12.14		
alpha	I	2028-11-03T14:15:31.199		62.13	-30.55	44731.20	-11.73		
4	I	2028-11-03T14:18:42.052		61.39	-29.80	42600.00	-10.61		
5	I	2028-11-03T14:19:12.462		61.28	-29.69	42272.97	-10.41		
6	I	2028-11-03T14:19:55.006		61.11	-29.52	41841.14	-10.14		

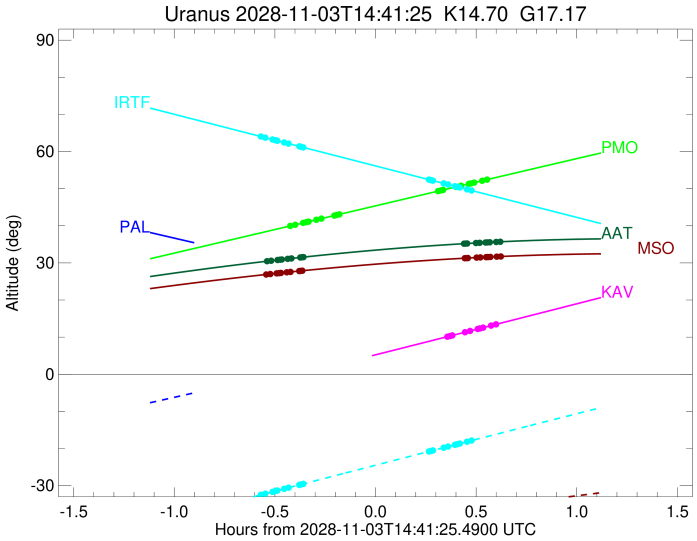
No planet occultations

6	E	2028-11-03T14:57:16.824		52.46	-20.82	41801.42	10.12		
5	E	2028-11-03T14:57:55.119		52.31	-20.67	42187.49	10.39		
4	E	2028-11-03T14:58:29.524		52.18	-20.54	42550.94	10.60		
alpha	E	2028-11-03T15:01:41.535		51.44	-19.80	44691.79	11.70		
beta	E	2028-11-03T15:03:03.375		51.12	-19.48	45666.77	12.11		
eta	E	2028-11-03T15:05:04.954		50.65	-19.01	47176.12	12.70		
gamma	E	2028-11-03T15:05:39.996		50.52	-18.87	47624.05	12.86		
delta	E	2028-11-03T15:06:32.120		50.32	-18.67	48300.35	13.09		
lambda	E	2028-11-03T15:08:41.410		49.82	-18.17	50026.71	13.61		
epsilon	E	2028-11-03T15:10:15.072		49.46	-17.81	51317.69	13.86		

Uranus_2028-11-03T14_41_25.4900_KAV.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:30:26 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-11-03T14:47:01.150
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 : 3413045793841019904
2Mass ID (if available) : 04461693+2219216
ICRS Star Coord at Epoch: 04h 46m 16.95502s +22:19:21.59516s
RUWE (>1.4 is poor) : 1.00
K magnitude : 14.700
G magnitude : 17.173
RP magnitude : 16.436
BP magnitude : 17.770
DUPflag : 0
Distance (au) : 18.449
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.01
Sun-Target sep (deg) : 148.31
Sun-Moon sep (deg) : 17.30
B (ring opening deg) : 81.02
PA of pole (deg) : -38.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.807
C/A sky separation (km) : 37559.1
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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





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

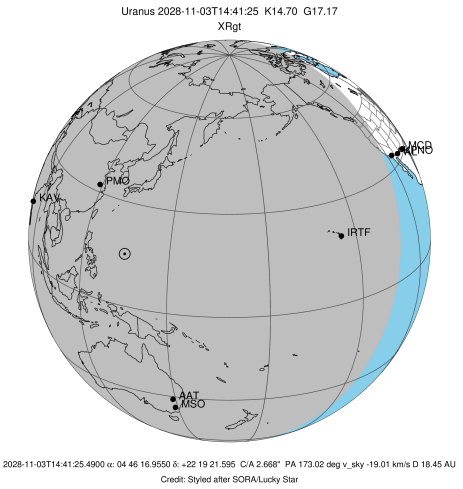
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-11-03T14:17:47.562	-0.11x	-29.36	50790.26	-12.70			
lambda	I	2028-11-03T14:18:48.535	0.12x	-29.61	50026.71	-12.40			
delta	I	2028-11-03T14:21:11.281	0.65x	-30.18	48300.35	-11.78			
gamma	I	2028-11-03T14:22:09.627	0.87x	-30.41	47621.09	-11.50			
eta	I	2028-11-03T14:22:48.625	1.02x	-30.57	47176.12	-11.31			
beta	I	2028-11-03T14:25:08.388	1.55x	-31.13	45644.60	-10.59			
alpha	I	2028-11-03T14:26:36.803	1.88x	-31.48	44728.03	-10.08			
4	I	2028-11-03T14:30:24.199	2.74x	-32.39	42595.77	-8.66			
5	I	2028-11-03T14:31:02.148	2.88x	-32.54	42264.29	-8.38			
6	I	2028-11-03T14:31:55.133	3.08x	-32.75	41835.88	-8.02			

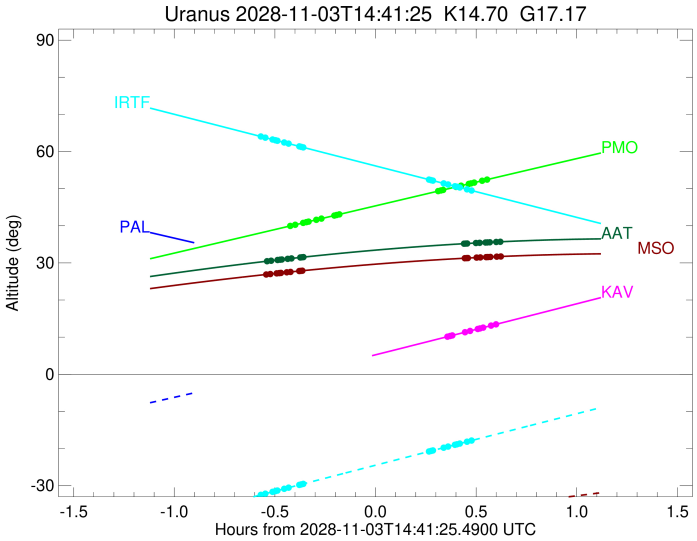
No planet occultations

6	E	2028-11-03T15:02:45.418	10.10	-40.17	41803.90	8.05			
5	E	2028-11-03T15:03:33.763	10.29	-40.36	42193.89	8.42			
4	E	2028-11-03T15:04:15.603	10.45	-40.53	42554.76	8.69			
alpha	E	2028-11-03T15:08:02.801	11.31	-41.44	44693.44	10.13			
beta	E	2028-11-03T15:09:36.294	11.67	-41.82	45665.40	10.65			
eta	E	2028-11-03T15:11:53.362	12.19	-42.37	47176.12	11.38			
gamma	E	2028-11-03T15:12:32.366	12.34	-42.52	47623.76	11.57			
delta	E	2028-11-03T15:13:30.134	12.56	-42.75	48300.35	11.85			
lambda	E	2028-11-03T15:15:51.977	13.10	-43.32	50026.71	12.48			
epsilon	E	2028-11-03T15:17:32.245	13.49	-43.73	51298.91	12.79			

Uranus_2028-11-03T14_41_25.4900_AAT.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:36:51 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-11-03T14:43:35.720
Event type : XRgt
: No Uranus occs
: 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 : 3413045793841019904
2Mass ID (if available) : 04461693+2219216
ICRS Star Coord at Epoch: 04h 46m 16.95502s +22:19:21.59516s
RUWE (>1.4 is poor) : 1.00
K magnitude : 14.700
G magnitude : 17.173
RP magnitude : 16.436
BP magnitude : 17.770
DUPflag : 0
Distance (au) : 18.449
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.01
Sun-Target sep (deg) : 148.31
Sun-Moon sep (deg) : 18.14
B (ring opening deg) : 81.02
PA of pole (deg) : -38.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.307
C/A sky separation (km) : 30863.3
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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





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

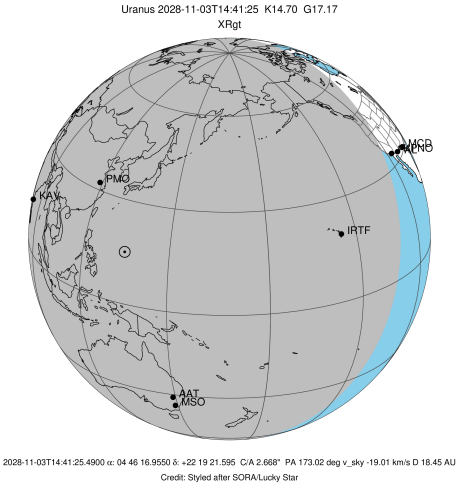
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-11-03T14:09:31.572		30.50	-43.25	50761.72	-15.36		
lambda	I	2028-11-03T14:10:19.737		30.59	-43.23	50026.71	-15.19		
delta	I	2028-11-03T14:12:14.693		30.79	-43.17	48300.35	-14.84		
gamma	I	2028-11-03T14:13:00.682		30.86	-43.15	47621.45	-14.69		
eta	I	2028-11-03T14:13:31.113		30.92	-43.13	47176.12	-14.58		
beta	I	2028-11-03T14:15:17.691		31.10	-43.07	45642.42	-14.19		
alpha	I	2028-11-03T14:16:22.030		31.20	-43.03	44735.63	-13.93		
4	I	2028-11-03T14:18:59.065		31.46	-42.93	42605.37	-13.24		
5	I	2028-11-03T14:19:22.967		31.50	-42.92	42284.32	-13.11		
6	I	2028-11-03T14:19:56.681		31.56	-42.90	41848.42	-12.95		

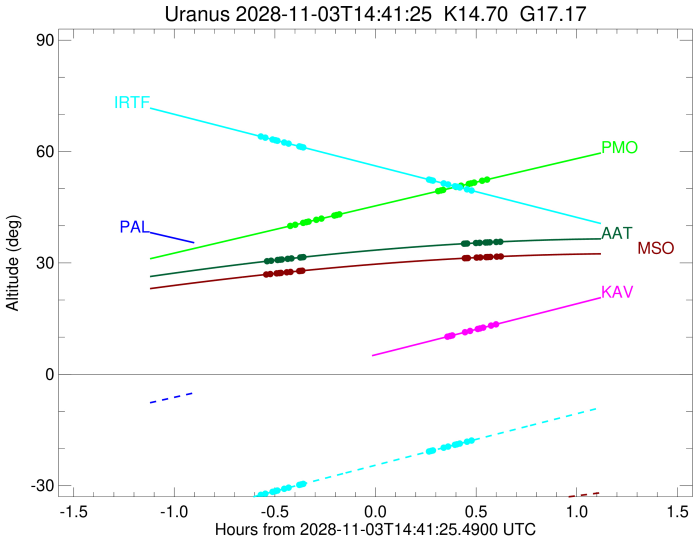
No planet occultations

6	E	2028-11-03T15:07:44.579		35.17	-39.69	41797.76	12.98		
5	E	2028-11-03T15:08:13.887		35.20	-39.64	42176.47	13.14		
4	E	2028-11-03T15:08:41.631		35.22	-39.60	42544.00	13.27		
alpha	E	2028-11-03T15:11:19.180		35.36	-39.35	44688.80	13.96		
beta	E	2028-11-03T15:12:28.755		35.41	-39.24	45669.65	14.23		
eta	E	2028-11-03T15:14:13.165		35.49	-39.07	47176.12	14.62		
gamma	E	2028-11-03T15:14:43.741		35.52	-39.02	47624.75	14.72		
delta	E	2028-11-03T15:15:29.383		35.55	-38.94	48300.35	14.88		
lambda	E	2028-11-03T15:17:24.022		35.64	-38.75	50026.71	15.23		
epsilon	E	2028-11-03T15:18:50.990		35.70	-38.60	51362.47	15.40		

Uranus_2028-11-03T14_41_25.4900_MSO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:41:10 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-11-03T14:43:33.110
Event type : XRgt
: No Uranus occs
: 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 : 3413045793841019904
2Mass ID (if available) : 04461693+2219216
ICRS Star Coord at Epoch: 04h 46m 16.95502s +22:19:21.59516s
RUWE (>1.4 is poor) : 1.00
K magnitude : 14.700
G magnitude : 17.173
RP magnitude : 16.436
BP magnitude : 17.770
DUPflag : 0
Distance (au) : 18.449
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -19.01
Sun-Target sep (deg) : 148.31
Sun-Moon sep (deg) : 18.14
B (ring opening deg) : 81.02
PA of pole (deg) : -38.22
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 2.287
C/A sky separation (km) : 30599.7
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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





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	2028-11-03T14:09:16.516		26.92	-39.26	50760.91	-15.42		
lambda	I	2028-11-03T14:10:04.418		27.00	-39.24	50026.71	-15.26		
delta	I	2028-11-03T14:11:58.821		27.18	-39.19	48300.35	-14.91		
gamma	I	2028-11-03T14:12:44.565		27.26	-39.17	47621.46	-14.77		
eta	I	2028-11-03T14:13:14.828		27.30	-39.16	47176.12	-14.66		
beta	I	2028-11-03T14:15:00.765		27.47	-39.10	45642.36	-14.29		
alpha	I	2028-11-03T14:16:04.648		27.57	-39.07	44735.88	-14.03		
4	I	2028-11-03T14:18:40.444		27.81	-38.98	42605.65	-13.35		
5	I	2028-11-03T14:19:04.114		27.84	-38.97	42284.92	-13.23		
6	I	2028-11-03T14:19:37.519		27.89	-38.95	41848.81	-13.08		

No planet occultations

6	E	2028-11-03T15:07:58.265		31.26	-36.03	41797.62	13.10		
5	E	2028-11-03T15:08:27.263		31.28	-35.99	42175.98	13.26		
4	E	2028-11-03T15:08:54.777		31.30	-35.95	42543.68	13.38		
alpha	E	2028-11-03T15:11:31.102		31.42	-35.72	44688.67	14.06		
beta	E	2028-11-03T15:12:40.229		31.48	-35.62	45669.79	14.32		
eta	E	2028-11-03T15:14:24.003		31.55	-35.47	47176.12	14.70		
gamma	E	2028-11-03T15:14:54.414		31.57	-35.42	47624.79	14.80		
delta	E	2028-11-03T15:15:39.815		31.60	-35.35	48300.35	14.95		
lambda	E	2028-11-03T15:17:33.910		31.68	-35.18	50026.71	15.30		
epsilon	E	2028-11-03T15:19:00.654		31.74	-35.04	51364.67	15.46		