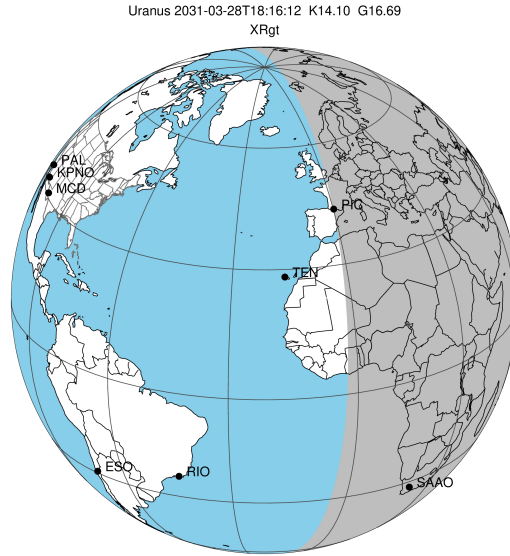


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-03-28T18:16:12.870  
 Event type : XRgt  
 : No Uranus occs  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3415724272887605376  
 2Mass ID (if available) : 05112268+2304110

ICRS Star Coord at Epoch: 05h 11m 22.68440s +23:04:10.89165s

RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.097  
 G magnitude : 16.690  
 RP magnitude : 15.880  
 BP magnitude : 17.391  
 DUPflag : 0  
 Distance (au) : 19.431  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 15.84  
 Sun-Target sep (deg) : 71.39  
 Sun-Moon sep (deg) : 6.11  
 B (ring opening deg) : 82.09  
 PA of pole (deg) : 3.74

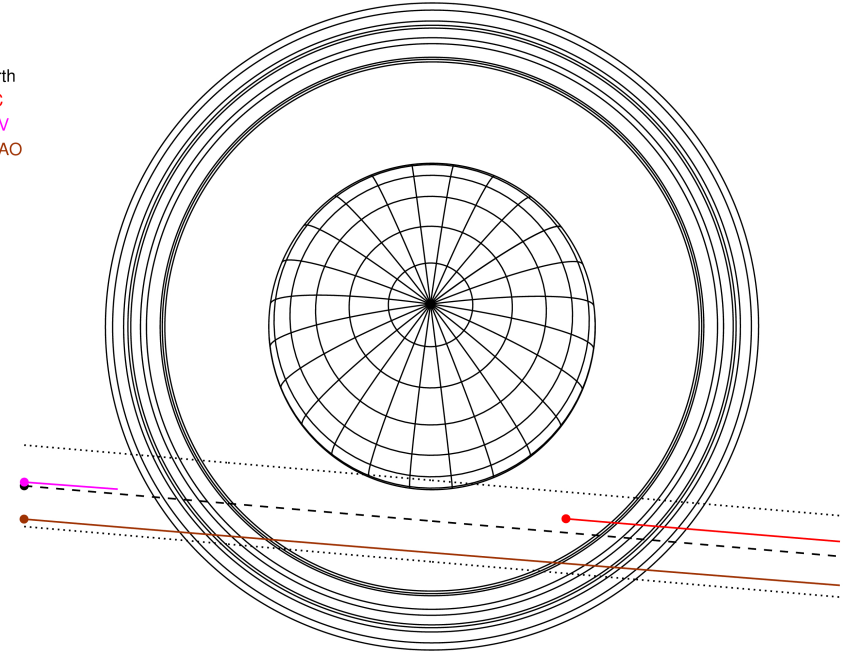
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon



2031-03-28T18:16:12.8700 ex: 05 11 22.6844 d: +23 04 10.892 C/A 2.149° PA 355.06 deg v\_sky +15.84 km/s D 19.43 AU  
 Credit: Styled after SORA/Lucky Star

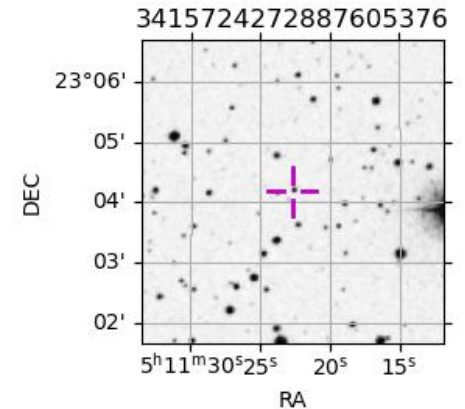
Uranus 2031-03-28T18:16:12 K14.10 G16.69 XRgt

Earth  
 PIC  
 KAV  
 SAAO

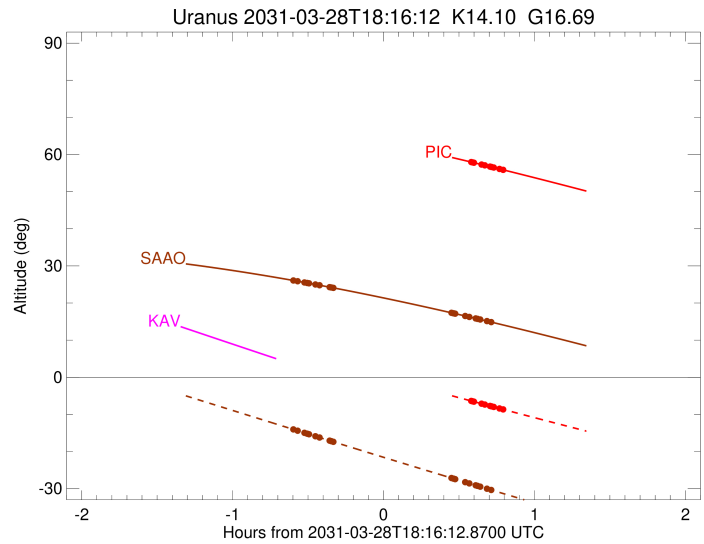
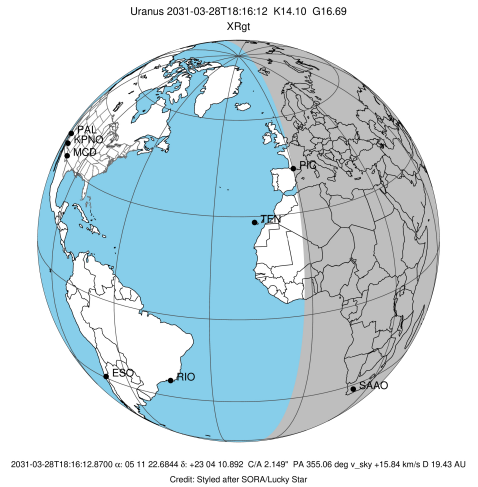


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1			+++++	MAR 28 18:51 - MAR 28 19:04	PnnRne
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					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
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					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8	+++++		+++++	MAR 28 17:40 - MAR 28 18:59	PnnRie
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-03-28T18:18:19.670  
 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 : 3415724272887605376  
 2Mass ID (if available) : 05112268+2304110  
 ICRS Star Coord at Epoch: 05h 11m 22.68440s +23:04:10.89165s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.097  
 G magnitude : 16.690  
 RP magnitude : 15.880  
 BP magnitude : 17.391  
 DUPflag : 0  
 Distance (au) : 19.431  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 15.84  
 Sun-Target sep (deg) : 71.39  
 Sun-Moon sep (deg) : 6.54  
 B (ring opening deg) : 82.09  
 PA of pole (deg) : 3.74  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.004  
 C/A sky separation (km) : 28238.4  
 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

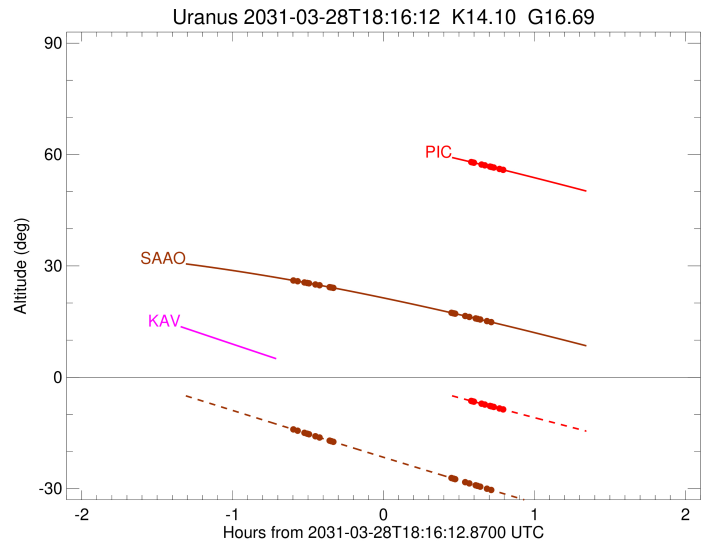
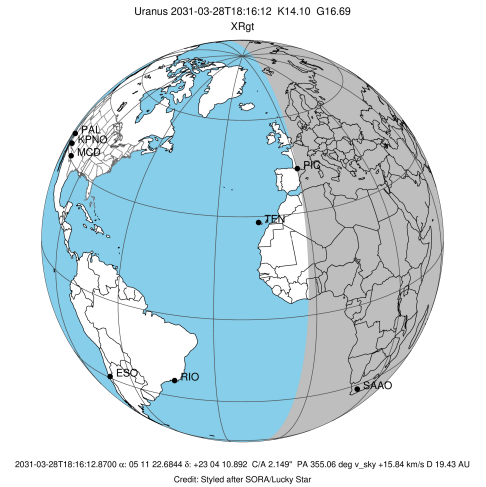


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-03-28T17:32:41.983		68.36	7.94x	51073.08	-12.91		
lambda	I	2031-03-28T17:34:03.826		68.24	7.69x	50026.71	-12.72		
delta	I	2031-03-28T17:36:20.701		68.03	7.28x	48300.35	-12.50		
gamma	I	2031-03-28T17:37:15.066		67.95	7.11x	47623.44	-12.40		
eta	I	2031-03-28T17:37:51.228		67.89	7.00x	47176.12	-12.34		
beta	I	2031-03-28T17:39:53.917		67.69	6.62x	45676.76	-12.10		
alpha	I	2031-03-28T17:41:15.212		67.56	6.38x	44700.48	-11.92		
4	I	2031-03-28T17:44:17.655		67.25	5.82x	42561.89	-11.49		
5	I	2031-03-28T17:44:41.600		67.21	5.75x	42288.28	-11.42		
6	I	2031-03-28T17:45:17.165		67.14	5.64x	41879.30	-11.35		

No planet occultations

6	E	2031-03-28T18:51:04.459		57.98	-6.37	41840.30	11.39		
5	E	2031-03-28T18:51:32.998		57.90	-6.46	42170.66	11.46		
4	E	2031-03-28T18:52:04.671		57.81	-6.55	42528.06	11.53		
alpha	E	2031-03-28T18:55:08.530		57.31	-7.11	44693.63	11.97		
beta	E	2031-03-28T18:56:27.511		57.09	-7.34	45645.38	12.15		
eta	E	2031-03-28T18:58:32.294		56.75	-7.72	47176.12	12.39		
gamma	E	2031-03-28T18:59:08.930		56.65	-7.83	47631.38	12.46		
delta	E	2031-03-28T19:00:02.409		56.50	-7.99	48300.35	12.56		
lambda	E	2031-03-28T19:02:18.633		56.12	-8.40	50026.71	12.79		
epsilon	E	2031-03-28T19:04:16.635		55.79	-8.75	51546.13	12.98		

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2031-03-28T18:19:53.470  
 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 : 3415724272887605376  
 2Mass ID (if available) : 05112268+2304110  
 ICRS Star Coord at Epoch: 05h 11m 22.68440s +23:04:10.89165s  
 RUWE (>1.4 is poor) : 1.06  
 K magnitude : 14.097  
 G magnitude : 16.690  
 RP magnitude : 15.880  
 BP magnitude : 17.391  
 DUPflag : 0  
 Distance (au) : 19.431  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 15.84  
 Sun-Target sep (deg) : 71.39  
 Sun-Moon sep (deg) : 6.49  
 B (ring opening deg) : 82.09  
 PA of pole (deg) : 3.74  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 2.506  
 C/A sky separation (km) : 35315.6  
 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	2031-03-28T17:40:24.608		26.07	-14.05	51146.79	-11.19		
lambda	I	2031-03-28T17:42:06.589		25.87	-14.40	50026.71	-10.86		
delta	I	2031-03-28T17:44:48.554		25.54	-14.97	48300.35	-10.45		
gamma	I	2031-03-28T17:45:53.805		25.40	-15.20	47624.43	-10.27		
eta	I	2031-03-28T17:46:37.731		25.31	-15.36	47176.12	-10.14		
beta	I	2031-03-28T17:49:09.247		25.00	-15.89	45673.54	-9.68		
alpha	I	2031-03-28T17:50:52.252		24.78	-16.25	44694.28	-9.33		
4	I	2031-03-28T17:54:52.621		24.27	-17.09	42550.68	-8.44		
5	I	2031-03-28T17:55:26.379		24.19	-17.21	42270.50	-8.30		
6	I	2031-03-28T17:56:13.149		24.09	-17.37	41879.39	-8.13		

No planet occultations

6	E	2031-03-28T18:43:14.116		17.36	-27.14	41851.35	8.17		
5	E	2031-03-28T18:43:53.801		17.26	-27.28	42185.16	8.34		
4	E	2031-03-28T18:44:35.334		17.15	-27.42	42525.99	8.49		
alpha	E	2031-03-28T18:48:36.534		16.52	-28.24	44689.06	9.39		
beta	E	2031-03-28T18:50:16.971		16.26	-28.58	45648.45	9.73		
eta	E	2031-03-28T18:52:50.194		15.85	-29.10	47176.12	10.21		
gamma	E	2031-03-28T18:53:34.474		15.74	-29.25	47630.99	10.34		
delta	E	2031-03-28T18:54:38.661		15.57	-29.47	48300.35	10.52		
lambda	E	2031-03-28T18:57:19.501		15.14	-30.01	50026.71	10.94		
epsilon	E	2031-03-28T18:59:37.090		14.77	-30.48	51555.01	11.27		