

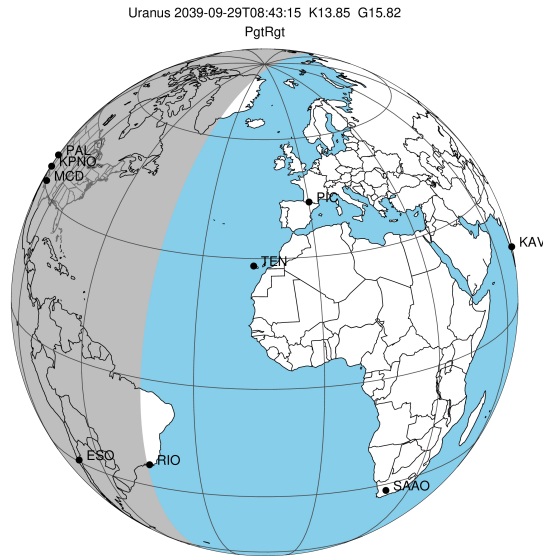
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-29T08:43:15.670  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 675682953634165504  
 2Mass ID (if available) : 08180829+2012204

Uranus 2039-09-29T08:43:15 K13.85 G15.82 PgtRgt

ICRS Star Coord at Epoch: 08h 18m 08.28168s +20:12:19.99680s

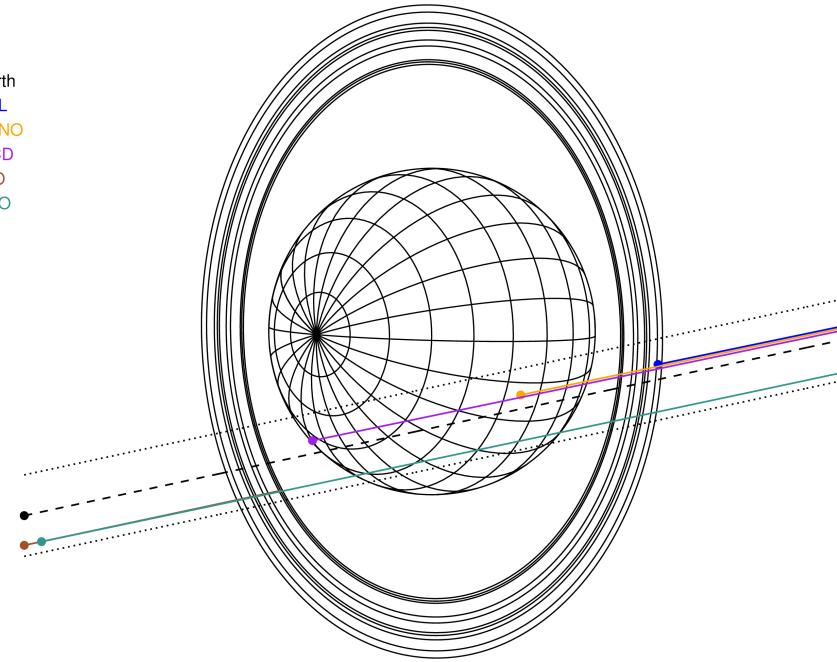
RUWE (>1.4 is poor) : 0.97  
 K magnitude : 13.845  
 G magnitude : 15.820  
 RP magnitude : 15.176  
 BP magnitude : 16.303  
 DUPflag : 0  
 Distance (au) : 19.033  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.89  
 Sun-Target sep (deg) : 63.39  
 Sun-Moon sep (deg) : 152.63  
 B (ring opening deg) : 44.87  
 PA of pole (deg) : 91.56

#	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



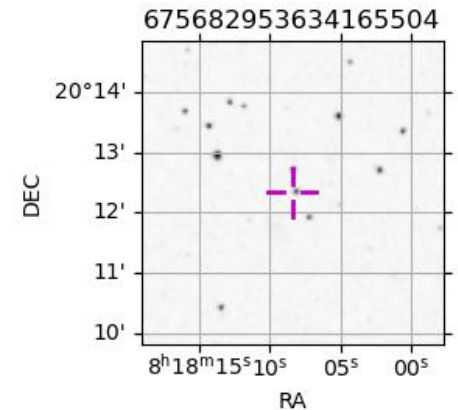
2039-09-29T08:43:15.6700 ra: 08 18 08.2817 s: +20 12 19.997 C/A 1.068° PA 12.12 deg v\_sky +19.89 km/s D 19.03 AU  
 Credit: Styled after SORA/Lucky Star

Earth  
 PAL  
 KPNO  
 MCD  
 RIO  
 ESO

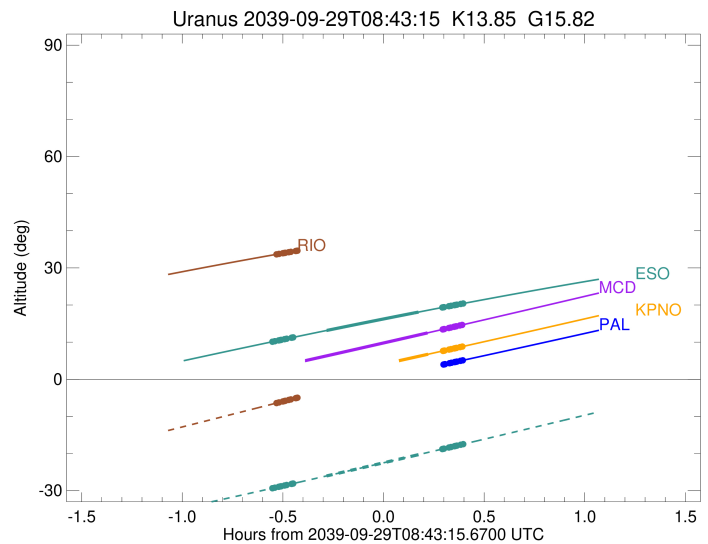
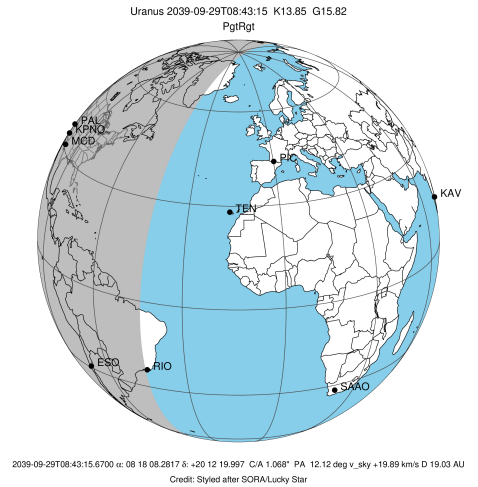


Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

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			+	SEP 29 09:06 - SEP 29 09:06	PnnRne
PNO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4		+	+++++	SEP 29 08:56 - SEP 29 09:06	PneRne
MCD	McDonald Obs. 2.7m	30.7	256.0		+	+++++	SEP 29 08:56 - SEP 29 09:06	PneRne
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	+++++			SEP 29 08:11 - SEP 29 08:17	PnnRin
ESO	European Southern Obs	-29.3	289.3	+++++	+ +	+++++	SEP 29 08:09 - SEP 29 09:06	PieRie
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

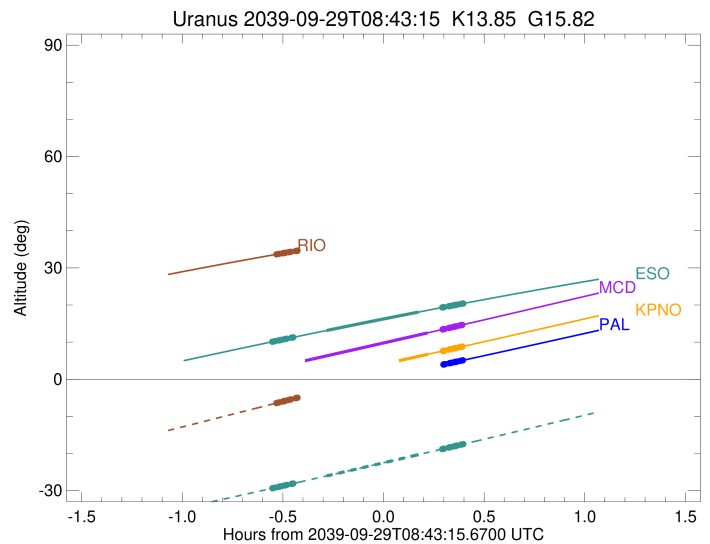
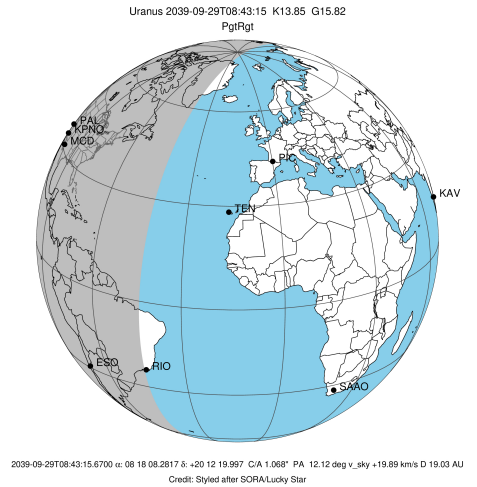


target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-29T08:38:17.380  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PAL  
 Location : Palomar Mt (200")  
 Latitude (deg) : 33.35622  
 E. Longitude (deg) : 243.13601  
 Altitude (km) : 1.706  
 Gaia source ID : 675682953634165504  
 2Mass ID (if available) : 08180829+2012204  
 ICRS Star Coord at Epoch: 08h 18m 08.28168s +20:12:19.99680s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 13.845  
 G magnitude : 15.820  
 RP magnitude : 15.176  
 BP magnitude : 16.303  
 DUPflag : 0  
 Distance (au) : 19.033  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.89  
 Sun-Target sep (deg) : 63.39  
 Sun-Moon sep (deg) : 153.36  
 B (ring opening deg) : 44.87  
 PA of pole (deg) : 91.56  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.887  
 C/A sky separation (km) : 12240.7  
 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\_itrf93\_040916.bsp  
 earth\_720101\_070426.bpc  
 earth\_200101\_990628\_predict.bpc  
 pg3f0000r.bsp  
 pg490000r.bsp  
 naif0012.tls  
 earth\_flat\_IAU.spk



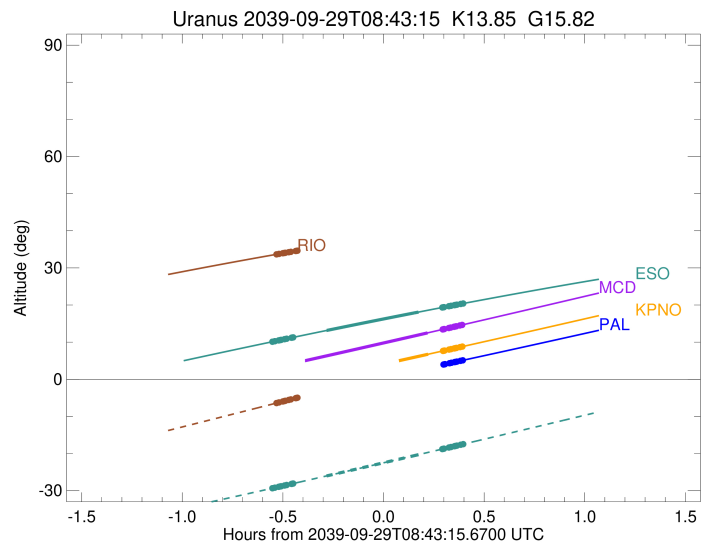
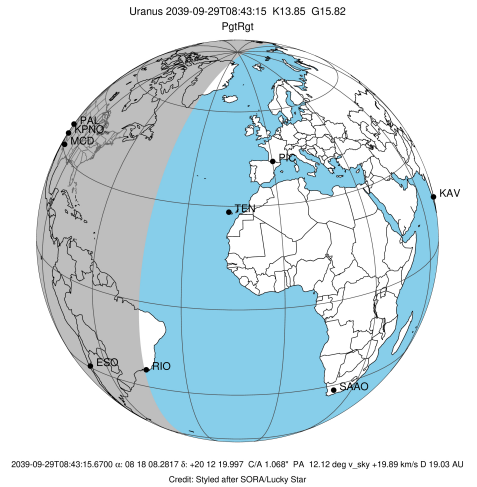
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-09-29T08:07:46.597	-6.16x	-58.44	51470.97	-27.35			
lambda	I	2039-09-29T08:08:39.510	-5.99x	-58.39	50026.71	-27.27			
delta	I	2039-09-29T08:09:42.897	-5.80x	-58.34	48300.35	-27.20			
gamma	I	2039-09-29T08:10:07.885	-5.72x	-58.31	47620.99	-27.17			
eta	I	2039-09-29T08:10:24.263	-5.67x	-58.30	47176.12	-27.15			
beta	I	2039-09-29T08:11:20.749	-5.50x	-58.24	45641.16	-27.08			
alpha	I	2039-09-29T08:11:56.432	-5.39x	-58.21	44689.63	-27.04			
4	I	2039-09-29T08:13:14.788	-5.15x	-58.13	42582.28	-26.94			
5	I	2039-09-29T08:13:24.458	-5.12x	-58.12	42315.20	-26.91			
6	I	2039-09-29T08:13:39.869	-5.07x	-58.11	41875.97	-26.85			
Uranus	I	2039-09-29T08:19:44.321	-3.94x	-57.70	25382.51			33.43	34.66
Uranus	E	2039-09-29T08:56:47.664	3.13x	-54.11	25298.63			-42.14	-43.45
6	E	2039-09-29T09:01:07.426	3.97x	-53.58	41795.40	26.72			
5	E	2039-09-29T09:01:18.807	4.01x	-53.56	42166.96	26.78			
4	E	2039-09-29T09:01:34.760	4.06x	-53.52	42586.44	26.80			
alpha	E	2039-09-29T09:02:55.192	4.32x	-53.36	44733.52	26.90			
beta	E	2039-09-29T09:03:30.903	4.44x	-53.28	45679.27	26.94			
eta	E	2039-09-29T09:04:26.251	4.62x	-53.16	47176.12	27.00			
gamma	E	2039-09-29T09:04:43.073	4.67x	-53.13	47630.56	27.02			
delta	E	2039-09-29T09:05:07.847	4.76x	-53.07	48300.35	27.05			
lambda	E	2039-09-29T09:06:11.596	4.96x	-52.93	50026.71	27.11			
epsilon	E	2039-09-29T09:06:46.624	5.08	-52.86	50976.90	27.19			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-29T08:38:11.400  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KPNO  
 Location : Kitt Peak Natl Obs  
 Latitude (deg) : 31.96333  
 E. Longitude (deg) : 248.40000  
 Altitude (km) : 2.120  
 Gaia source ID : 675682953634165504  
 2Mass ID (if available) : 08180829+2012204  
 ICRS Star Coord at Epoch: 08h 18m 08.28168s +20:12:19.99680s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 13.845  
 G magnitude : 15.820  
 RP magnitude : 15.176  
 BP magnitude : 16.303  
 DUPflag : 0  
 Distance (au) : 19.033  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.89  
 Sun-Target sep (deg) : 63.39  
 Sun-Moon sep (deg) : 153.41  
 B (ring opening deg) : 44.87  
 PA of pole (deg) : 91.56  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.909  
 C/A sky separation (km) : 12554.3  
 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



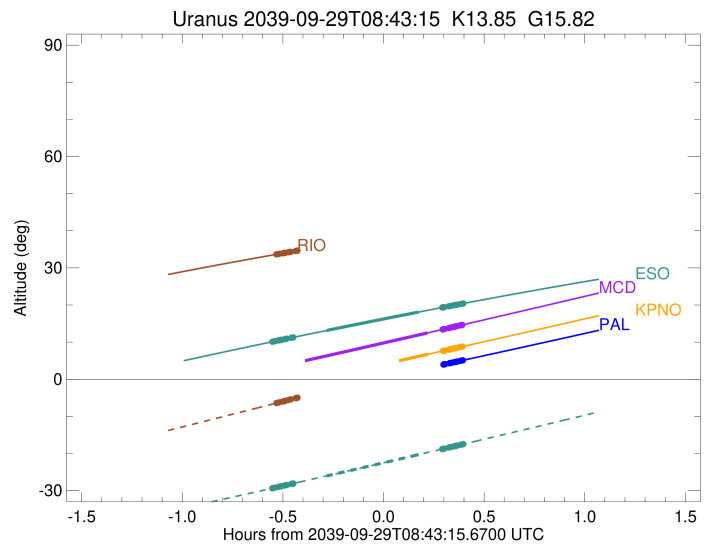
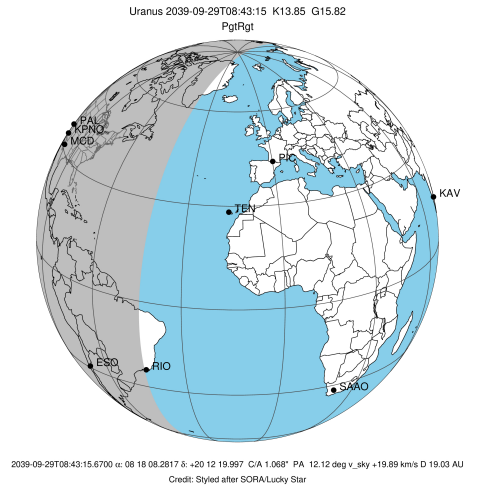
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2039-09-29T08:07:38.882	-2.87x	-58.27	51472.55	-27.27			
lambda	I	2039-09-29T08:08:32.026	-2.70x	-58.19	50026.71	-27.18			
delta	I	2039-09-29T08:09:35.627	-2.50x	-58.09	48300.35	-27.11			
gamma	I	2039-09-29T08:10:00.703	-2.42x	-58.05	47620.98	-27.08			
eta	I	2039-09-29T08:10:17.139	-2.37x	-58.03	47176.12	-27.06			
beta	I	2039-09-29T08:11:13.828	-2.18x	-57.94	45641.18	-26.98			
alpha	I	2039-09-29T08:11:49.648	-2.07x	-57.89	44689.50	-26.94			
4	I	2039-09-29T08:13:08.288	-1.82x	-57.76	42582.62	-26.83			
5	I	2039-09-29T08:13:18.006	-1.79x	-57.74	42315.17	-26.80			
6	I	2039-09-29T08:13:33.509	-1.74x	-57.72	41875.83	-26.74			
Uranus	I	2039-09-29T08:19:45.022	-0.54x	-57.09	25386.53			33.00	34.22
Uranus	E	2039-09-29T08:56:34.910	6.75	-52.39	25301.12			-41.89	-43.20
6	E	2039-09-29T09:00:58.895	7.63	-51.74	41795.47	26.61			
5	E	2039-09-29T09:01:10.323	7.67	-51.71	42167.29	26.67			
4	E	2039-09-29T09:01:26.350	7.72	-51.67	42586.77	26.69			
alpha	E	2039-09-29T09:02:47.087	8.00	-51.46	44733.30	26.79			
beta	E	2039-09-29T09:03:22.941	8.12	-51.37	45679.21	26.83			
eta	E	2039-09-29T09:04:18.500	8.30	-51.23	47176.12	26.91			
gamma	E	2039-09-29T09:04:35.383	8.36	-51.19	47630.54	26.92			
delta	E	2039-09-29T09:05:00.248	8.44	-51.13	48300.35	26.95			
lambda	E	2039-09-29T09:06:04.223	8.66	-50.96	50026.71	27.02			
epsilon	E	2039-09-29T09:06:39.456	8.78	-50.87	50979.20	27.10			

target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-29T08:38:08.400  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : MCD  
 Location : McDonald Obs. 2.7m  
 Latitude (deg) : 30.67158  
 E. Longitude (deg) : 255.97844  
 Altitude (km) : 2.075  
 Gaia source ID : 675682953634165504  
 2Mass ID (if available) : 08180829+2012204  
 ICRS Star Coord at Epoch: 08h 18m 08.28168s +20:12:19.99680s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 13.845  
 G magnitude : 15.820  
 RP magnitude : 15.176  
 BP magnitude : 16.303  
 DUPflag : 0  
 Distance (au) : 19.033  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.89  
 Sun-Target sep (deg) : 63.39  
 Sun-Moon sep (deg) : 153.47  
 B (ring opening deg) : 44.87  
 PA of pole (deg) : 91.56  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 0.937  
 C/A sky separation (km) : 12934.9  
 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\_itrfr93\_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	2039-09-29T08:07:32.788		2.52x	-55.98	51474.50	-27.14		
lambda	I	2039-09-29T08:08:26.247		2.70x	-55.86	50026.71	-27.05		
delta	I	2039-09-29T08:09:30.150		2.91x	-55.72	48300.35	-26.98		
gamma	I	2039-09-29T08:09:55.348		3.00x	-55.66	47620.98	-26.95		
eta	I	2039-09-29T08:10:11.864		3.05x	-55.62	47176.12	-26.92		
beta	I	2039-09-29T08:11:08.840		3.24x	-55.49	45641.20	-26.84		
alpha	I	2039-09-29T08:11:44.848		3.36x	-55.41	44689.34	-26.79		
4	I	2039-09-29T08:13:03.886		3.63x	-55.23	42583.04	-26.68		
5	I	2039-09-29T08:13:13.669		3.66x	-55.21	42315.13	-26.65		
6	I	2039-09-29T08:13:29.296		3.71x	-55.17	41875.65	-26.59		
Uranus	I	2039-09-29T08:19:49.954		4.99x	-54.27	25391.54		32.45	33.66
Uranus	E	2039-09-29T08:56:23.796		12.49	-48.38	25304.25		-41.57	-42.88
6	E	2039-09-29T09:00:53.267		13.42	-47.59	41795.54	26.45		
5	E	2039-09-29T09:01:04.759		13.46	-47.56	42167.69	26.52		
4	E	2039-09-29T09:01:20.885		13.52	-47.51	42587.16	26.54		
alpha	E	2039-09-29T09:02:42.043		13.80	-47.27	44733.03	26.65		
beta	E	2039-09-29T09:03:18.092		13.93	-47.17	45679.13	26.69		
eta	E	2039-09-29T09:04:13.940		14.12	-47.00	47176.12	26.77		
gamma	E	2039-09-29T09:04:30.907		14.18	-46.95	47630.51	26.79		
delta	E	2039-09-29T09:04:55.897		14.27	-46.88	48300.35	26.82		
lambda	E	2039-09-29T09:06:00.183		14.49	-46.68	50026.71	26.89		
epsilon	E	2039-09-29T09:06:35.685		14.61	-46.58	50981.95	26.98		

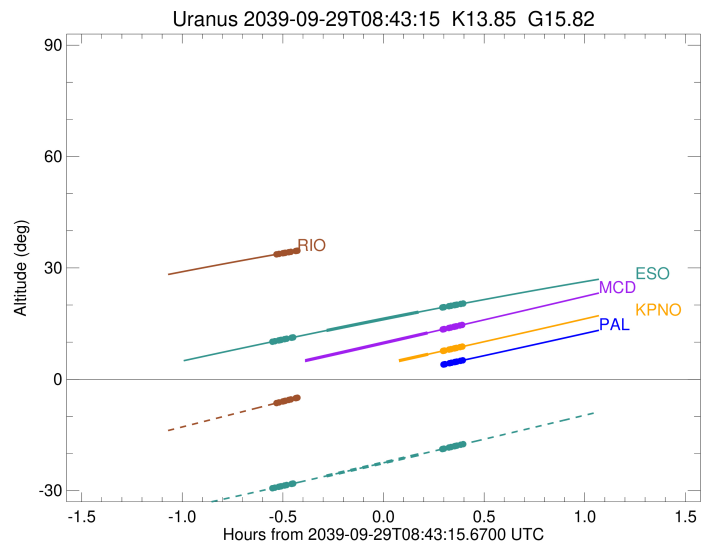
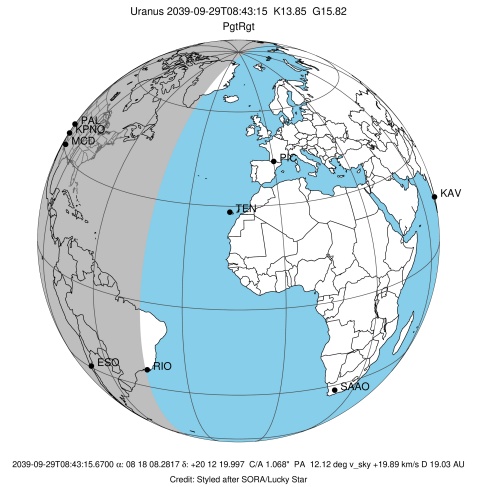
target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-29T08:41:35.540  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : RIO  
 Location : Rio de Janeiro  
 Latitude (deg) : -22.89506  
 E. Longitude (deg) : 316.77708  
 Altitude (km) : 0.033  
 Gaia source ID : 675682953634165504  
 2Mass ID (if available) : 08180829+2012204  
 ICRS Star Coord at Epoch: 08h 18m 08.28168s +20:12:19.99680s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 13.845  
 G magnitude : 15.820  
 RP magnitude : 15.176  
 BP magnitude : 16.303  
 DUPflag : 0  
 Distance (au) : 19.033  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.89  
 Sun-Target sep (deg) : 63.39  
 Sun-Moon sep (deg) : 153.25  
 B (ring opening deg) : 44.87  
 PA of pole (deg) : 91.56  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.404  
 C/A sky separation (km) : 19381.6  
 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\_itrfr93\_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	2039-09-29T08:11:08.609		33.62	-6.46	51505.05	-25.45		
lambda	I	2039-09-29T08:12:06.942		33.77	-6.24	50026.71	-25.28		
delta	I	2039-09-29T08:13:15.466		33.95	-5.97	48300.35	-25.11		
gamma	I	2039-09-29T08:13:42.563		34.03	-5.87	47620.97	-25.04		
eta	I	2039-09-29T08:14:00.349		34.07	-5.80	47176.12	-24.99		
beta	I	2039-09-29T08:15:01.866		34.23	-5.57	45641.82	-24.81		
alpha	I	2039-09-29T08:15:40.926		34.33	-5.42	44686.94	-24.69		
4	I	2039-09-29T08:17:06.525		34.56	-5.09	42590.31	-24.41		
5	I	2039-09-29T08:17:17.489		34.58	-5.05	42313.20	-24.35		
6	I	2039-09-29T08:17:35.263		34.63	-4.98x	41871.92	-24.25		
Uranus	I	2039-09-29T08:27:27.497		36.13	-2.71x	25485.91		20.70	21.59
Uranus	E	2039-09-29T08:55:36.152		40.00	3.78x	25383.55		-33.32	-34.55
6	E	2039-09-29T09:02:32.385		40.85	5.38x	41797.43	24.18		
5	E	2039-09-29T09:02:45.040		40.88	5.43x	42175.61	24.28		
4	E	2039-09-29T09:03:02.726		40.91	5.50x	42593.74	24.34		
alpha	E	2039-09-29T09:04:30.453		41.09	5.83x	44728.25	24.61		
beta	E	2039-09-29T09:05:09.504		41.16	5.98x	45677.62	24.73		
eta	E	2039-09-29T09:06:09.728		41.28	6.22x	47176.12	24.90		
gamma	E	2039-09-29T09:06:27.936		41.32	6.29x	47630.02	24.95		
delta	E	2039-09-29T09:06:54.762		41.37	6.39x	48300.35	25.02		
lambda	E	2039-09-29T09:08:03.523		41.50	6.65x	50026.71	25.19		
epsilon	E	2039-09-29T09:08:43.319		41.58	6.81x	51030.86	25.36		



target : Uranus  
 target radius (km) : 25559.00  
 C/A epoch : 2039-09-29T08:40:02.710  
 Event type : PgtRgt  
 : Uranus occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : ESO  
 Location : European Southern Obs. (3.6m)  
 Latitude (deg) : -29.26097  
 E. Longitude (deg) : 289.26831  
 Altitude (km) : 2.400  
 Gaia source ID : 675682953634165504  
 2Mass ID (if available) : 08180829+2012204  
 ICRS Star Coord at Epoch: 08h 18m 08.28168s +20:12:19.99680s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 13.845  
 G magnitude : 15.820  
 RP magnitude : 15.176  
 BP magnitude : 16.303  
 DUPflag : 0  
 Distance (au) : 19.033  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 19.89  
 Sun-Target sep (deg) : 63.39  
 Sun-Moon sep (deg) : 153.34  
 B (ring opening deg) : 44.87  
 PA of pole (deg) : 91.56  
 Pole direction: RA (deg): 257.31100  
 Dec (deg): -15.17500  
 C/A sky separation (") : 1.422  
 C/A sky separation (km) : 19629.8  
 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\_itrfr93\_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	2039-09-29T08:09:54.851		10.07	-29.40	51505.53	-25.61		
lambda	I	2039-09-29T08:10:52.838		10.25	-29.20	50026.71	-25.43		
delta	I	2039-09-29T08:12:00.946		10.47	-28.97	48300.35	-25.26		
gamma	I	2039-09-29T08:12:27.883		10.55	-28.88	47620.97	-25.18		
eta	I	2039-09-29T08:12:45.565		10.61	-28.82	47176.12	-25.13		
beta	I	2039-09-29T08:13:46.732		10.80	-28.61	45641.84	-24.94		
alpha	I	2039-09-29T08:14:25.580		10.92	-28.48	44686.90	-24.82		
4	I	2039-09-29T08:15:50.726		11.19	-28.19	42590.46	-24.53		
5	I	2039-09-29T08:16:01.643		11.23	-28.15	42313.14	-24.47		
6	I	2039-09-29T08:16:19.343		11.28	-28.09	41871.82	-24.36		
Uranus	I	2039-09-29T08:26:15.832		13.14	-26.04	25488.71		20.28	21.16
Uranus	E	2039-09-29T08:53:42.613		18.10	-20.30	25388.94		-32.74	-33.95
6	E	2039-09-29T09:00:46.401		19.33	-18.81	41797.57	24.26		
5	E	2039-09-29T09:00:59.022		19.37	-18.76	42176.12	24.36		
4	E	2039-09-29T09:01:16.645		19.42	-18.70	42594.10	24.43		
alpha	E	2039-09-29T09:02:44.009		19.67	-18.39	44727.96	24.71		
beta	E	2039-09-29T09:03:22.906		19.78	-18.25	45677.52	24.83		
eta	E	2039-09-29T09:04:22.881		19.96	-18.04	47176.12	25.01		
gamma	E	2039-09-29T09:04:41.009		20.01	-17.98	47629.99	25.06		
delta	E	2039-09-29T09:05:07.718		20.09	-17.88	48300.35	25.13		
lambda	E	2039-09-29T09:06:16.170		20.28	-17.64	50026.71	25.30		
epsilon	E	2039-09-29T09:06:55.904		20.39	-17.50	51033.94	25.48		