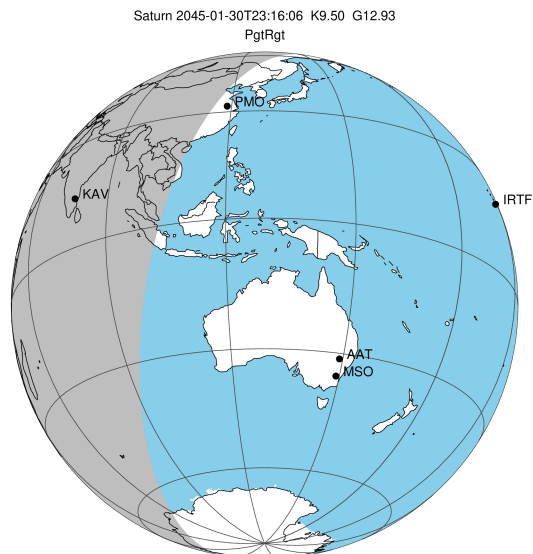


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-01-30T23:16:06.110  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 6052759872519258496  
 2Mass ID (if available) : 16311850-2002524

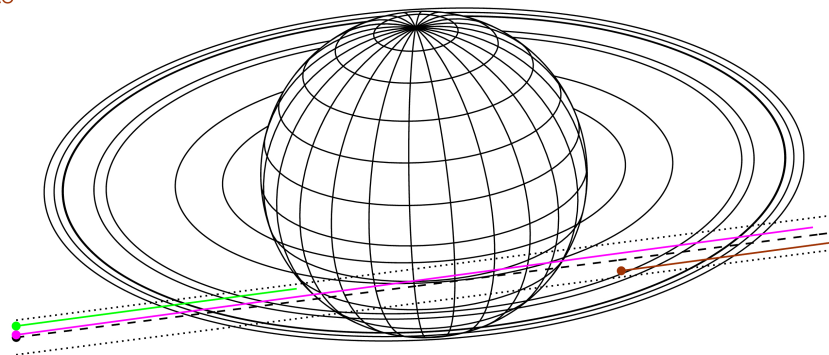
Saturn 2045-01-30T23:16:06 K9.50 G12.93 PgtRgt

ICRS Star Coord at Epoch: 16h 31m 18.50323s -20:02:52.84995s

RUWE (>1.4 is poor) : 0.97  
 K magnitude : 9.503  
 G magnitude : 12.929  
 RP magnitude : 11.966  
 BP magnitude : 13.880  
 DUPflag : 0  
 Distance (au) : 10.416  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.72  
 Sun-Target sep (deg) : 61.64  
 Sun-Moon sep (deg) : 145.04  
 B (ring opening deg) : 25.80  
 PA of pole (deg) : 3.30  
 # a(km) ring



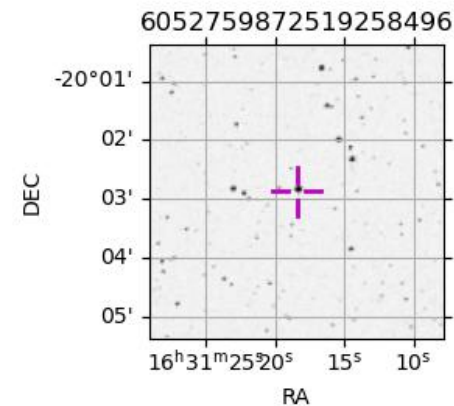
Earth  
 PMO  
 KAV  
 SAAO



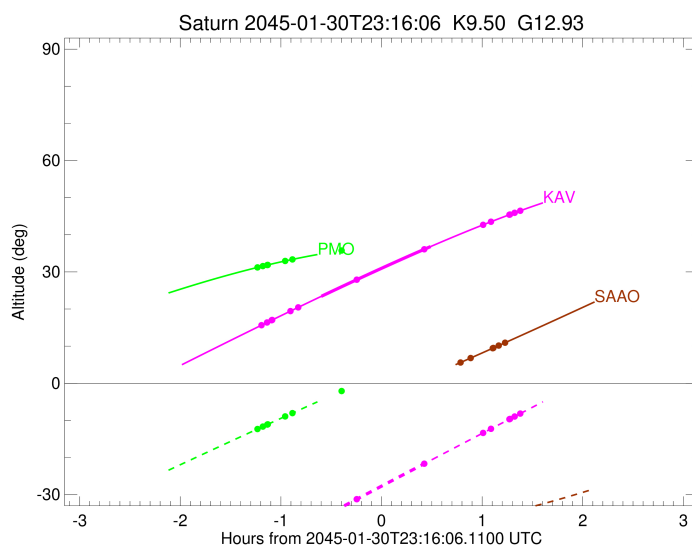
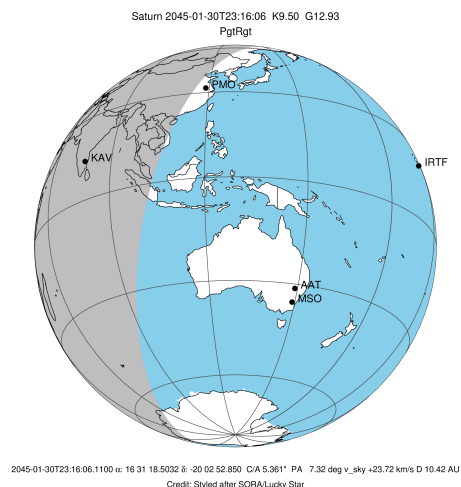
2045-01-30T23:16:06.1100 α: 16 31 18.50323 δ: -20 02 52.850 C/A 5.361° PA 7.32 deg v\_sky +23.72 km/s D 10.42 AU  
 Credit: Styled after SORA/Lucky Star

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 (20	33.4	243.1					PnnRnn		
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	+	+	JAN 30 22:02 - JAN 30 22:22	PnnRin
KPNO	Kitt Peak Natl	32.0	248.4					PnnRnn		
MCD	McDonald Obs.	30.7	256.0					PnnRnn		
TEN	Teide Obs./Ten	28.3	343.5					PnnRnn		
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn		
KAV	Kavalur Observ	12.6	78.8	+	+	+	+	+	JAN 30 22:04 - JAN 31 00:38	PieRie
RIO	Rio de Janeiro	-22.9	316.8		+	+				PnnRnn
ESO	European South	-29.3	289.3					PnnRnn		
AAT	Siding Spring	-31.3	149.1					PnnRnn		
SAAO	So. Afr. Astro	-32.4	20.8			+	+	+	JAN 31 00:03 - JAN 31 00:29	PnnRne
MSO	Mt. Stromlo Ob	-35.3	149.0					PnnRnn		



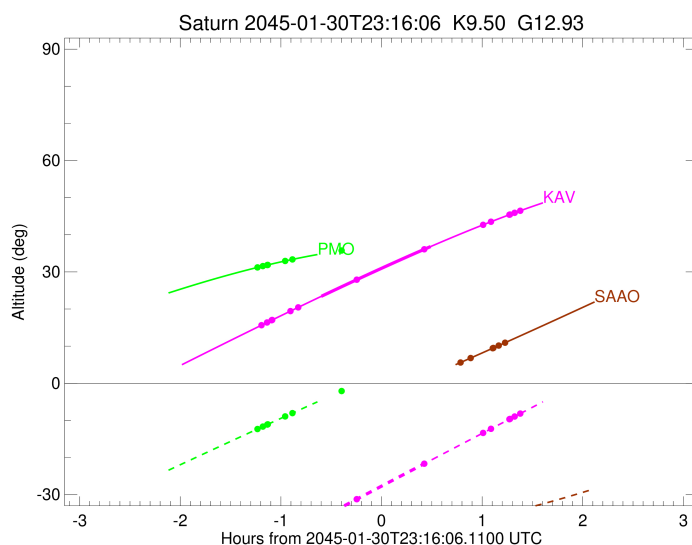
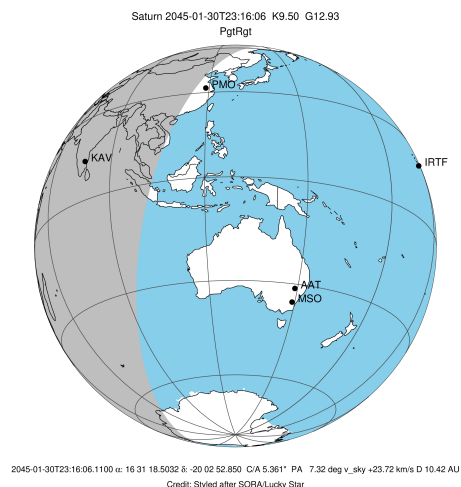
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-01-30T23:15:04.420  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 6052759872519258496  
 2Mass ID (if available) : 16311850-2002524  
 ICRS Star Coord at Epoch: 16h 31m 18.50323s -20:02:52.84995s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 9.503  
 G magnitude : 12.929  
 RP magnitude : 11.966  
 BP magnitude : 13.880  
 DUPflag : 0  
 Distance (au) : 10.416  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.72  
 Sun-Target sep (deg) : 61.64  
 Sun-Moon sep (deg) : 145.70  
 B (ring opening deg) : 25.80  
 PA of pole (deg) : 3.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.721  
 C/A sky separation (km) : 35661.6  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 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
F ring	I	2045-01-30T22:02:03.714		31.20	-12.35	140461.00	-19.36		
A (OER)	I	2045-01-30T22:05:15.461		31.55	-11.69	136774.40	-19.09		
Encke (OEG)	I	2045-01-30T22:07:55.163		31.84	-11.14	133744.89	-18.85		
Encke (IEG)	I	2045-01-30T22:08:12.237		31.87	-11.08	133423.31	-18.82		
A (IER)	I	2045-01-30T22:18:34.240		32.94	-8.95	122050.38	-17.70		
B (OER)	I	2045-01-30T22:22:51.301		33.35	-8.07	117571.16	-17.14		
B (IER)	I	2045-01-30T22:52:17.708	b	35.76	-2.10x	91984.69	-11.10		
Saturn	I	2045-01-30T22:40:49.074		34.91	-4.41x	59803.27		-36.08	-41.62
Saturn	E	2045-01-30T23:49:30.005		37.94	9.07x	59956.36		-28.78	-33.87
B (IER)	E	2045-01-30T23:53:26.325		37.96	9.81x	91984.69	11.12		
B (OER)	E	2045-01-31T00:22:54.647		37.57	15.24x	117571.16	17.09		
A (IER)	E	2045-01-31T00:27:12.588		37.43	16.01x	122050.38	17.63		
Encke (IEG)	E	2045-01-31T00:37:37.119		37.02	17.85x	133423.31	18.74		
Encke (OEG)	E	2045-01-31T00:37:54.269		37.00	17.90x	133744.89	18.76		
A (OER)	E	2045-01-31T00:40:34.707		36.88	18.36x	136774.40	19.00		
F ring	E	2045-01-31T00:43:47.379		36.72	18.92x	140461.00	19.26		

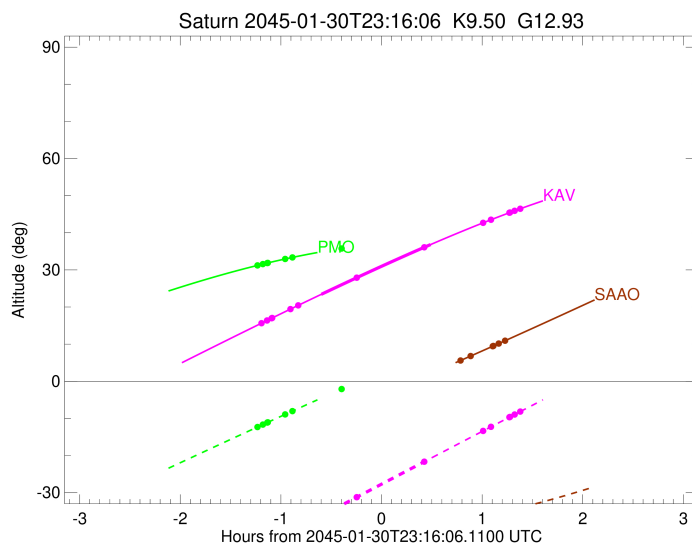
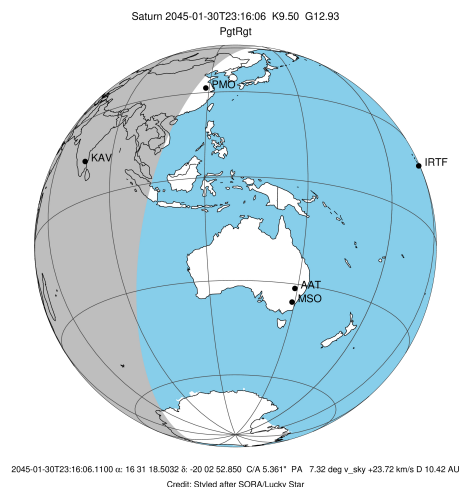
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-01-30T23:12:41.040  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 6052759872519258496  
 2Mass ID (if available) : 16311850-2002524  
 ICRS Star Coord at Epoch: 16h 31m 18.50323s -20:02:52.84995s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 9.503  
 G magnitude : 12.929  
 RP magnitude : 11.966  
 BP magnitude : 13.880  
 DUPflag : 0  
 Distance (au) : 10.416  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.72  
 Sun-Target sep (deg) : 61.64  
 Sun-Moon sep (deg) : 146.04  
 B (ring opening deg) : 25.80  
 PA of pole (deg) : 3.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.092  
 C/A sky separation (km) : 38465.7  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itrf93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 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
F ring	I	2045-01-30T22:04:26.084		15.62	-44.79	140461.00	-18.71		
A (OER)	I	2045-01-30T22:07:44.902		16.35	-44.00	136774.40	-18.37		
Encke (OEG)	I	2045-01-30T22:10:31.110		16.96	-43.34	133744.89	-18.08		
Encke (IEG)	I	2045-01-30T22:10:48.916		17.03	-43.27	133423.31	-18.04		
A (IER)	I	2045-01-30T22:21:43.423		19.42	-40.67	122050.38	-16.65		
B (OER)	I	2045-01-30T22:26:18.183		20.42	-39.58	117571.16	-15.94		
B (IER)	I	2045-01-30T23:01:23.507	b	27.91	-31.22	91984.69	-7.34		
Saturn	I	2045-01-30T22:40:15.087		23.43	-36.25	59734.85		-39.15	-44.76
Saturn	E	2045-01-30T23:45:21.248		36.82	-20.78	59899.80		-31.57	-36.89
B (IER)	E	2045-01-30T23:41:33.490	b	36.08	-21.68	91984.69	7.36		
B (OER)	E	2045-01-31T00:16:44.429		42.69	-13.37	117571.16	15.83		
A (IER)	E	2045-01-31T00:21:21.375		43.51	-12.28	122050.38	16.51		
Encke (IEG)	E	2045-01-31T00:32:22.040		45.40	-9.69	133423.31	17.86		
Encke (OEG)	E	2045-01-31T00:32:40.031		45.45	-9.62	133744.89	17.89		
A (OER)	E	2045-01-31T00:35:28.010		45.92	-8.96	136774.40	18.18		
F ring	E	2045-01-31T00:38:49.047		46.47	-8.17	140461.00	18.49		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2045-01-30T23:13:01.020  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : 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 : 6052759872519258496  
 2Mass ID (if available) : 16311850-2002524  
 ICRS Star Coord at Epoch: 16h 31m 18.50323s -20:02:52.84995s  
 RUWE (>1.4 is poor) : 0.97  
 K magnitude : 9.503  
 G magnitude : 12.929  
 RP magnitude : 11.966  
 BP magnitude : 13.880  
 DUPflag : 0  
 Distance (au) : 10.416  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : 23.72  
 Sun-Target sep (deg) : 61.64  
 Sun-Moon sep (deg) : 145.49  
 B (ring opening deg) : 25.80  
 PA of pole (deg) : 3.30  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.942  
 C/A sky separation (km) : 44886.8  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 Saturn\_ring\_plane.tf  
 sat378.bsp  
 sat286.bsp  
 vgr1.sat286.bsp  
 vgr2.sat286.bsp  
 HST1081HSPephemUTC.bsp  
 pfb10000r.bsp  
 cassini.bsp  
 earthstns\_itr93\_040916.bsp  
 earth\_200101\_990628\_predict.bpc  
 earth\_720101\_070426.bpc  
 cpck28Mar2008.tpc  
 pck.sat440.tpc  
 IAU\_SATURN\_for\_RINGFIT.tpc  
 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
F ring	I	2045-01-30T22:16:10.032	-14.46x	-39.79	140461.00	-16.63			
A (OER)	I	2045-01-30T22:19:55.165	-13.82x	-39.93	136774.40	-16.11			
Encke (OEG)	I	2045-01-30T22:23:05.982	-13.26x	-40.03	133744.89	-15.64			
Encke (IEG)	I	2045-01-30T22:23:26.583	-13.20x	-40.04	133423.31	-15.58			
A (IER)	I	2045-01-30T22:36:32.701	-10.88x	-40.35	122050.38	-13.25			
B (OER)	I	2045-01-30T22:42:27.445	-9.82x	-40.42	117571.16	-11.98			
Saturn	I	2045-01-30T22:45:40.745	-9.23x	-40.44	59575.61			-46.13	-51.66
Saturn	E	2045-01-30T23:40:35.157	1.13x	-39.01	59737.00			-39.06	-44.66
B (OER)	E	2045-01-31T00:03:19.037	5.61	-37.45	117571.16	11.94			
A (IER)	E	2045-01-31T00:09:15.274	6.79	-36.96	122050.38	13.18			
Encke (IEG)	E	2045-01-31T00:22:26.384	9.44	-35.76	133423.31	15.47			
Encke (OEG)	E	2045-01-31T00:22:47.143	9.51	-35.72	133744.89	15.52			
A (OER)	E	2045-01-31T00:25:59.488	10.16	-35.41	136774.40	15.98			
F ring	E	2045-01-31T00:29:46.560	10.92	-35.02	140461.00	16.49			