

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:50:35.740  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018

Saturn 2033-01-09T17:50:35 K9.74 G14.40 PgtRgt

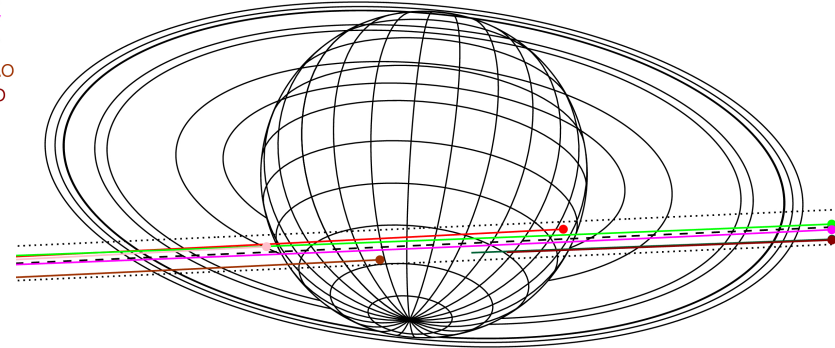
ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s

RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 52.33  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68

Saturn 2033-01-09T17:50:35 K9.74 G14.40  
 PgtRgt



Earth  
 PIC  
 PMO  
 TEN  
 KAV  
 AAT  
 SAO  
 MSO

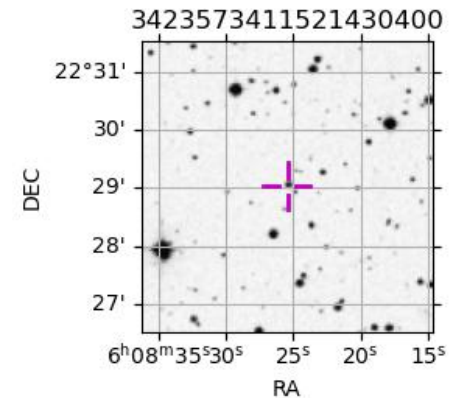


2033-01-09T17:50:35.7400 a: 06 08 25.4627 & +22 29 01.837 C/A 4.458° PA 2.54 deg v\_sky -18.75 km/s D 08.07 AU  
 Credit: Styled after SORA/Lucky Star

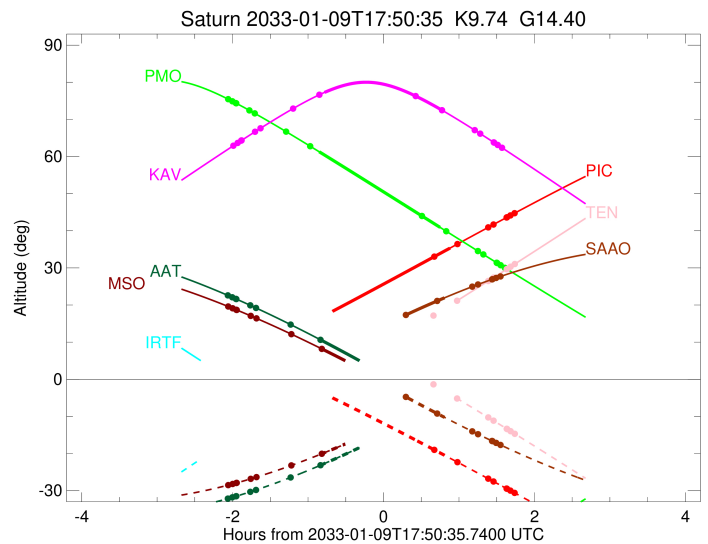
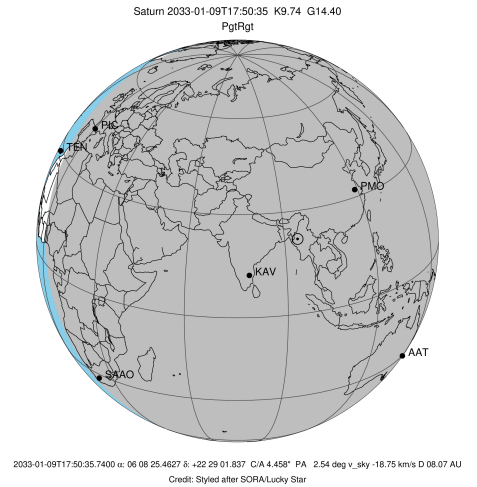
#	a(km)	ring
1	74490.6	C (IER)
2	91984.7	B (IER)
3	117571.2	B (OER)
4	122050.4	A (IER)
5	133423.3	Encke (IEG)
6	133744.9	Encke (OEG)
7	136774.4	A (OER)
8	140461.0	F ring

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	OEncode
PIC	Pic du Midi	42.9	0.1		+	+	JAN 09 18:43 - JAN 09 19:34	PneRne
PAL	Palomar Mt (20	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs	32.1	118.8	+	+	+	JAN 09 15:47 - JAN 09 19:27	PieRie
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			+	JAN 09 18:49 - JAN 09 19:34	PnnRne
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observ	12.6	78.8	+	+	+	JAN 09 15:51 - JAN 09 19:24	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	+	+		JAN 09 15:46 - JAN 09 16:59	PinRin
SAO	So. Afr. Astro	-32.4	20.8		+	+	JAN 09 18:39 - JAN 09 19:23	PneRne
MSO	Mt. Stromlo Ob	-35.3	149.0	+	+	+	JAN 09 15:47 - JAN 09 17:00	PinRin

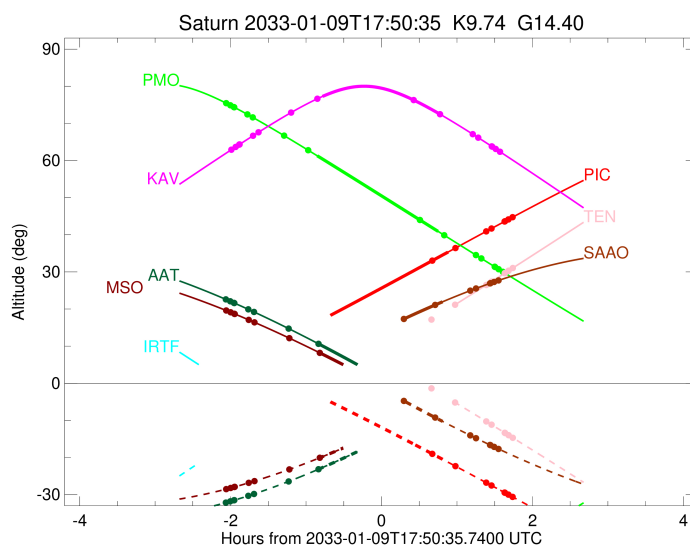
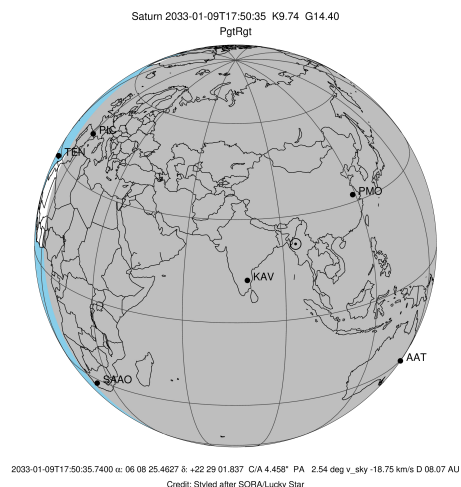


target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:54:36.780  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PIC  
 Location : Pic du Midi  
 Latitude (deg) : 42.93656  
 E. Longitude (deg) : 0.14231  
 Altitude (km) : 2.890  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 52.24  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 3.895  
 C/A sky separation (km) : 22801.2  
 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



Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
F ring	I	2033-01-09T15:51:32.957		4.76x	7.16x	140461.00	-18.28		
A (OER)	I	2033-01-09T15:54:55.008		5.31	6.67x	136774.40	-18.21		
Encke (OEG)	I	2033-01-09T15:57:41.611		5.77	6.27x	133744.89	-18.15		
Encke (IEG)	I	2033-01-09T15:57:59.328		5.82	6.23x	133423.31	-18.15		
A (IER)	I	2033-01-09T16:08:30.417		7.59	4.69x	122050.38	-17.88		
B (OER)	I	2033-01-09T16:12:41.800		8.29	4.06x	117571.16	-17.75		
B (IER)	I	2033-01-09T16:37:27.106		12.55	0.26x	91984.69	-16.55		
C (IER)	I	2033-01-09T16:55:58.726		15.80	-2.70x	74490.58	-14.73		
Saturn	I	2033-01-09T17:05:14.854		17.44	-4.22x	60203.57		-12.23	-14.90
Saturn	E	2033-01-09T18:43:35.136		35.36	-21.28	59966.48		-27.37	-32.33
C (IER)	E	2033-01-09T18:30:55.680	b	33.03	-19.01	74490.58	14.79		
B (IER)	E	2033-01-09T18:49:21.048		36.42	-22.32	91984.69	16.67		
B (OER)	E	2033-01-09T19:13:53.022		40.92	-26.78	117571.16	17.94		
A (IER)	E	2033-01-09T19:18:01.689		41.68	-27.53	122050.38	18.08		
Encke (IEG)	E	2033-01-09T19:28:25.419		43.57	-29.44	133423.31	18.37		
Encke (OEG)	E	2033-01-09T19:28:42.917		43.63	-29.49	133744.89	18.38		
A (OER)	E	2033-01-09T19:31:27.447		44.13	-29.99	136774.40	18.45		
F ring	E	2033-01-09T19:34:46.914		44.73	-30.60	140461.00	18.52		

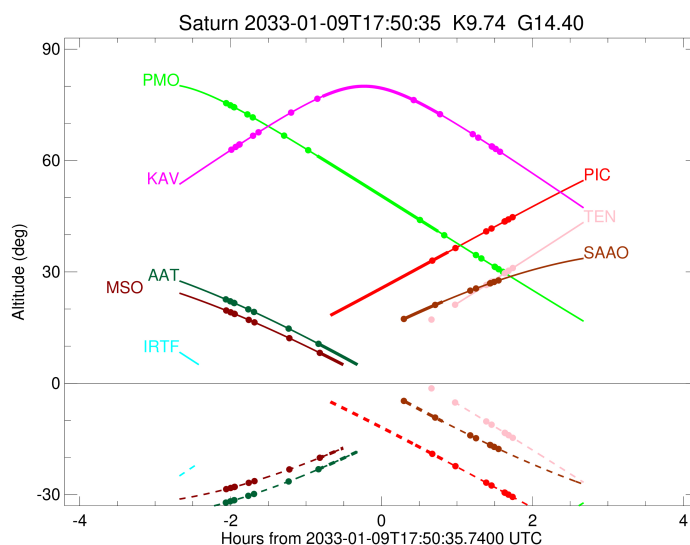
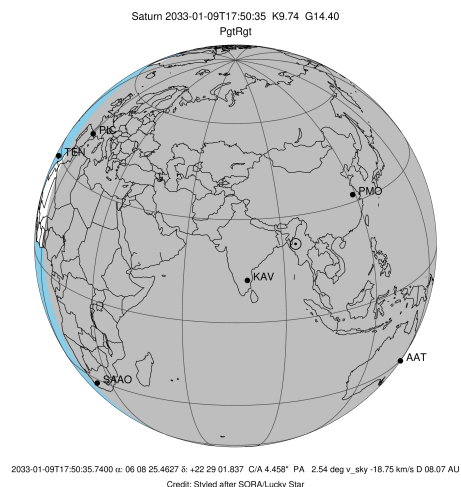
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:47:32.290  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : PMO  
 Location : Purple Mtn Obs. Nanking  
 Latitude (deg) : 32.06667  
 E. Longitude (deg) : 118.82089  
 Altitude (km) : 0.364  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 53.27  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.155  
 C/A sky separation (km) : 24327.1  
 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	2033-01-09T15:47:06.252		75.46	-78.65	140461.00	-18.41		
A (OER)	I	2033-01-09T15:50:26.929		74.88	-79.00	136774.40	-18.33		
Encke (OEG)	I	2033-01-09T15:53:12.565		74.40	-79.25	133744.89	-18.25		
Encke (IEG)	I	2033-01-09T15:53:30.188		74.35	-79.27	133423.31	-18.26		
A (IER)	I	2033-01-09T16:03:59.203		72.43	-79.93	122050.38	-17.90		
B (OER)	I	2033-01-09T16:08:10.531		71.64	-80.05	117571.16	-17.74		
B (IER)	I	2033-01-09T16:33:08.644		66.71	-79.03	91984.69	-16.24		
C (IER)	I	2033-01-09T16:52:17.589		62.78	-76.64	74490.58	-13.98		
Saturn	I	2033-01-09T16:59:23.964		61.30	-75.53	60180.91		-14.27	-17.33
Saturn	E	2033-01-09T18:35:36.761		40.91	-56.67	59951.25		-28.12	-33.16
C (IER)	E	2033-01-09T18:21:05.814	b	44.00	-59.71	74490.58	13.85		
B (IER)	E	2033-01-09T18:40:25.607		39.89	-55.66	91984.69	16.08		
B (OER)	E	2033-01-09T19:05:41.115		34.54	-50.32	117571.16	17.51		
A (IER)	E	2033-01-09T19:09:55.826		33.64	-49.42	122050.38	17.66		
Encke (IEG)	E	2033-01-09T19:20:33.919		31.40	-47.17	133423.31	17.97		
Encke (OEG)	E	2033-01-09T19:20:51.809		31.33	-47.10	133744.89	17.98		
A (OER)	E	2033-01-09T19:23:39.988		30.74	-46.51	136774.40	18.05		
F ring	E	2033-01-09T19:27:03.827		30.03	-45.79	140461.00	18.12		

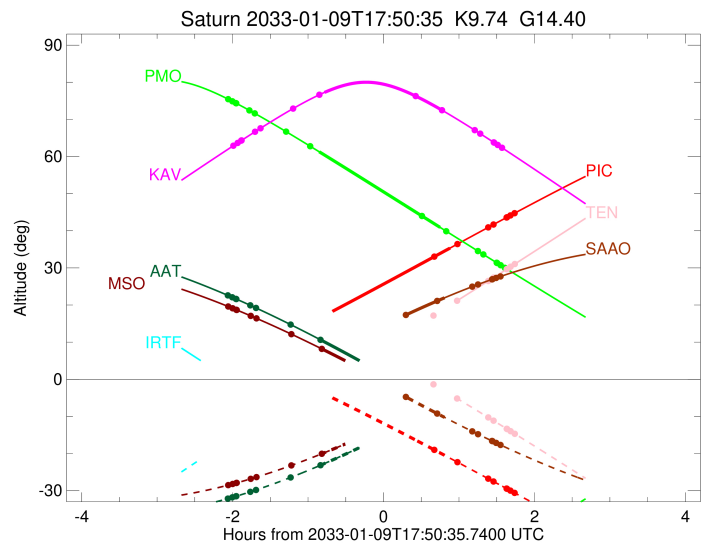
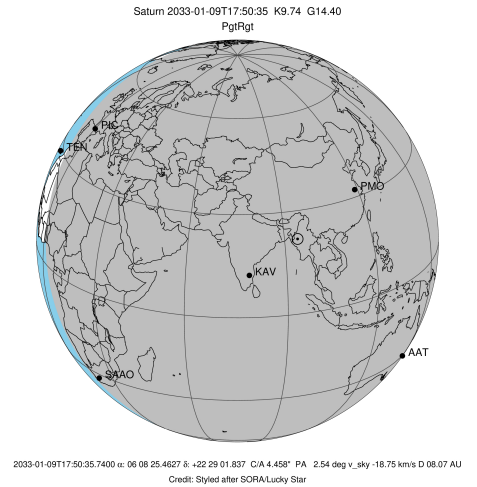
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:55:31.920  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : TEN  
 Location : Teide Obs./Tenerife  
 Latitude (deg) : 28.30050  
 E. Longitude (deg) : 343.48909  
 Altitude (km) : 2.395  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 51.92  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.025  
 C/A sky separation (km) : 23562.4  
 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	2033-01-09T15:51:52.535		-14.31x	26.94x	140461.00	-18.09		
A (OER)	I	2033-01-09T15:55:16.733		-13.70x	26.44x	136774.40	-18.02		
Encke (OEG)	I	2033-01-09T15:58:05.147		-13.19x	26.02x	133744.89	-17.96		
Encke (IEG)	I	2033-01-09T15:58:23.058		-13.13x	25.98x	133423.31	-17.95		
A (IER)	I	2033-01-09T16:09:01.415		-11.18x	24.35x	122050.38	-17.67		
B (OER)	I	2033-01-09T16:13:15.904		-10.40x	23.68x	117571.16	-17.53		
B (IER)	I	2033-01-09T16:38:23.649		-5.63x	19.57x	91984.69	-16.25		
C (IER)	I	2033-01-09T16:57:21.707		-1.93x	16.29x	74490.58	-14.29		
Saturn	I	2033-01-09T17:06:11.163		-0.18x	14.72x	60197.09		-12.85	-15.64
Saturn	E	2033-01-09T18:44:25.613		20.15	-4.22x	59950.36		-28.16	-33.20
C (IER)	E	2033-01-09T18:30:15.220	b	17.14	-1.36x	74490.58	14.36		
B (IER)	E	2033-01-09T18:49:04.436		21.14	-5.17	91984.69	16.41		
B (OER)	E	2033-01-09T19:13:53.817		26.48	-10.28	117571.16	17.79		
A (IER)	E	2033-01-09T19:18:04.583		27.38	-11.15	122050.38	17.94		
Encke (IEG)	E	2033-01-09T19:28:32.862		29.65	-13.34	133423.31	18.25		
Encke (OEG)	E	2033-01-09T19:28:50.476		29.71	-13.40	133744.89	18.26		
A (OER)	E	2033-01-09T19:31:36.053		30.31	-13.98	136774.40	18.33		
F ring	E	2033-01-09T19:34:56.717		31.03	-14.68	140461.00	18.41		

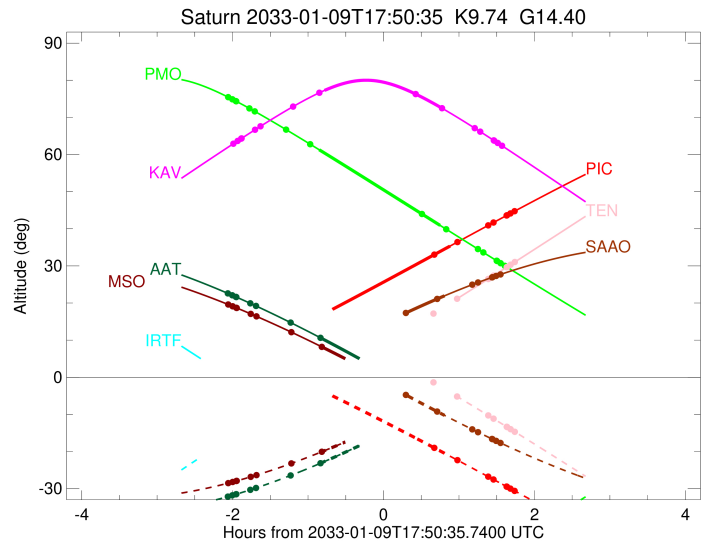
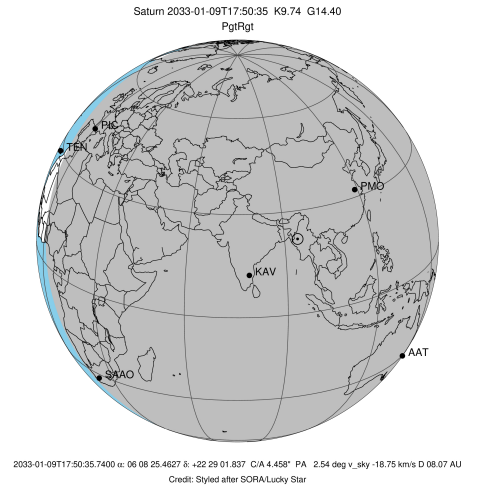
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:50:15.800  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : KAV  
 Location : Kavalur Observatory  
 Latitude (deg) : 12.57556  
 E. Longitude (deg) : 78.83167  
 Altitude (km) : 0.722  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 53.13  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 4.642  
 C/A sky separation (km) : 27173.4  
 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	2033-01-09T15:51:14.137		62.91	-45.99	140461.00	-18.11		
A (OER)	I	2033-01-09T15:54:38.250		63.66	-46.77	136774.40	-18.01		
Encke (OEG)	I	2033-01-09T15:57:26.904		64.28	-47.42	133744.89	-17.92		
Encke (IEG)	I	2033-01-09T15:57:44.858		64.35	-47.49	133423.31	-17.91		
A (IER)	I	2033-01-09T16:08:27.260		66.68	-49.96	122050.38	-17.48		
B (OER)	I	2033-01-09T16:12:44.953		67.60	-50.94	117571.16	-17.28		
B (IER)	I	2033-01-09T16:38:42.207		72.92	-56.88	91984.69	-15.35		
C (IER)	I	2033-01-09T16:59:35.228		76.64	-61.60	74490.58	-12.25		
Saturn	I	2033-01-09T17:03:40.109		77.27	-62.51	60149.70		-16.70	-20.20
Saturn	E	2033-01-09T18:36:38.153		72.57	-79.84	59891.78		-30.93	-36.20
C (IER)	E	2033-01-09T18:16:05.275	b	76.30	-77.23	74490.58	12.17		
B (IER)	E	2033-01-09T18:37:04.617		72.49	-79.88	91984.69	15.28		
B (OER)	E	2033-01-09T19:03:09.117		67.10	-80.16	117571.16	17.19		
A (IER)	E	2033-01-09T19:07:28.133		66.17	-79.84	122050.38	17.39		
Encke (IEG)	E	2033-01-09T19:18:14.041		63.82	-78.65	133423.31	17.80		
Encke (OEG)	E	2033-01-09T19:18:32.098		63.75	-78.61	133744.89	17.81		
A (OER)	E	2033-01-09T19:21:21.727		63.13	-78.22	136774.40	17.90		
F ring	E	2033-01-09T19:24:47.048		62.37	-77.72	140461.00	18.00		

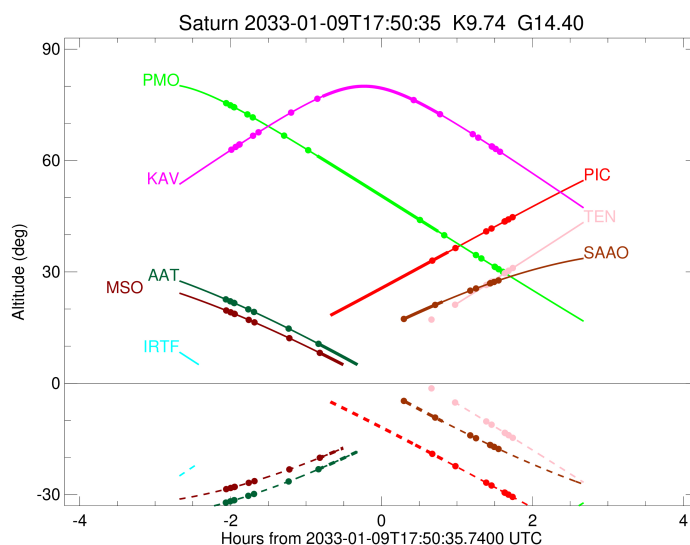
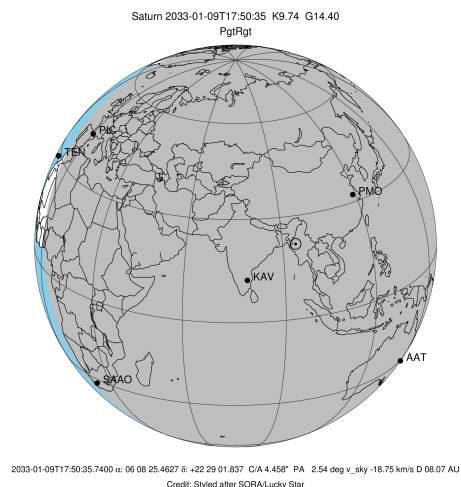
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:46:01.600  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : AAT  
 Location : Siding Spring (AAT)  
 Latitude (deg) : -31.27703  
 E. Longitude (deg) : 149.06608  
 Altitude (km) : 1.164  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 52.83  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.040  
 C/A sky separation (km) : 29507.1  
 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	2033-01-09T15:46:49.987		22.60	-32.15	140461.00	-17.57		
A (OER)	I	2033-01-09T15:50:20.590		22.08	-31.81	136774.40	-17.44		
Encke (OEG)	I	2033-01-09T15:53:14.889		21.65	-31.52	133744.89	-17.32		
Encke (IEG)	I	2033-01-09T15:53:33.460		21.61	-31.49	133423.31	-17.31		
A (IER)	I	2033-01-09T16:04:40.207		19.92	-30.33	122050.38	-16.78		
B (OER)	I	2033-01-09T16:09:09.112		19.22	-29.83	117571.16	-16.53		
B (IER)	I	2033-01-09T16:36:43.548		14.73	-26.46	91984.69	-14.12		
C (IER)	I	2033-01-09T17:00:28.323	b	10.63	-23.16	74490.58	-10.02		
Saturn	I	2033-01-09T16:59:50.544		10.74	-23.26	60111.60		-19.30	-23.23
Saturn	E	2033-01-09T18:32:08.553		-6.68x	-7.99	59849.70		-32.84	-38.23
C (IER)	E	2033-01-09T18:05:14.855	b	-1.40x	-12.77	74490.58	9.90		
B (IER)	E	2033-01-09T18:29:15.755	b	-6.11x	-8.51	91984.69	13.95		
B (OER)	E	2033-01-09T18:57:12.557		-11.71x	-3.34x	117571.16	16.27		
A (IER)	E	2033-01-09T19:01:45.738		-12.64x	-2.48x	122050.38	16.51		
Encke (IEG)	E	2033-01-09T19:13:03.922		-14.94x	-0.32x	133423.31	17.00		
Encke (OEG)	E	2033-01-09T19:13:22.829		-15.01x	-0.26x	133744.89	17.01		
A (OER)	E	2033-01-09T19:16:20.325		-15.61x	0.31x	136774.40	17.12		
F ring	E	2033-01-09T19:19:54.901		-16.35x	1.00x	140461.00	17.24		

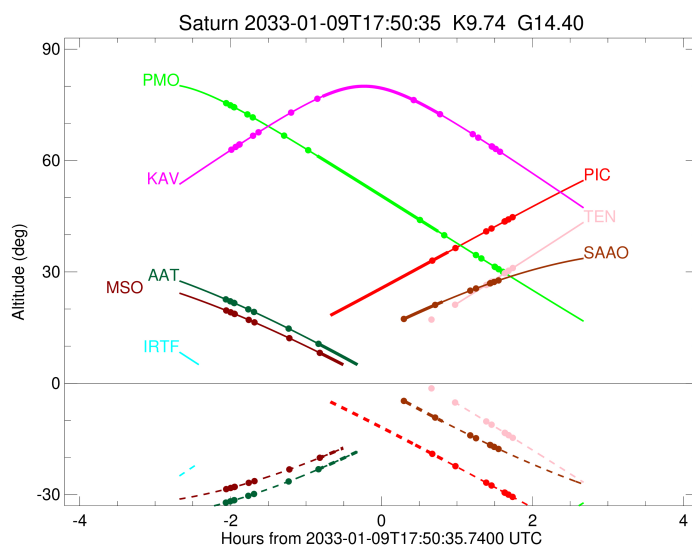
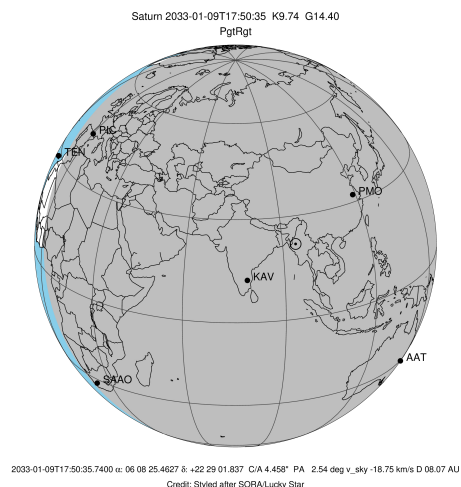
target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:54:06.670  
 Event type : PgtRgt  
 : Saturn occs: geocentric, topocentric  
 : Ring occs: geocentric, topocentric  
 Observer code : SAAO  
 Location : So. Afr. Astro. Obs. (Sutherland)  
 Latitude (deg) : -32.37953  
 E. Longitude (deg) : 20.81070  
 Altitude (km) : 1.768  
 Gaia source ID : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 52.12  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.236  
 C/A sky separation (km) : 30654.4  
 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	2033-01-09T15:54:32.448		-6.74x	21.57x	140461.00	-17.34		
A (OER)	I	2033-01-09T15:58:05.863		-6.04x	20.84x	136774.40	-17.21		
Encke (OEG)	I	2033-01-09T16:01:02.504		-5.47x	20.23x	133744.89	-17.09		
Encke (IEG)	I	2033-01-09T16:01:21.326		-5.41x	20.17x	133423.31	-17.08		
A (IER)	I	2033-01-09T16:12:37.336		-3.22x	17.86x	122050.38	-16.54		
B (OER)	I	2033-01-09T16:17:10.212		-2.35x	16.93x	117571.16	-16.28		
B (IER)	I	2033-01-09T16:45:17.683		2.96x	11.25x	91984.69	-13.73		
C (IER)	I	2033-01-09T17:10:16.505	b	7.51	6.31x	74490.58	-9.13		
Saturn	I	2033-01-09T17:08:38.516		7.22	6.63x	60105.24		-19.71	-23.70
Saturn	E	2033-01-09T18:39:08.775		21.95	-10.27	59810.35		-34.58	-40.06
C (IER)	E	2033-01-09T18:08:15.909	b	17.31	-4.73x	74490.58	9.10		
B (IER)	E	2033-01-09T18:33:13.980	b	21.10	-9.23	91984.69	13.78		
B (OER)	E	2033-01-09T19:01:11.241		24.95	-14.04	117571.16	16.41		
A (IER)	E	2033-01-09T19:05:41.871		25.53	-14.79	122050.38	16.69		
Encke (IEG)	E	2033-01-09T19:16:51.724		26.91	-16.61	133423.31	17.25		
Encke (OEG)	E	2033-01-09T19:17:10.363		26.94	-16.66	133744.89	17.26		
A (OER)	E	2033-01-09T19:20:05.256		27.29	-17.13	136774.40	17.38		
F ring	E	2033-01-09T19:23:36.490		27.70	-17.69	140461.00	17.52		

target : Saturn  
 target radius (km) : 60268.00  
 C/A epoch : 2033-01-09T17:46:12.900  
 Event type : PgtRgt  
 : Saturn 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 : 3423573411521430400  
 2Mass ID (if available) : 06082546+2229018  
 ICRS Star Coord at Epoch: 06h 08m 25.46266s +22:29:01.83703s  
 RUWE (>1.4 is poor) : 1.14  
 K magnitude : 9.745  
 G magnitude : 14.404  
 RP magnitude : 13.229  
 BP magnitude : 15.892  
 DUPflag : 0  
 Distance (au) : 8.072  
 f0 (km) : 0.000  
 g0 (km) : 0.000  
 skyplane vel. (km/s) : -18.75  
 Sun-Target sep (deg) : 162.59  
 Sun-Moon sep (deg) : 52.79  
 B (ring opening deg) : -26.43  
 PA of pole (deg) : -5.68  
 Pole direction: RA (deg): 40.60000  
 Dec (deg): 83.50000  
 C/A sky separation (") : 5.096  
 C/A sky separation (km) : 29836.1  
 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	2033-01-09T15:47:06.893		19.60	-28.52	140461.00	-17.51		
A (OER)	I	2033-01-09T15:50:38.234		19.12	-28.21	136774.40	-17.38		
Encke (OEG)	I	2033-01-09T15:53:33.177		18.72	-27.94	133744.89	-17.26		
Encke (IEG)	I	2033-01-09T15:53:51.818		18.67	-27.91	133423.31	-17.24		
A (IER)	I	2033-01-09T16:05:01.372		17.08	-26.83	122050.38	-16.70		
B (OER)	I	2033-01-09T16:09:31.592		16.42	-26.37	117571.17	-16.44		
B (IER)	I	2033-01-09T16:37:18.306		12.16	-23.21	91984.69	-13.96		
C (IER)	I	2033-01-09T17:01:30.019	b	8.19	-20.07	74490.58	-9.69		
Saturn	I	2033-01-09T17:00:11.018		8.41	-20.25	60106.87		-19.60	-23.58
Saturn	E	2033-01-09T18:32:09.877		-8.16x	-5.89	59842.32		-33.17	-38.58
C (IER)	E	2033-01-09T18:04:13.195	b	-2.91x	-10.60	74490.58	9.59		
B (IER)	E	2033-01-09T18:28:40.864	b	-7.49x	-6.49	91984.69	13.81		
B (OER)	E	2033-01-09T18:56:49.120		-12.90x	-1.54x	117571.16	16.20		
A (IER)	E	2033-01-09T19:01:23.441		-13.79x	-0.72x	122050.38	16.45		
Encke (IEG)	E	2033-01-09T19:12:43.960		-16.01x	1.35x	133423.31	16.95		
Encke (OEG)	E	2033-01-09T19:13:02.923		-16.07x	1.41x	133744.89	16.96		
A (OER)	E	2033-01-09T19:16:00.930		-16.66x	1.95x	136774.40	17.07		
F ring	E	2033-01-09T19:19:36.079		-17.36x	2.61x	140461.00	17.20		