

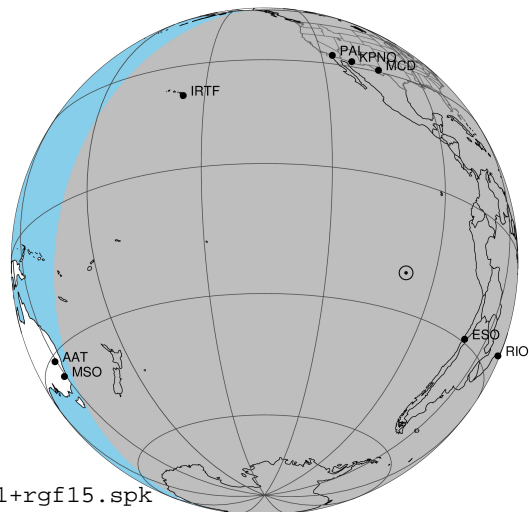
target : Jupiter  
 target radius (km) : 71492.00  
 C/A epoch : 2031-07-17T06:41:02.870  
 Event type : Pgt  
 : Jupiter occs: geocentric, topocentric  
 : Not a ringed target  
 Gaia source ID : 4114509370314680192  
 2Mass ID (if available) : 17164664-2241022

Jupiter 2031-07-17T06:41:02 K9.12 G13.12 Pgt

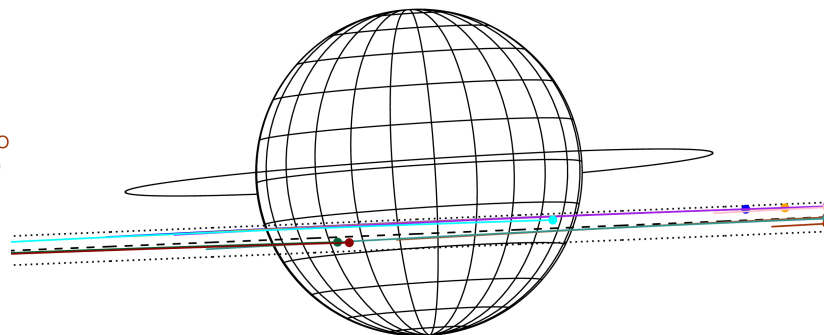
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s

RUWE (>1.4 is poor) : 1.06  
 K magnitude : 9.121  
 G magnitude : 13.120  
 RP magnitude : 12.042  
 BP magnitude : 14.328  
 DUPflag : 0  
 Distance (au) : 4.397  
 f0 (km) : 0.00  
 g0 (km) : 0.00  
 skyplane vel. (km/s) : -11.50  
 Sun-Target sep (deg) : 145.95  
 Sun-Moon sep (deg) : 170.56  
 B (ring opening deg) : -2.55  
 PA of pole (deg) : 3.81  
 Pole direction: RA (deg): 268.05689  
 Dec (deg): 64.49652  
 C/A sky separation (") : 8.417  
 C/A sky separation (km) : 26838.8  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk

Jupiter 2031-07-17T06:41:02 K9.12 G13.12  
 Pgt



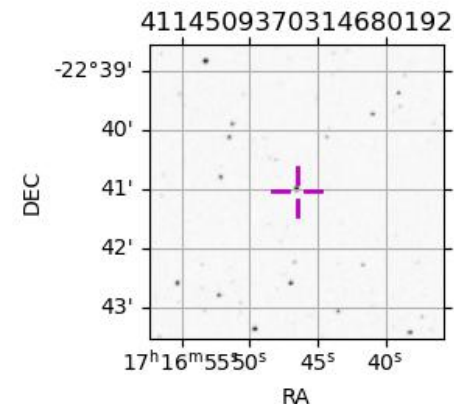
Earth  
 PAL  
 KPNO  
 MCD  
 TEN  
 IRTF  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO



2031-07-17T06:41:02.8700 a: 17 16 46.6637 δ: -22 41 02.383 C/A 8.428" PA 2.36 deg v\_sky -11.50 km/s D 04.40 AU  
 Credit: Styled after SORA/Lucky Star

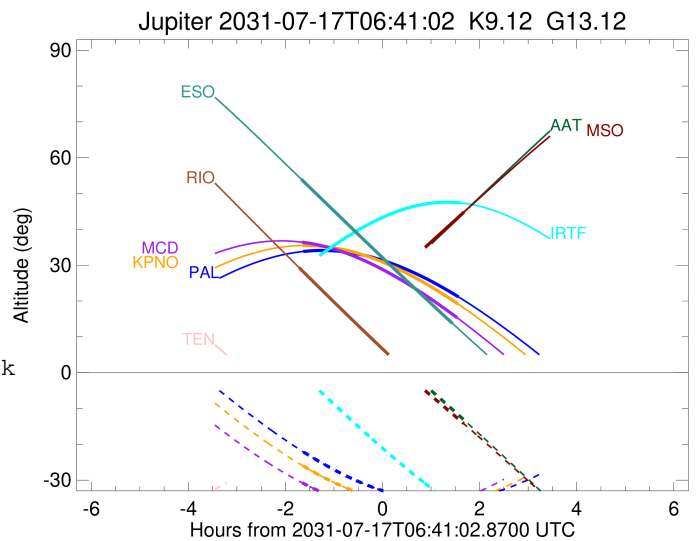
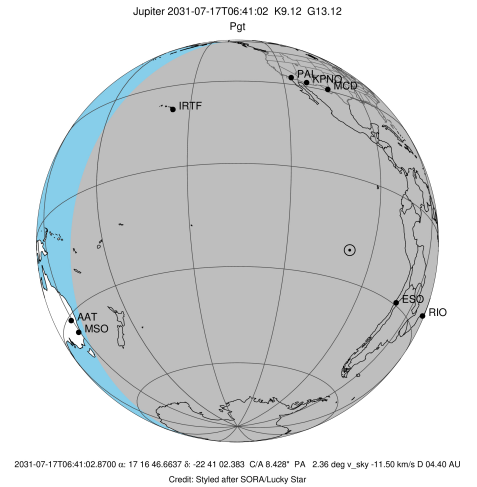
Observable events with sun below -5 deg and altitude above 5 deg

Obs	Location	lat	Elon	Target	Observed Events Interval	OCode
PIC	Pic du Midi	42.9	0.1			Pnn
PAL	Palomar Mt (200")	33.4	243.1	+ +	JUL 17 05:03 - JUL 17 08:14	Pie
PMO	Purple Mtn Obs. Nanking	32.1	118.8			Pnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+ +	JUL 17 05:02 - JUL 17 08:14	Pie
MCD	McDonald Obs. 2.7m	30.7	256.0	+ +	JUL 17 05:01 - JUL 17 08:13	Pie
TEN	Teide Obs./Tenerife	28.3	343.5			Pnn
IRTF	Mauna Kea/IRTF	19.8	204.5	+	JUL 17 08:18 - JUL 17 08:18	Pne
KAV	Kavalur Observatory	12.6	78.8			Pnn
RIO	Rio de Janeiro	-22.9	316.8	+	JUL 17 04:57 - JUL 17 04:57	Pin
ESO	European Southern Obs. (3.6m)	-29.3	289.3	+ +	JUL 17 05:00 - JUL 17 08:07	Pie
AAT	Siding Spring (AAT)	-31.3	149.1	+	JUL 17 08:22 - JUL 17 08:22	Pne
SAAO	So. Afr. Astro. Obs. (Sutherland)	-32.4	20.8			Pnn
MSO	Mt. Stromlo Observatory	-35.3	149.0	+	JUL 17 08:21 - JUL 17 08:21	Pne



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-17T06:38:50.960
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : PAL
Location             : Palomar Mt (200")
Latitude (deg)       : 33.35622
E. Longitude (deg)   : 243.13601
Altitude (km)        : 1.706
Gaia source ID       : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude          : 9.121
G magnitude          : 13.120
RP magnitude         : 12.042
BP magnitude         : 14.328
DUPflag             : 0
Distance (au)        : 4.397
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg) : 145.95
Sun-Moon sep (deg)   : 170.25
B (ring opening deg) : -2.55
PA of pole (deg)     : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation ("): 6.775
C/A sky separation (km): 21604.3
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

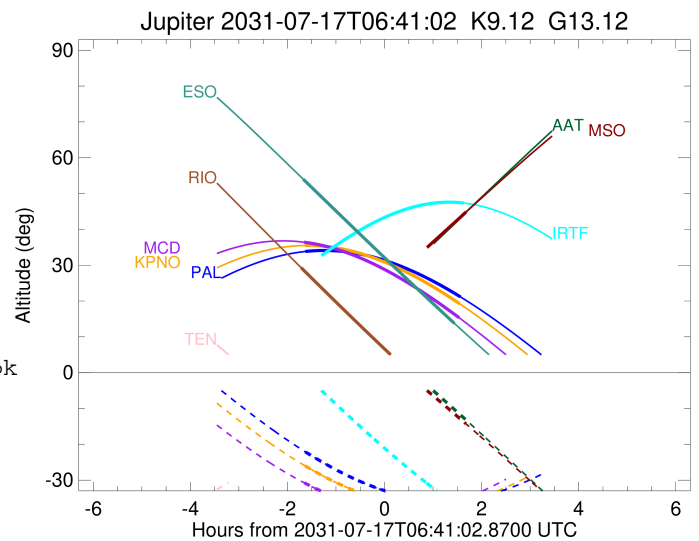
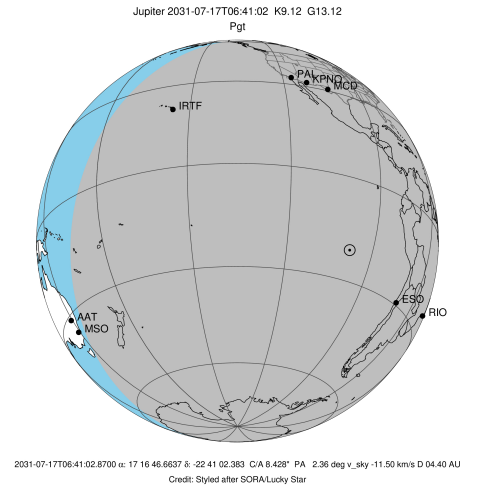


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:03:26.505	33.83	-22.13	71491.1	-19.01	-21.48
Jupiter	E	2031-07-17T08:14:47.399	21.17	-35.39	71491.3	-16.43	-18.62

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-17T06:38:06.940
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : KPNO
Location            : Kitt Peak Natl Obs
Latitude (deg)      : 31.96333
E. Longitude (deg)  : 248.40000
Altitude (km)       : 2.120
Gaia source ID      : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude         : 9.121
G magnitude         : 13.120
RP magnitude        : 12.042
BP magnitude        : 14.328
DUPflag            : 0
Distance (au)       : 4.397
f0 (km)             : 0.00
g0 (km)             : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg) : 145.95
Sun-Moon sep (deg)  : 170.19
B (ring opening deg) : -2.55
PA of pole (deg)    : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (" ) : 6.818
C/A sky separation (km) : 21740.6
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
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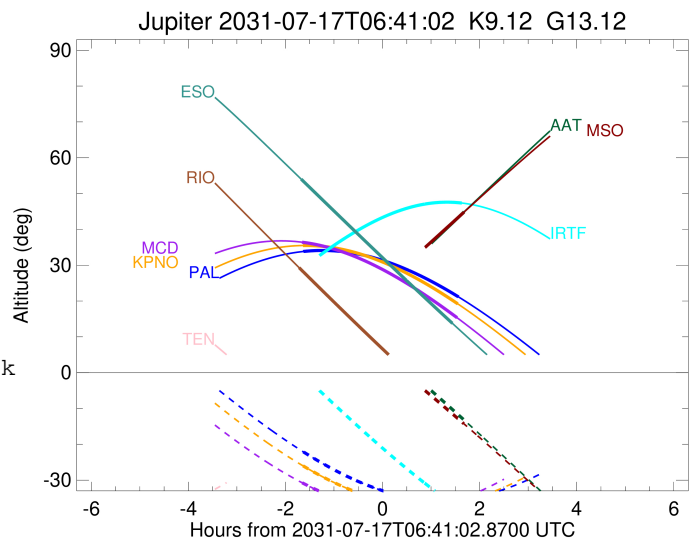
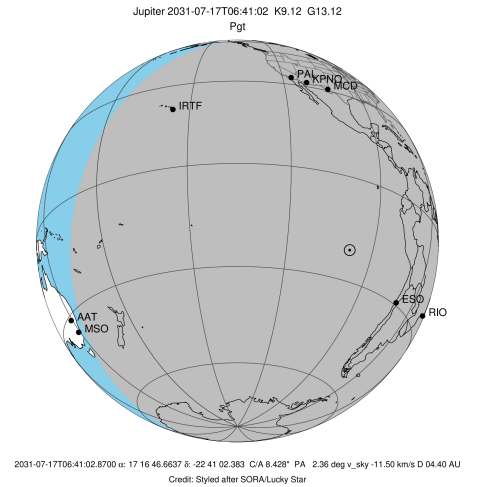


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:02:46.876	35.49	-26.00	71491.1	-19.06	-21.53
Jupiter	E	2031-07-17T08:14:06.013	19.21	-36.09	71491.3	-16.61	-18.82

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-17T06:37:06.150
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : MCD
Location              : McDonald Obs. 2.7m
Latitude (deg)        : 30.67158
E. Longitude (deg)    : 255.97844
Altitude (km)         : 2.075
Gaia source ID        : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 9.121
G magnitude           : 13.120
RP magnitude          : 12.042
BP magnitude          : 14.328
DUPflag              : 0
Distance (au)         : 4.397
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg)  : 145.95
Sun-Moon sep (deg)    : 170.10
B (ring opening deg)  : -2.55
PA of pole (deg)      : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 6.876
C/A sky separation (km) : 21924.5
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
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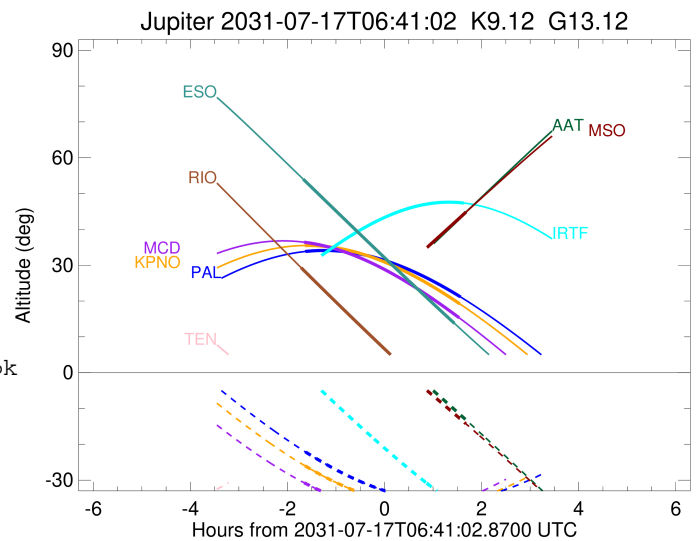
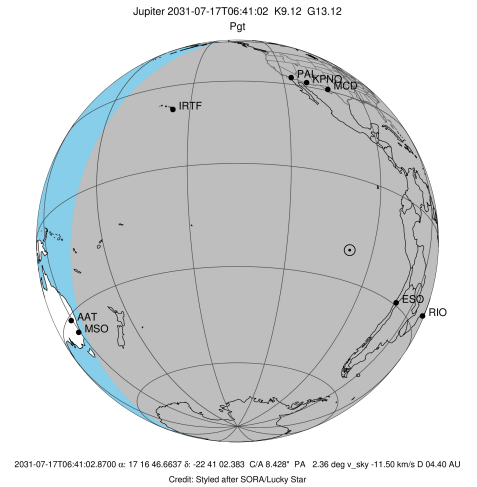


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:01:47.766	36.41	-30.74	71491.0	-19.12	-21.60
Jupiter	E	2031-07-17T08:13:13.396	15.34	-35.56	71491.3	-16.85	-19.09

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-17T06:44:19.700
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : IRTF
Location              : Mauna Kea/IRTF
Latitude (deg)        : 19.82622
E. Longitude (deg)    : 204.52800
Altitude (km)         : 4.168
Gaia source ID        : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 9.121
G magnitude           : 13.120
RP magnitude          : 12.042
BP magnitude          : 14.328
DUPflag              : 0
Distance (au)         : 4.397
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg)  : 145.95
Sun-Moon sep (deg)    : 170.81
B (ring opening deg) : -2.55
PA of pole (deg)     : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 7.132
C/A sky separation (km) : 22741.9
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
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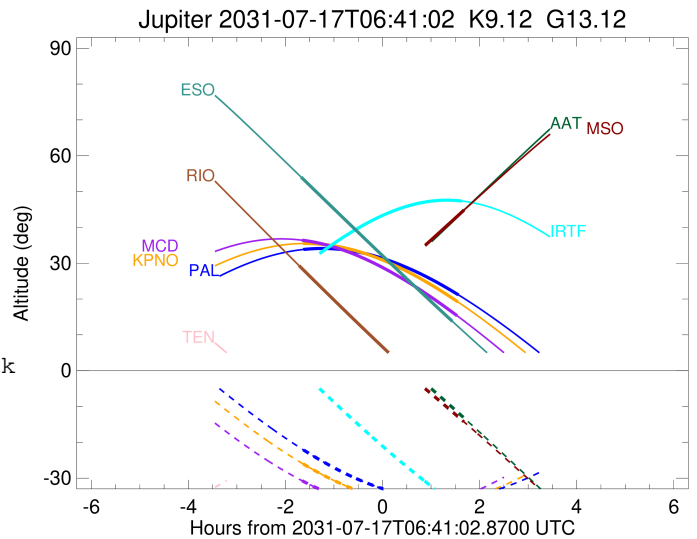
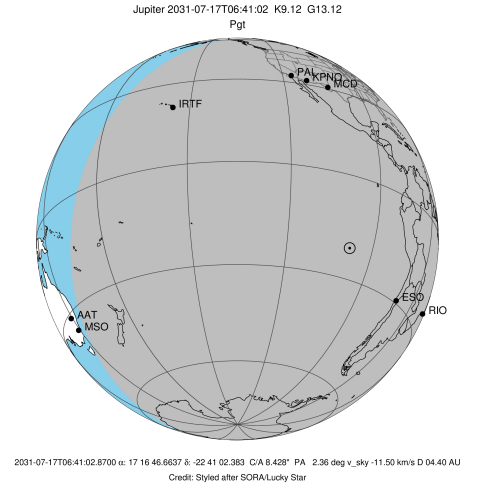


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:09:18.793	30.34	-2.01x	71490.9	-20.46	-23.08
Jupiter	E	2031-07-17T08:18:59.480	47.35	-38.34	71491.2	-16.91	-19.15

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-17T06:31:48.540
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : RIO
Location              : Rio de Janeiro
Latitude (deg)        : -22.89506
E. Longitude (deg)    : 316.77708
Altitude (km)         : 0.033
Gaia source ID        : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 9.121
G magnitude           : 13.120
RP magnitude          : 12.042
BP magnitude          : 14.328
DUPflag              : 0
Distance (au)         : 4.397
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg)  : 145.95
Sun-Moon sep (deg)    : 169.83
B (ring opening deg) : -2.55
PA of pole (deg)      : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (" ) : 9.060
C/A sky separation (km) : 28890.2
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
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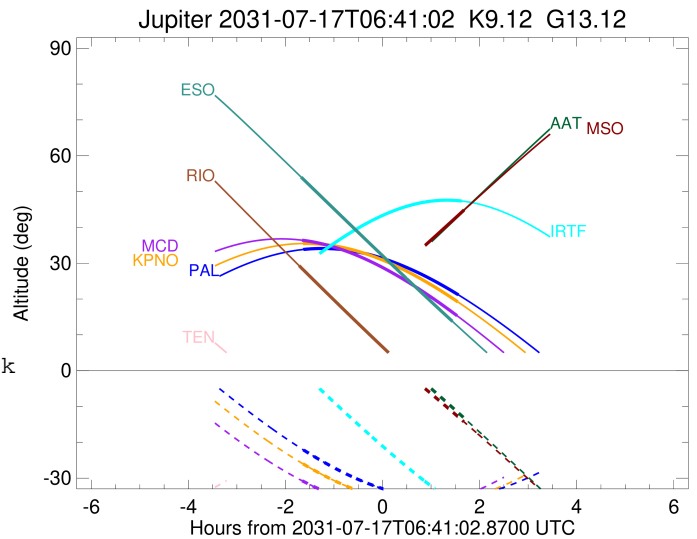
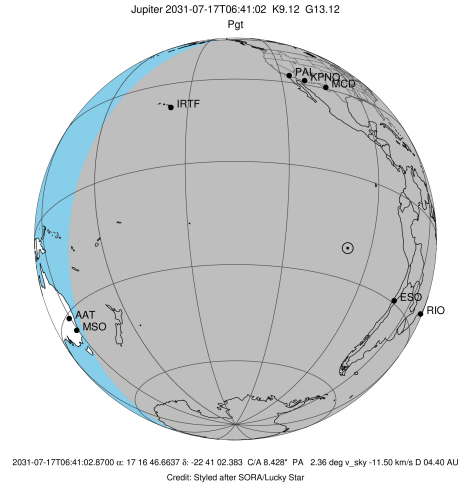


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T04:57:56.125	29.32	-62.45	71490.5	-24.48	-27.46
Jupiter	E	2031-07-17T08:07:18.116	-11.26x	-19.42	71490.6	-23.19	-26.07

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-17T06:33:18.040
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
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       : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 9.121
G magnitude           : 13.120
RP magnitude          : 12.042
BP magnitude          : 14.328
DUPflag              : 0
Distance (au)        : 4.397
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg) : 145.95
Sun-Moon sep (deg)  : 170.00
B (ring opening deg) : -2.55
PA of pole (deg)    : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation ("): 8.947
C/A sky separation (km): 28528.6
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



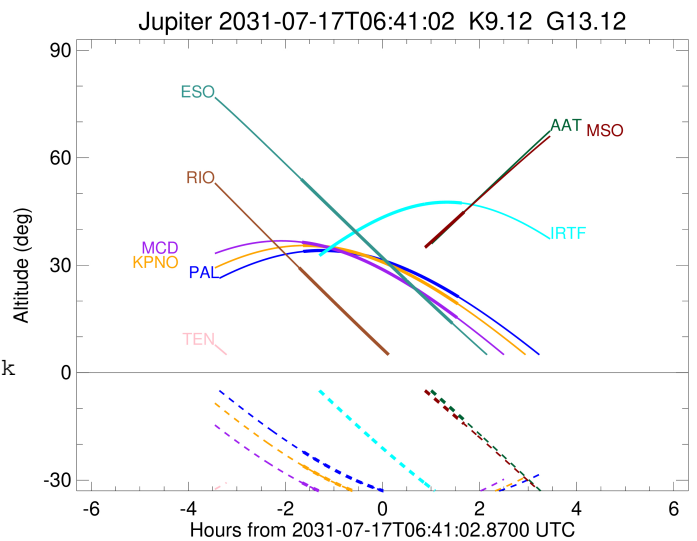
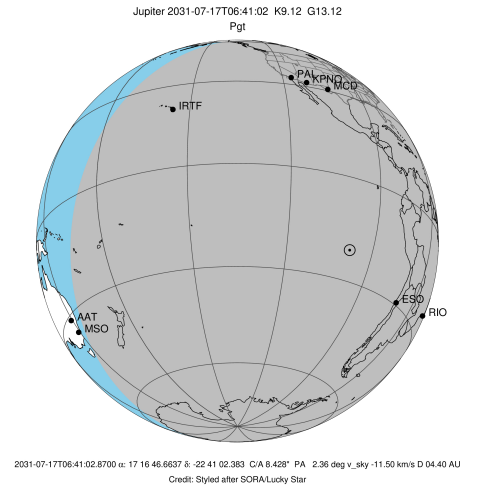
x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:00:32.703	54.01	-81.71	71490.5	-24.39	-27.37
Jupiter	E	2031-07-17T08:07:22.416	13.78	-44.77	71490.7	-22.77	-25.61



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-17T06:49:02.790
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : AAT
Location             : Siding Spring (AAT)
Latitude (deg)       : -31.27703
E. Longitude (deg)   : 149.06608
Altitude (km)        : 1.164
Gaia source ID       : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 9.121
G magnitude           : 13.120
RP magnitude         : 12.042
BP magnitude         : 14.328
DUPflag              : 0
Distance (au)        : 4.397
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg) : 145.95
Sun-Moon sep (deg)   : 171.40
B (ring opening deg) : -2.55
PA of pole (deg)     : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation ("): 9.243
C/A sky separation (km): 29474.5
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



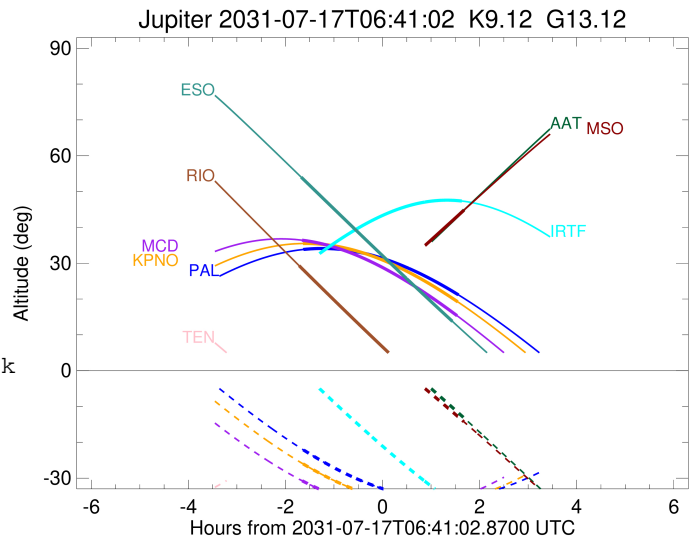
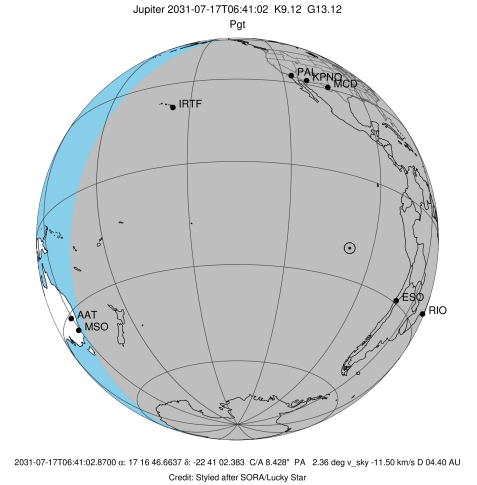
x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:14:57.747	5.91	21.39x	71490.2	-26.52	-29.67
Jupiter	E	2031-07-17T08:22:00.002	44.90	-13.23	71490.7	-22.19	-24.97



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-17T06:48:40.270
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : MSO
Location              : Mt. Stromlo Observatory
Latitude (deg)        : -35.32000
E. Longitude (deg)    : 149.00833
Altitude (km)         : 0.770
Gaia source ID        : 4114509370314680192
2Mass ID (if available) : 17164664-2241022
ICRS Star Coord at Epoch: 17h 16m 46.66373s -22:41:02.38327s
RUWE (>1.4 is poor) : 1.06
K magnitude           : 9.121
G magnitude           : 13.120
RP magnitude          : 12.042
BP magnitude          : 14.328
DUPflag              : 0
Distance (au)         : 4.397
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -11.50
Sun-Target sep (deg)  : 145.95
Sun-Moon sep (deg)    : 171.38
B (ring opening deg) : -2.55
PA of pole (deg)      : 3.81
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (" ) : 9.359
C/A sky separation (km) : 29843.0
NAIF SPICE kernels    : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-17T05:14:48.739	7.40	18.64x	71490.2	-26.81	-29.98
Jupiter	E	2031-07-17T08:21:27.584	44.74	-14.23	71490.7	-22.54	-25.36