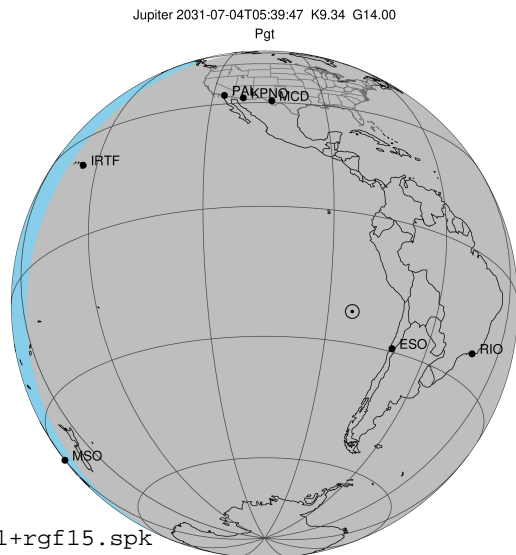


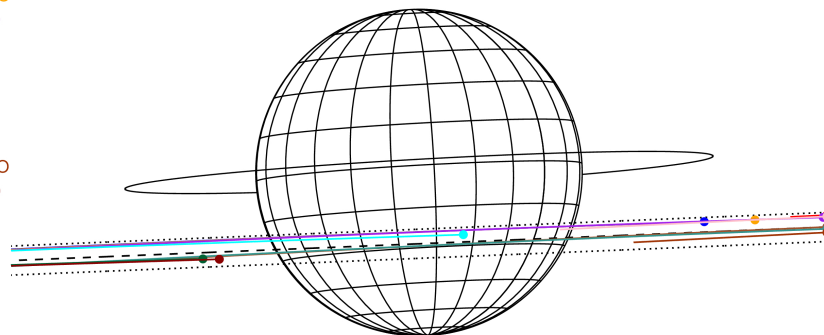
target : Jupiter  
 target radius (km) : 71492.00  
 C/A epoch : 2031-07-04T05:39:47.500  
 Event type : Pgt  
 : Jupiter occs: geocentric, topocentric  
 : Not a ringed target  
 Gaia source ID : 4114646667493526016  
 2Mass ID (if available) : 17222743-2244214

Jupiter 2031-07-04T05:39:47 K9.34 G14.00 Pgt

ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s  
 RUWE (>1.4 is poor) : 1.01  
 K magnitude : 9.336  
 G magnitude : 14.004  
 RP magnitude : 12.787  
 BP magnitude : 15.619  
 DUPflag : 0  
 Distance (au) : 4.309  
 f0 (km) : 0.00  
 g0 (km) : 0.00  
 skyplane vel. (km/s) : -14.67  
 Sun-Target sep (deg) : 159.69  
 Sun-Moon sep (deg) : 12.61  
 B (ring opening deg) : -2.57  
 PA of pole (deg) : 3.20  
 Pole direction: RA (deg): 268.05690  
 Dec (deg): 64.49651  
 C/A sky separation (") : 9.984  
 C/A sky separation (km) : 31199.5  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk  
 URKALLvl.spk  
 naif0012.tls  
 nep097.bsp  
 nep101.bsp  
 sat4401.bsp



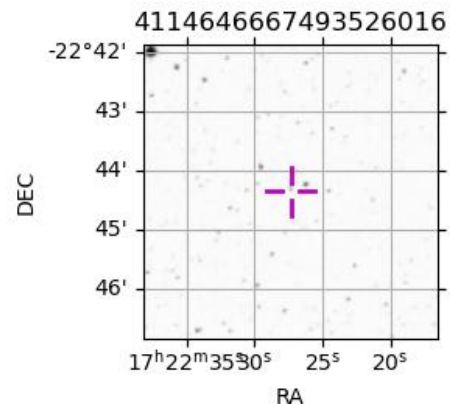
Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 IRTF  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO



2031-07-04T05:39:47.5000 a: 17 22 27.4144 δ: -22 44 21.700 C/A 9.995° PA 2.36 deg v\_sky -14.67 km/s D 04.31 AU  
 Credit: Styled after SORA/Lucky Star

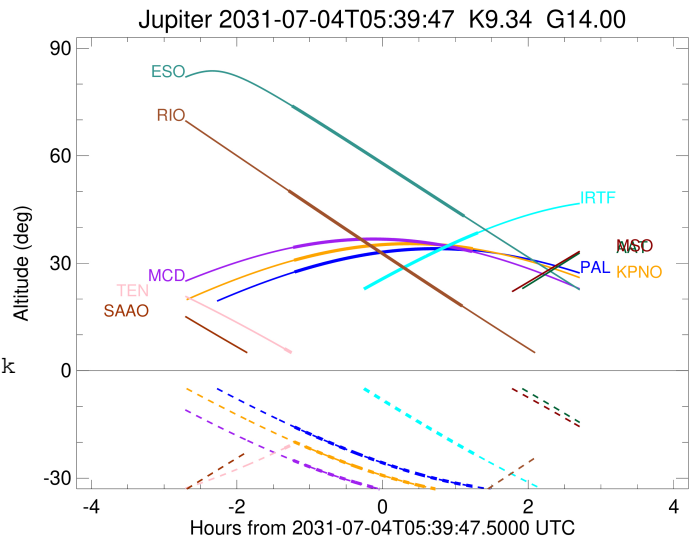
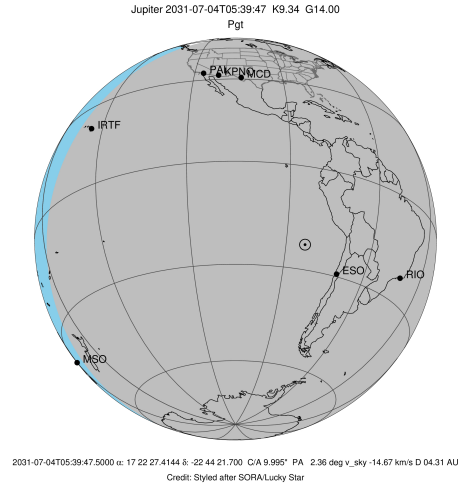
Observable events with sun below -5 deg and altitude above 5 deg

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 04 04:27	- JUL 04 06:54	Pie
PMO	Purple Mtn Obs. Nanking	32.1	118.8				Pnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+ +	JUL 04 04:26	- JUL 04 06:54	Pie
MCD	McDonald Obs. 2.7m	30.7	256.0	+ +	JUL 04 04:26	- JUL 04 06:53	Pie
TEN	Teide Obs./Tenerife	28.3	343.5	+	JUL 04 04:18	- JUL 04 04:18	Pin
IRTF	Mauna Kea/IRTF	19.8	204.5	+	JUL 04 06:58	- JUL 04 06:58	Pne
KAV	Kavalur Observatory	12.6	78.8				Pnn
RIO	Rio de Janeiro	-22.9	316.8	+ +	JUL 04 04:22	- JUL 04 06:45	Pie
ESO	European Southern Obs. (3.6m)	-29.3	289.3	+ +	JUL 04 04:25	- JUL 04 06:47	Pie
AAT	Siding Spring (AAT)	-31.3	149.1				Pnn
SAAO	So. Afr. Astro. Obs. (Sutherland)	-32.4	20.8				Pnn
MSO	Mt. Stromlo Observatory	-35.3	149.0				Pnn



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-04T05:41:12.880
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        : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 9.336
G magnitude           : 14.004
RP magnitude          : 12.787
BP magnitude          : 15.619
DUPflag              : 0
Distance (au)         : 4.309
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg)  : 159.69
Sun-Moon sep (deg)    : 12.79
B (ring opening deg) : -2.57
PA of pole (deg)      : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (" ) : 8.318
C/A sky separation (km) : 25995.3
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
    
```

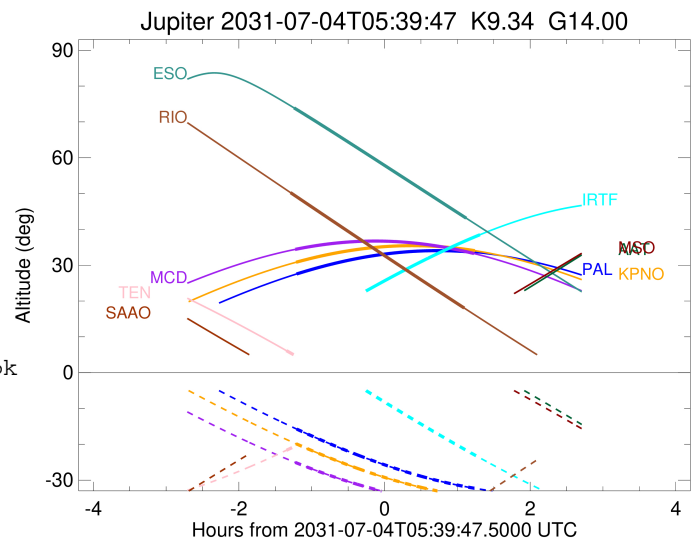
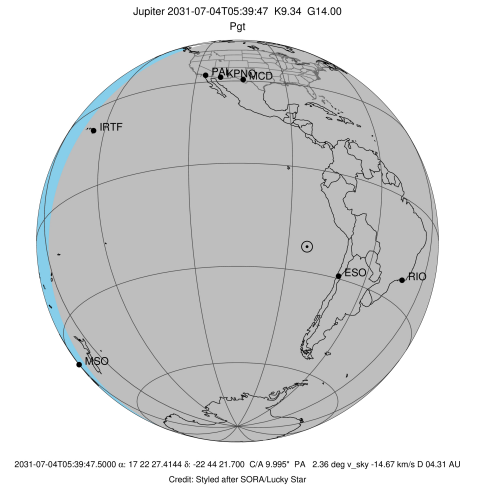


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-04T04:27:25.036	27.55	-15.74	71490.7	-22.39	-25.19
Jupiter	E	2031-07-04T06:54:55.937	33.55	-32.32	71490.9	-20.39	-23.00

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-04T05:40:39.590
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        : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 9.336
G magnitude           : 14.004
RP magnitude          : 12.787
BP magnitude          : 15.619
DUPflag              : 0
Distance (au)         : 4.309
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg)  : 159.69
Sun-Moon sep (deg)    : 12.72
B (ring opening deg) : -2.57
PA of pole (deg)      : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (") : 8.333
C/A sky separation (km) : 26039.3
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
    
```

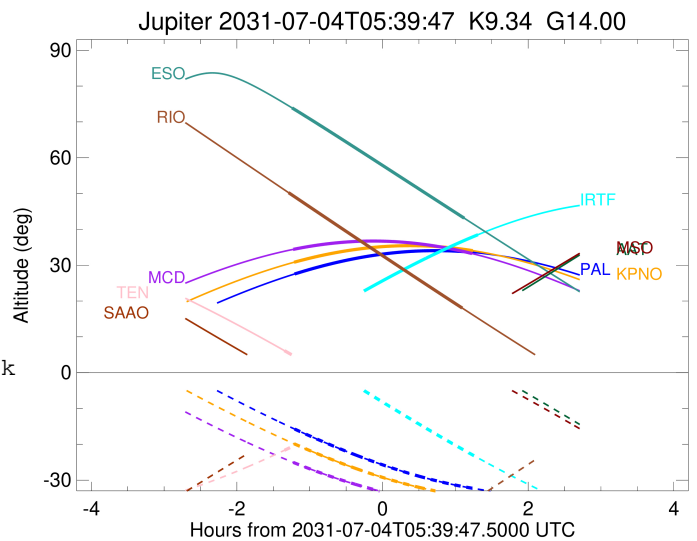
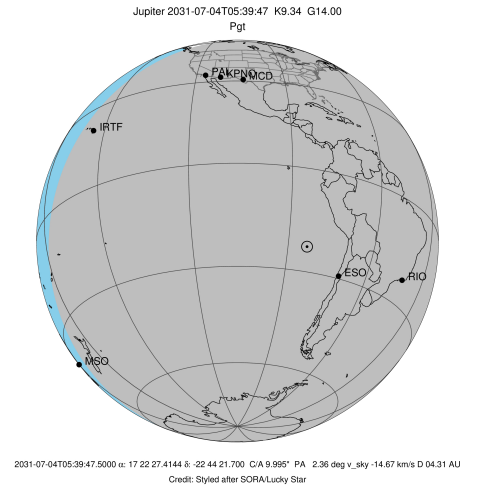


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-04T04:26:57.916	30.82	-19.85	71490.7	-22.38	-25.18
Jupiter	E	2031-07-04T06:54:19.693	34.05	-34.64	71490.9	-20.48	-23.10

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-04T05:39:49.510
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        : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 9.336
G magnitude           : 14.004
RP magnitude          : 12.787
BP magnitude          : 15.619
DUPflag              : 0
Distance (au)         : 4.309
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg)  : 159.69
Sun-Moon sep (deg)    : 12.62
B (ring opening deg)  : -2.57
PA of pole (deg)      : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (") : 8.348
C/A sky separation (km) : 26088.4
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
    
```

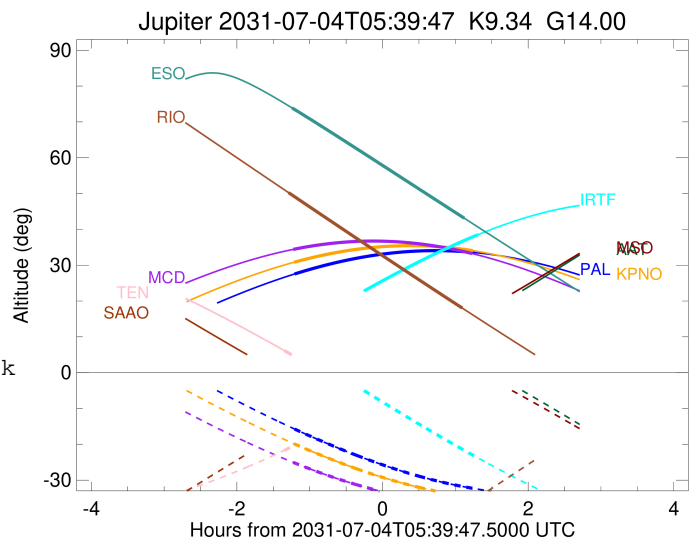
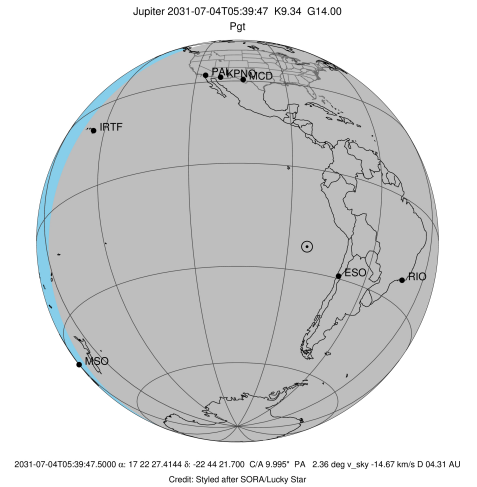


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-04T04:26:13.870	34.41	-25.04	71490.7	-22.35	-25.15
Jupiter	E	2031-07-04T06:53:28.395	33.26	-36.59	71490.9	-20.60	-23.23

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-04T05:33:11.440
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : TEN
Location             : Teide Obs./Tenerife
Latitude (deg)       : 28.30050
E. Longitude (deg)   : 343.48909
Altitude (km)        : 2.395
Gaia source ID       : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 9.336
G magnitude           : 14.004
RP magnitude          : 12.787
BP magnitude          : 15.619
DUPflag              : 0
Distance (au)         : 4.309
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg) : 159.69
Sun-Moon sep (deg)   : 11.64
B (ring opening deg) : -2.57
PA of pole (deg)     : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (") : 9.003
C/A sky separation (km) : 28133.3
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
    
```

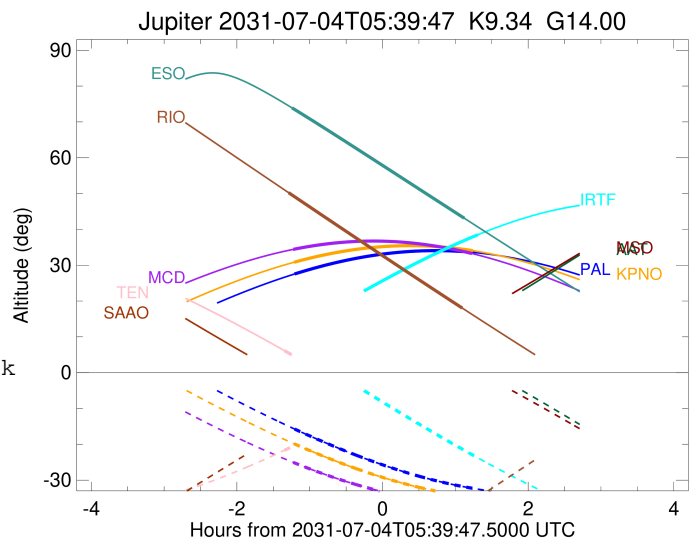
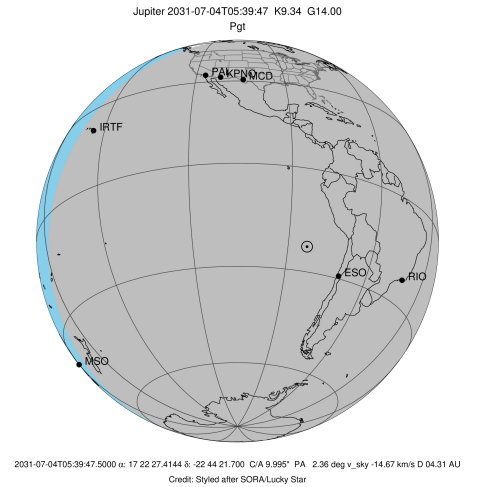


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-04T04:18:59.238	6.14	-21.66	71490.6	-23.40	-26.30
Jupiter	E	2031-07-04T06:48:07.343	-24.46x	6.00x	71490.6	-22.93	-25.78

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-04T05:45:19.070
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      : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude         : 9.336
G magnitude         : 14.004
RP magnitude        : 12.787
BP magnitude        : 15.619
DUPflag            : 0
Distance (au)       : 4.309
f0 (km)            : 0.00
g0 (km)            : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg) : 159.69
Sun-Moon sep (deg)  : 13.35
B (ring opening deg) : -2.57
PA of pole (deg)    : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (" ) : 8.909
C/A sky separation (km) : 27839.4
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
    
```

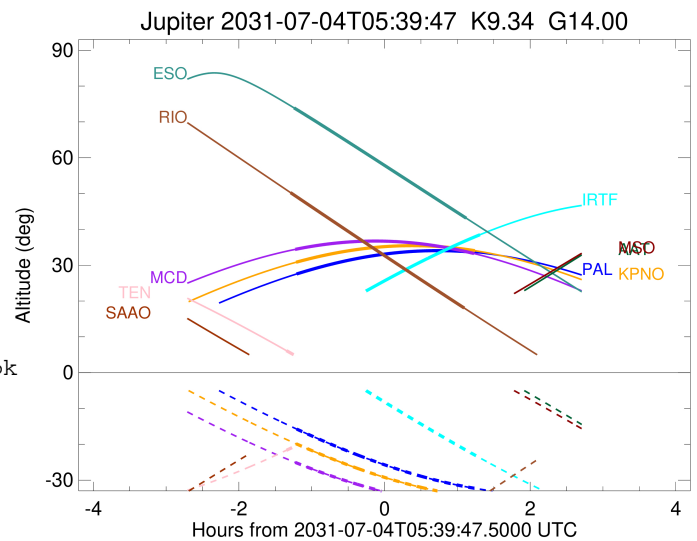
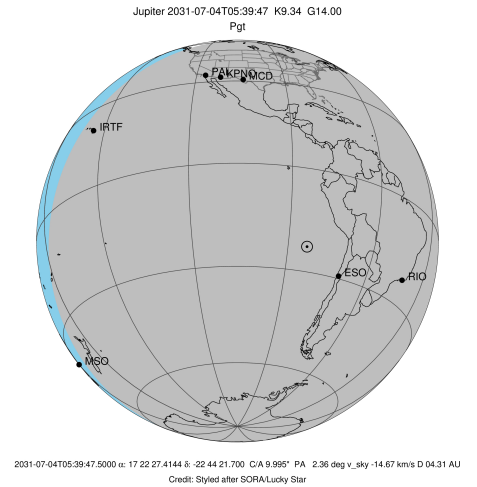


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-04T04:31:41.301	12.34	6.35x	71490.5	-24.31	-27.28
Jupiter	E	2031-07-04T06:58:27.963	38.51	-23.80	71490.8	-21.60	-24.33

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-04T05:33:33.470
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        : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 9.336
G magnitude           : 14.004
RP magnitude          : 12.787
BP magnitude          : 15.619
DUPflag              : 0
Distance (au)         : 4.309
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg)  : 159.69
Sun-Moon sep (deg)    : 11.95
B (ring opening deg) : -2.57
PA of pole (deg)      : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (") : 10.298
C/A sky separation (km) : 32180.3
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
    
```



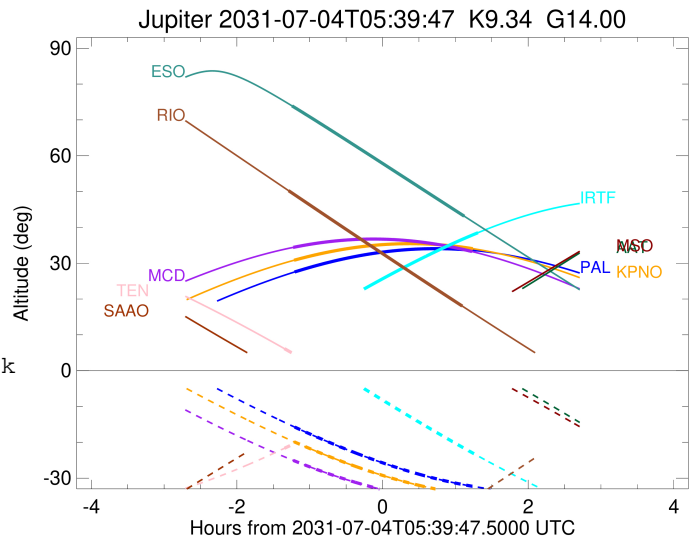
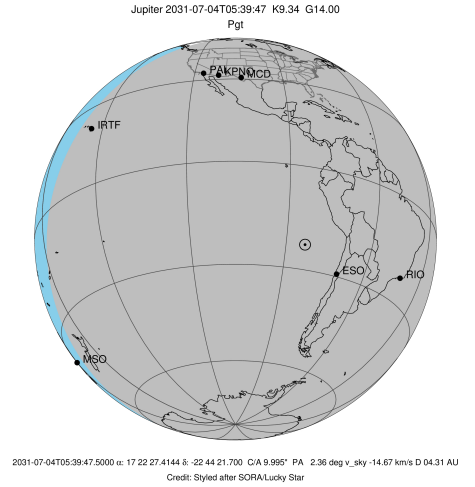
x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-04T04:22:22.219	50.25	-70.41	71490.1	-27.10	-30.29
Jupiter	E	2031-07-04T06:45:21.007	18.07	-37.80	71490.2	-26.46	-29.60



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-04T05:36:00.180
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       : 4114646667493526016
2Mass ID (if available) : 17222743-2244214
ICRS Star Coord at Epoch: 17h 22m 27.41438s -22:44:21.70043s
RUWE (>1.4 is poor) : 1.01
K magnitude           : 9.336
G magnitude           : 14.004
RP magnitude         : 12.787
BP magnitude         : 15.619
DUPflag              : 0
Distance (au)        : 4.309
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -14.67
Sun-Target sep (deg) : 159.69
Sun-Moon sep (deg)  : 12.33
B (ring opening deg) : -2.57
PA of pole (deg)    : 3.20
Pole direction: RA (deg): 268.05690
Dec (deg): 64.49651
C/A sky separation (") : 10.290
C/A sky separation (km) : 32156.8
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	2031-07-04T04:25:17.490	73.89	-82.06	71490.1	-27.34	-30.54
Jupiter	E	2031-07-04T06:47:05.025	43.13	-62.46	71490.2	-26.23	-29.35