

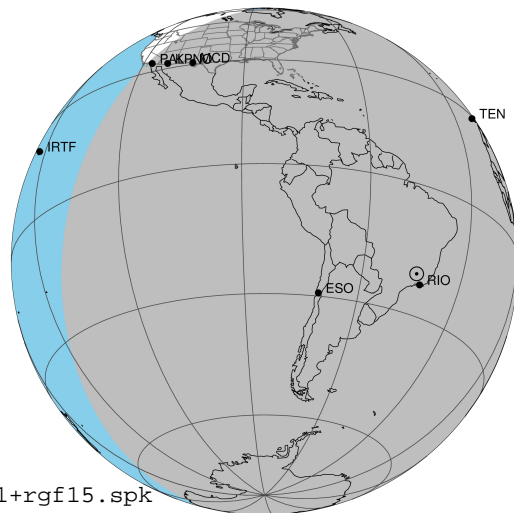
target : Jupiter
 target radius (km) : 71492.00
 C/A epoch : 2031-07-20T03:05:57.300
 Event type : Pgt
 : Jupiter occs: geocentric, topocentric
 : Not a ringed target
 Gaia source ID : 4114516895097189888
 2Mass ID (if available) : 17154516-2240200

Jupiter 2031-07-20T03:05:57 K8.66 G14.38 Pgt

ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s

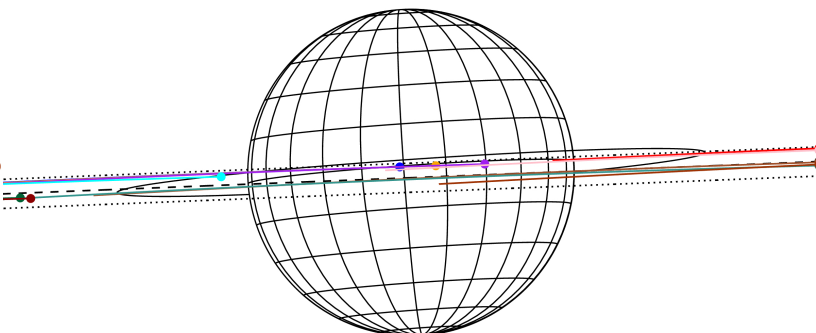
RUWE (>1.4 is poor) : 1.08
 K magnitude : 8.661
 G magnitude : 14.381
 RP magnitude : 12.956
 BP magnitude : 17.023
 DUPflag : 0
 Distance (au) : 4.421
 f0 (km) : 0.00
 g0 (km) : 0.00
 skyplane vel. (km/s) : -10.62
 Sun-Target sep (deg) : 142.99
 Sun-Moon sep (deg) : 136.71
 B (ring opening deg) : -2.54
 PA of pole (deg) : 3.92
 Pole direction: RA (deg): 268.05689
 Dec (deg): 64.49652
 C/A sky separation (") : 0.713
 C/A sky separation (km) : 2286.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk

Jupiter 2031-07-20T03:05:57 K8.66 G14.38
 Pgt



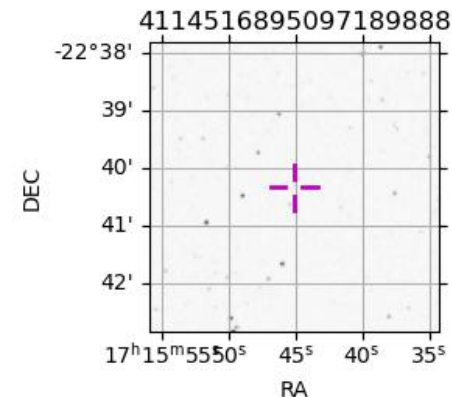
2031-07-20T03:05:57.3000 a: 17 15 45.1542 d: -22 40 20.169 C/A 0.724" PA 2.28 deg v_sky -10.62 km/s D 04.42 AU
 Credit: Styled after SORA/Lucky Star

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



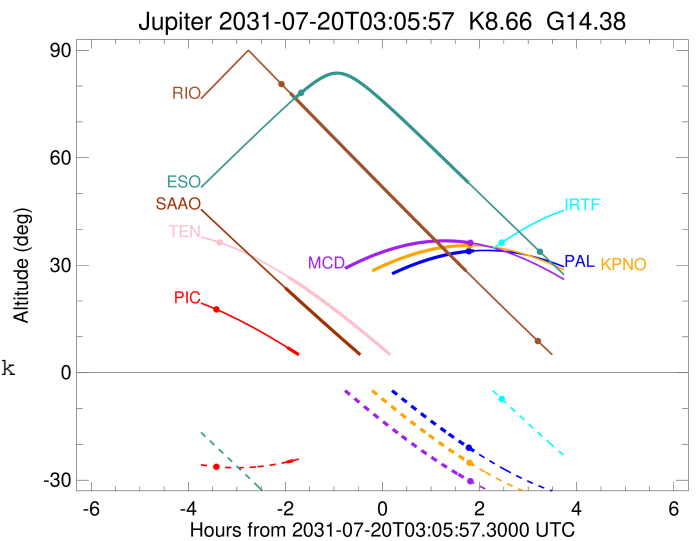
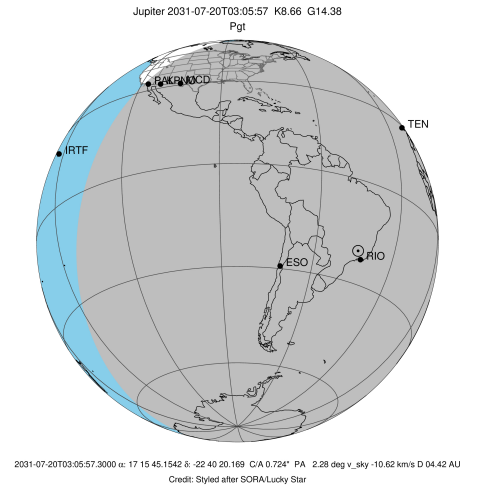
Observable events with sun below -5 deg and altitude above 5 deg

Obs	Location	lat	Elon	Target	Observed Events Interval	OCode
PIC	Pic du Midi	42.9	0.1	+	JUL 20 01:08 - JUL 20 01:08	Pin
PAL	Palomar Mt (200")	33.4	243.1	+	JUL 20 04:59 - JUL 20 04:59	Pne
PMO	Purple Mtn Obs. Nanking	32.1	118.8			Pnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+	JUL 20 04:58 - JUL 20 04:58	Pne
MCD	McDonald Obs. 2.7m	30.7	256.0	+	JUL 20 04:57 - JUL 20 04:57	Pne
TEN	Teide Obs./Tenerife	28.3	343.5	+	JUL 20 01:08 - JUL 20 01:08	Pin
IRTF	Mauna Kea/IRTF	19.8	204.5			Pnn
KAV	Kavalur Observatory	12.6	78.8			Pnn
RIO	Rio de Janeiro	-22.9	316.8	+	JUL 20 01:11 - JUL 20 04:49	Pie
ESO	European Southern Obs. (3.6m)	-29.3	289.3	+	JUL 20 01:15 - JUL 20 04:52	Pie
AAT	Siding Spring (AAT)	-31.3	149.1			Pnn
SAAO	So. Afr. Astro. Obs. (Sutherland)	-32.4	20.8	+	JUL 20 01:05 - JUL 20 01:05	Pin
MSO	Mt. Stromlo Observatory	-35.3	149.0			Pnn



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-20T02:58:56.860
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : PIC
Location             : Pic du Midi
Latitude (deg)       : 42.93656
E. Longitude (deg)   : 0.14231
Altitude (km)        : 2.890
Gaia source ID       : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude           : 8.661
G magnitude           : 14.381
RP magnitude          : 12.956
BP magnitude          : 17.023
DUPflag              : 0
Distance (au)         : 4.421
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg)  : 142.99
Sun-Moon sep (deg)   : 136.10
B (ring opening deg) : -2.54
PA of pole (deg)     : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.650
C/A sky separation (km) : 2083.4
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
    
```

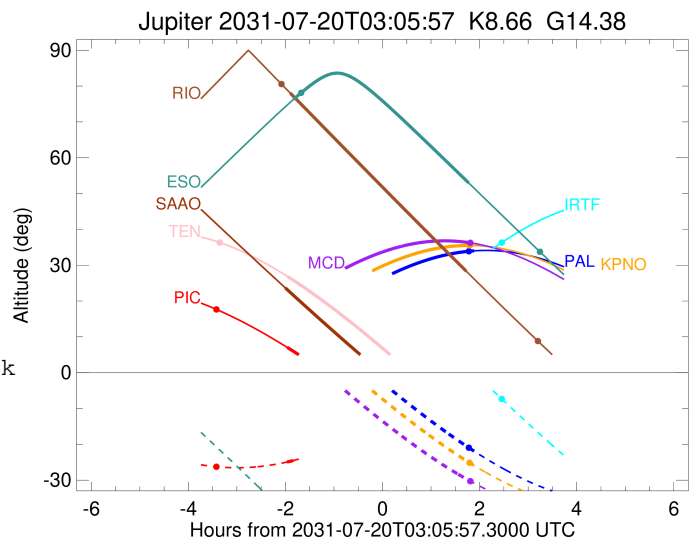
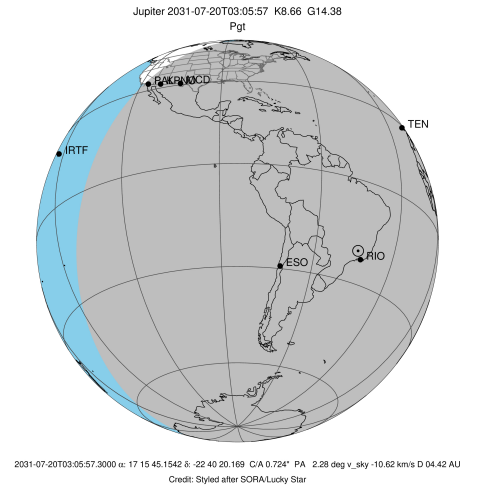


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:08:12.415	7.05	-24.93	71492.0	0.65	0.75
Jupiter	E	2031-07-20T04:51:37.411	-30.63x	1.22x	71492.0	2.60	2.98

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-20T03:10:30.480
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      : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude          : 8.661
G magnitude          : 14.381
RP magnitude         : 12.956
BP magnitude         : 17.023
DUPflag             : 0
Distance (au)       : 4.421
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg) : 142.99
Sun-Moon sep (deg)  : 137.25
B (ring opening deg) : -2.54
PA of pole (deg)    : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation ("): 0.809
C/A sky separation (km): 2594.0
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
    
```

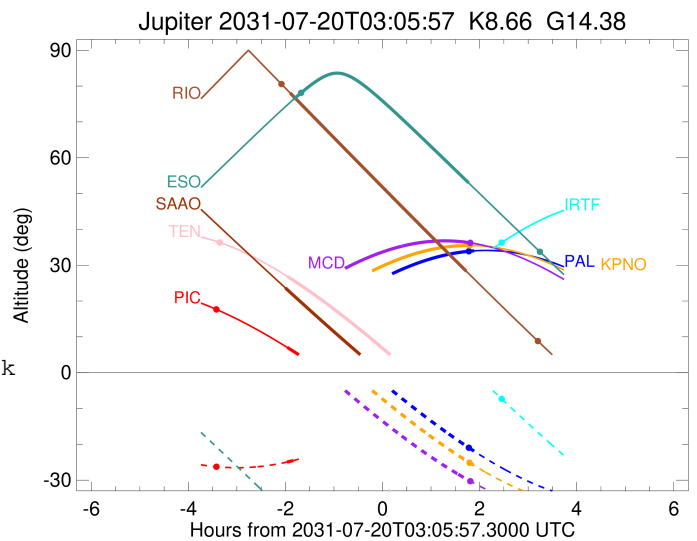
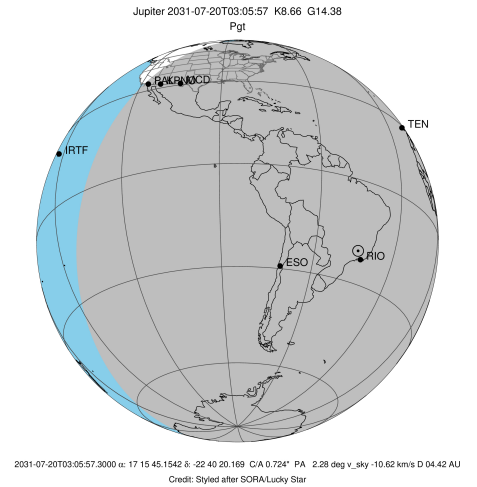


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:21:14.885	11.19	17.73x	71492.0	-0.16	-0.19
Jupiter	E	2031-07-20T04:59:02.733	34.00	-21.89	71492.0	4.02	4.60

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-20T03:09:54.700
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        : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude           : 8.661
G magnitude           : 14.381
RP magnitude          : 12.956
BP magnitude          : 17.023
DUPflag              : 0
Distance (au)         : 4.421
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg) : 142.99
Sun-Moon sep (deg)   : 137.25
B (ring opening deg) : -2.54
PA of pole (deg)     : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.812
C/A sky separation (km) : 2604.6
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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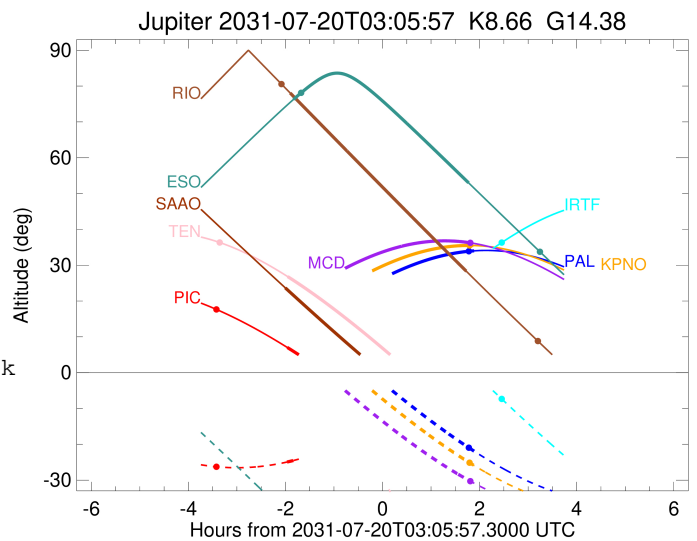
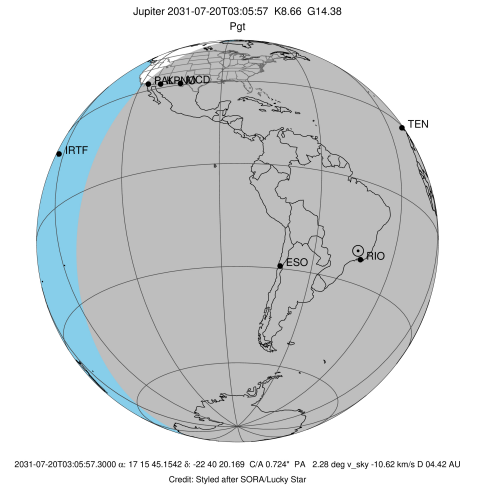


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:20:55.991	15.48	13.14x	71492.0	-0.11	-0.13
Jupiter	E	2031-07-20T04:58:17.958	35.49	-25.80	71492.0	3.97	4.53

```

target                : Jupiter
target radius (km)    : 71492.00
C/A epoch              : 2031-07-20T03:08:56.890
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        : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor)  : 1.08
K magnitude           : 8.661
G magnitude            : 14.381
RP magnitude           : 12.956
BP magnitude           : 17.023
DUPflag               : 0
Distance (au)         : 4.421
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s)  : -10.62
Sun-Target sep (deg)  : 142.99
Sun-Moon sep (deg)    : 137.22
B (ring opening deg)  : -2.54
PA of pole (deg)      : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.824
C/A sky separation (km) : 2642.2
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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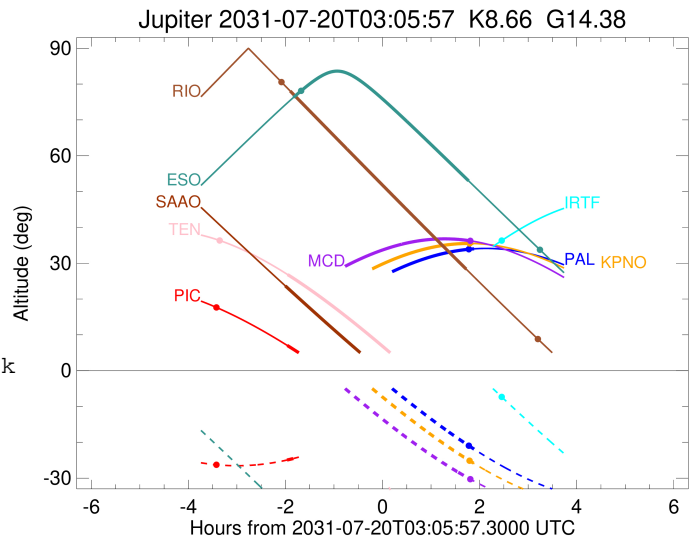
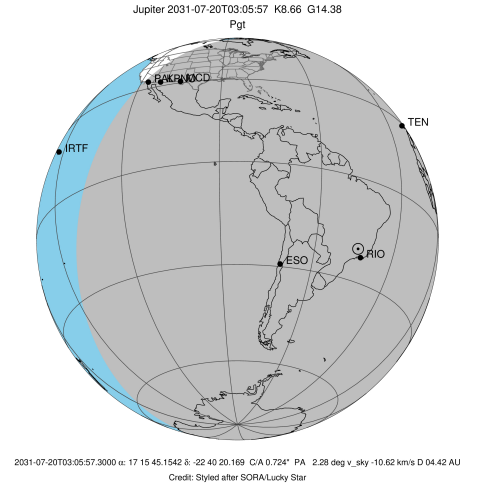


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:20:18.860	21.04	6.71x	71492.0	-0.01	-0.01
Jupiter	E	2031-07-20T04:57:11.998	36.15	-30.62	71492.0	3.90	4.46

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-20T02:58:07.040
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        : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude           : 8.661
G magnitude           : 14.381
RP magnitude          : 12.956
BP magnitude          : 17.023
DUPflag              : 0
Distance (au)         : 4.421
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg) : 142.99
Sun-Moon sep (deg)   : 136.24
B (ring opening deg) : -2.54
PA of pole (deg)     : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.481
C/A sky separation (km) : 1542.7
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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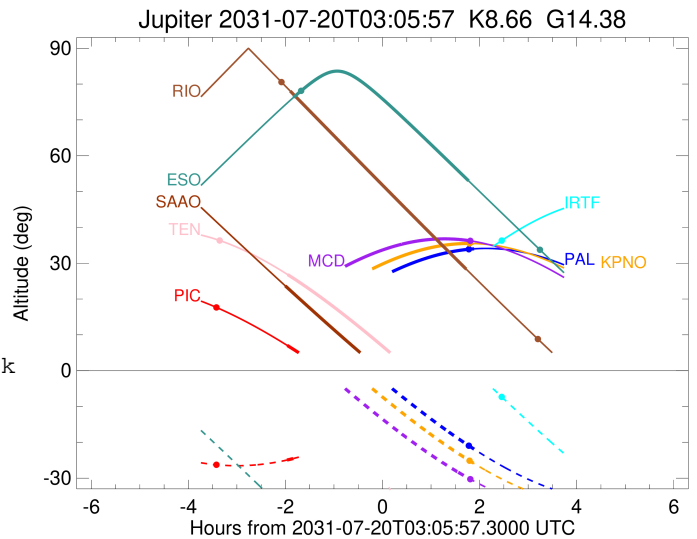
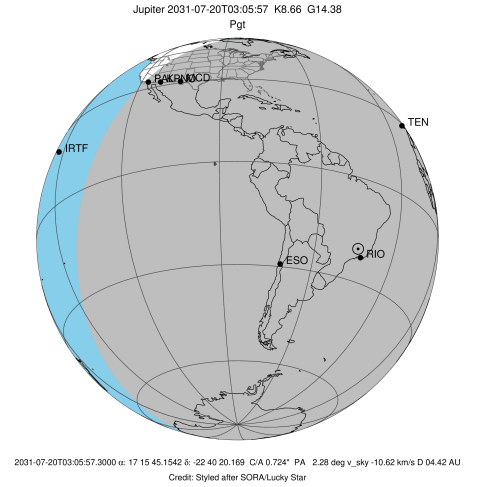


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:08:38.889	26.83	-41.14	71492.0	0.20	0.23
Jupiter	E	2031-07-20T04:49:37.718	-14.05x	-18.34	71492.0	2.06	2.36

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-20T02:59:57.220
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        : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude           : 8.661
G magnitude           : 14.381
RP magnitude          : 12.956
BP magnitude          : 17.023
DUPflag              : 0
Distance (au)         : 4.421
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg)  : 142.99
Sun-Moon sep (deg)   : 136.80
B (ring opening deg) : -2.54
PA of pole (deg)     : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.838
C/A sky separation (km) : 2687.3
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
    
```

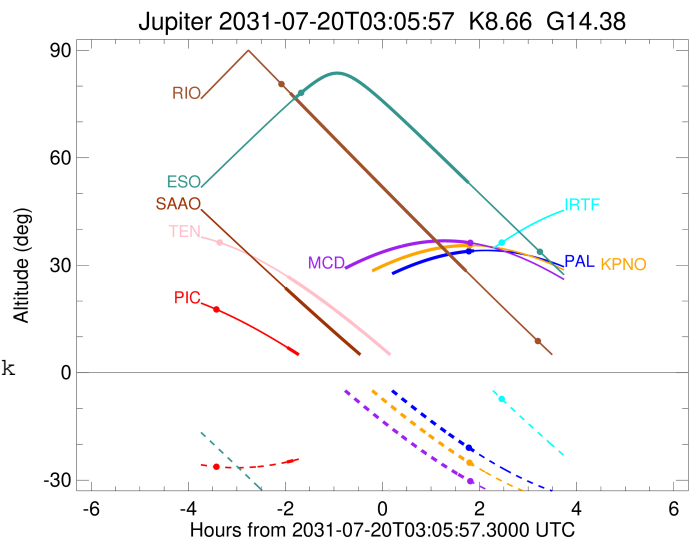
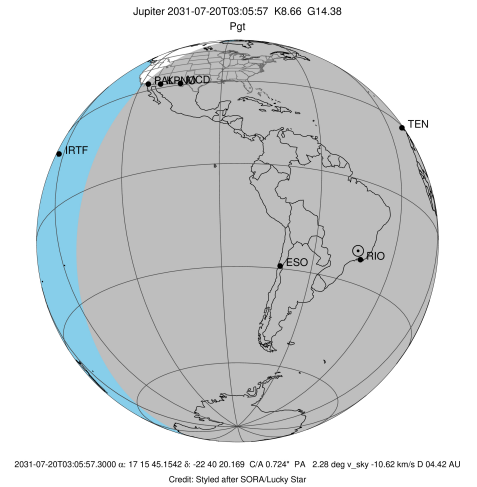


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:11:51.057	78.05	-65.01	71492.0	-3.48	-3.98
Jupiter	E	2031-07-20T04:49:32.506	28.31	-64.35	71492.0	-1.16	-1.32

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-20T03:03:51.440
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        : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude           : 8.661
G magnitude           : 14.381
RP magnitude          : 12.956
BP magnitude          : 17.023
DUPflag              : 0
Distance (au)         : 4.421
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg)  : 142.99
Sun-Moon sep (deg)   : 137.17
B (ring opening deg) : -2.54
PA of pole (deg)     : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.938
C/A sky separation (km) : 3008.6
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
    
```

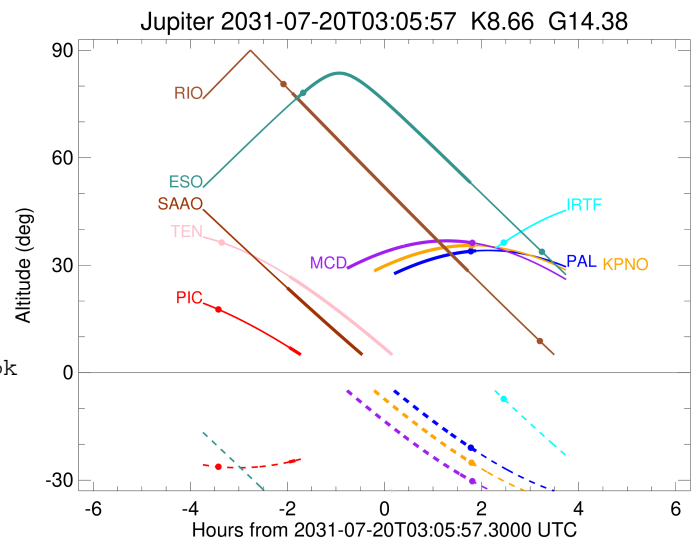
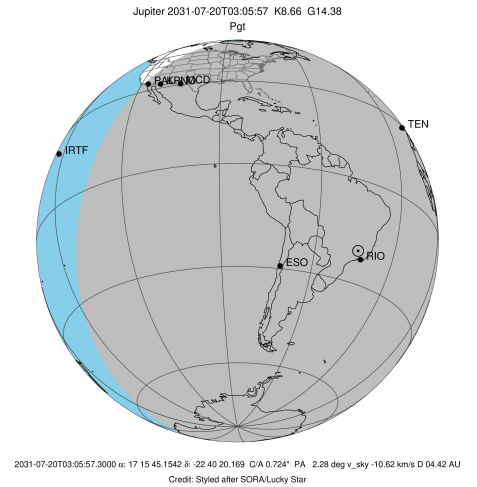


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-07-20T01:15:57.602	76.27	-41.31	71492.0	-4.13	-4.72
Jupiter	E	2031-07-20T04:52:23.103	52.98	-81.56	71492.0	-1.07	-1.22


```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-20T02:57:23.590
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
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       : 4114516895097189888
2Mass ID (if available) : 17154516-2240200
ICRS Star Coord at Epoch: 17h 15m 45.15419s -22:40:20.16944s
RUWE (>1.4 is poor) : 1.08
K magnitude          : 8.661
G magnitude          : 14.381
RP magnitude         : 12.956
BP magnitude         : 17.023
DUPflag             : 0
Distance (au)        : 4.421
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -10.62
Sun-Target sep (deg) : 142.99
Sun-Moon sep (deg)   : 136.19
B (ring opening deg) : -2.54
PA of pole (deg)     : 3.92
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 1.781
C/A sky separation (km) : 5712.3
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	2031-07-20T01:05:47.002	23.68	-56.26	71491.9	-5.41	-6.18
Jupiter	E	2031-07-20T04:51:14.803	-18.46x	-9.23	71492.0	-3.70	-4.23