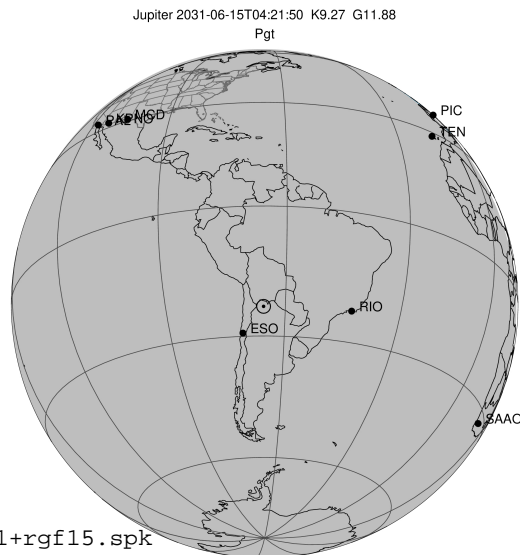


target : Jupiter
 target radius (km) : 71492.00
 C/A epoch : 2031-06-15T04:21:50.650
 Event type : Pgt
 : Jupiter occs: geocentric, topocentric
 : Not a ringed target
 Gaia source ID : 4117468735884230272
 2Mass ID (if available) : 17323636-2249114

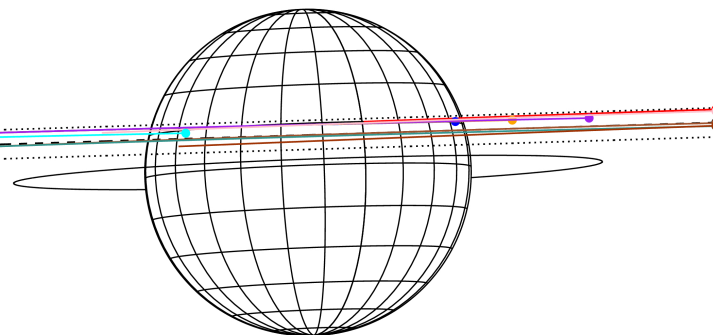
Jupiter 2031-06-15T04:21:50 K9.27 G11.88 Pgt

ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
 RUWE (>1.4 is poor) : 0.74
 K magnitude : 9.268
 G magnitude : 11.881
 RP magnitude : 11.049
 BP magnitude : 12.604
 DUPflag : 0
 Distance (au) : 4.265
 f0 (km) : 0.00
 g0 (km) : 0.00
 skyplane vel. (km/s) : -16.47
 Sun-Target sep (deg) : 179.49
 Sun-Moon sep (deg) : 126.77
 B (ring opening deg) : -2.60
 PA of pole (deg) : 2.11
 Pole direction: RA (deg): 268.05692
 Dec (deg): 64.49651
 C/A sky separation (") : 5.317
 C/A sky separation (km) : 16447.1
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 naif0012.tls
 nep097.bsp
 nep101.bsp
 sat4401.bsp



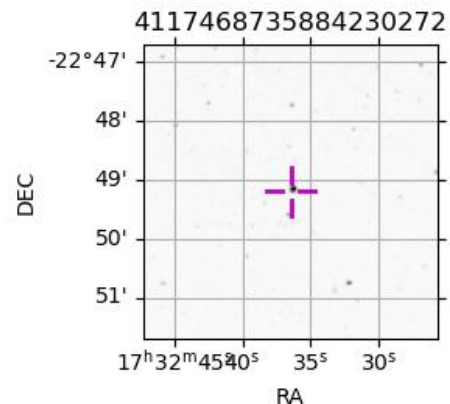
2031-06-15T04:21:50.6500 at: 17 32 36.3508 s: -22 49 12.736 C/A 5.305" PA 181.75 deg v_sky -16.47 km/s D 04.26 AU
 Credit: Styled after SORA/Lucky Star

Earth
 PIC
 PAL
 KPNO
 MCD
 TEN
 IRTF
 RIO
 ESO
 SAAO
 MSO



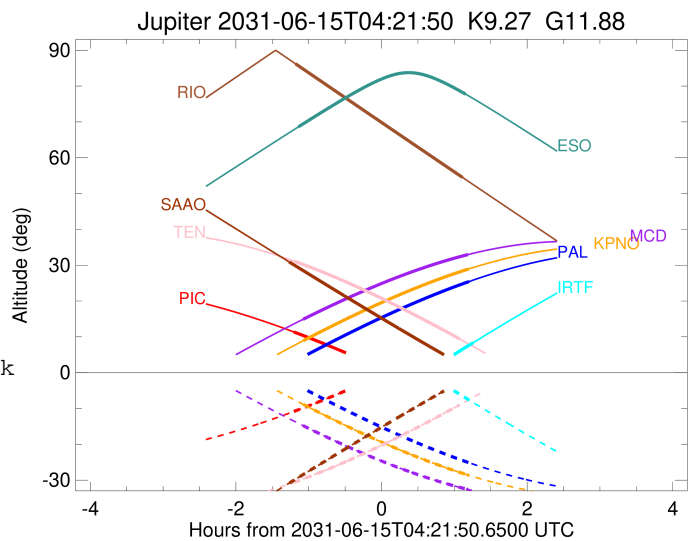
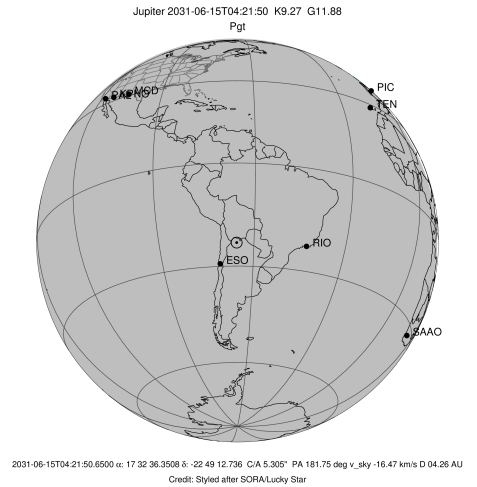
Observable events with sun below -5 deg and altitude above 5 deg

Obs	Location	lat	Elon	Target	Observed Events	Interval	OCode
PIC	Pic du Midi	42.9	0.1	+	JUN 15 03:09 - JUN 15 03:09		Pin
PAL	Palomar Mt (200")	33.4	243.1	+	JUN 15 05:34 - JUN 15 05:34		Pne
PMO	Purple Mtn Obs. Nanking	32.1	118.8				Pnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	+	JUN 15 03:17 - JUN 15 05:33		Pie
MCD	McDonald Obs. 2.7m	30.7	256.0	+	JUN 15 03:17 - JUN 15 05:33		Pie
TEN	Teide Obs./Tenerife	28.3	343.5	+	JUN 15 03:09 - JUN 15 05:26		Pie
IRTF	Mauna Kea/IRTF	19.8	204.5	+	JUN 15 05:37 - JUN 15 05:37		Pne
KAV	Kavalur Observatory	12.6	78.8				Pnn
RIO	Rio de Janeiro	-22.9	316.8	+	JUN 15 03:11 - JUN 15 05:28		Pie
ESO	European Southern Obs. (3.6m)	-29.3	289.3	+	JUN 15 03:13 - JUN 15 05:31		Pie
AAT	Siding Spring (AAT)	-31.3	149.1				Pnn
SAAO	So. Afr. Astro. Obs. (Sutherland)	-32.4	20.8	+	JUN 15 03:05 - JUN 15 03:05		Pin
MSO	Mt. Stromlo Observatory	-35.3	149.0				Pnn



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-06-15T04:17:51.790
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     : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude        : 9.268
G magnitude        : 11.881
RP magnitude       : 11.049
BP magnitude       : 12.604
DUPflag           : 0
Distance (au)     : 4.265
f0 (km)           : 0.00
g0 (km)           : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg) : 127.16
B (ring opening deg) : -2.60
PA of pole (deg)  : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (") : 6.897
C/A sky separation (km) : 21335.1
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
    
```

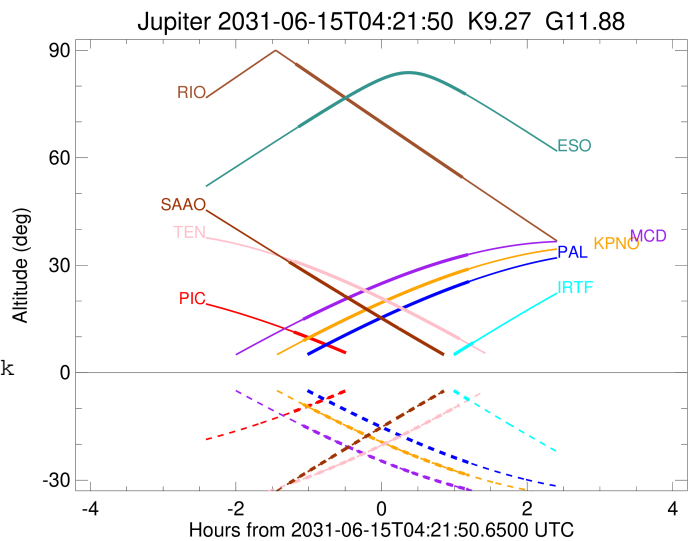
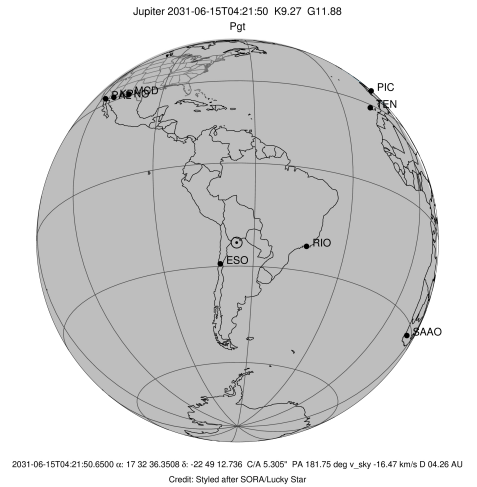


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:09:36.994	11.36	-10.83	71491.2	17.34	19.63
Jupiter	E	2031-06-15T05:26:28.647	-9.37x	9.82x	71491.2	17.28	19.56

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-06-15T04:25:59.360
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        : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude           : 9.268
G magnitude           : 11.881
RP magnitude          : 11.049
BP magnitude          : 12.604
DUPflag              : 0
Distance (au)         : 4.265
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)   : 126.61
B (ring opening deg) : -2.60
PA of pole (deg)     : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation ("): 6.743
C/A sky separation (km): 20858.7
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
    
```

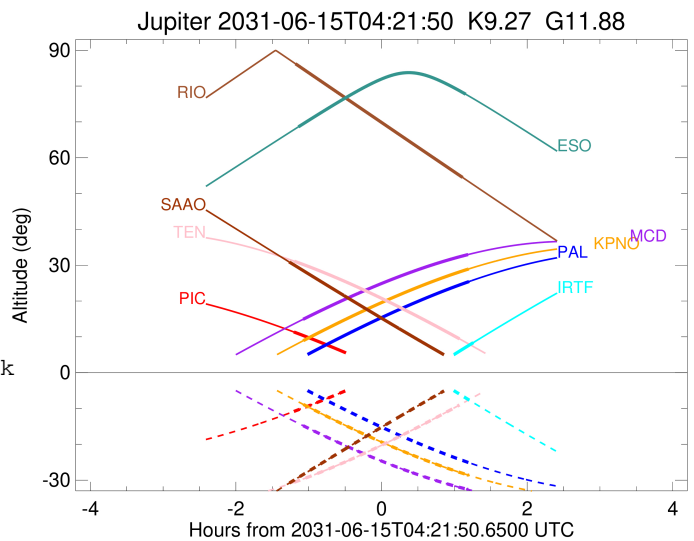
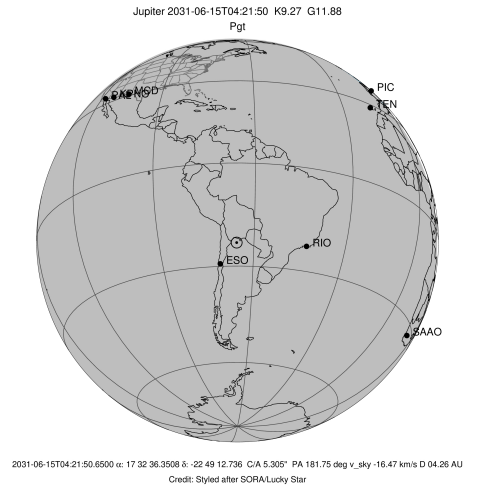


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:17:35.775	4.48x	-4.42x	71491.3	16.12	18.28
Jupiter	E	2031-06-15T05:34:01.113	25.44	-25.14	71491.1	17.68	20.01

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-06-15T04:25:43.950
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        : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude           : 9.268
G magnitude           : 11.881
RP magnitude          : 11.049
BP magnitude          : 12.604
DUPflag              : 0
Distance (au)         : 4.265
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg)  : 179.49
Sun-Moon sep (deg)   : 126.68
B (ring opening deg) : -2.60
PA of pole (deg)     : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (") : 6.760
C/A sky separation (km) : 20908.7
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
    
```

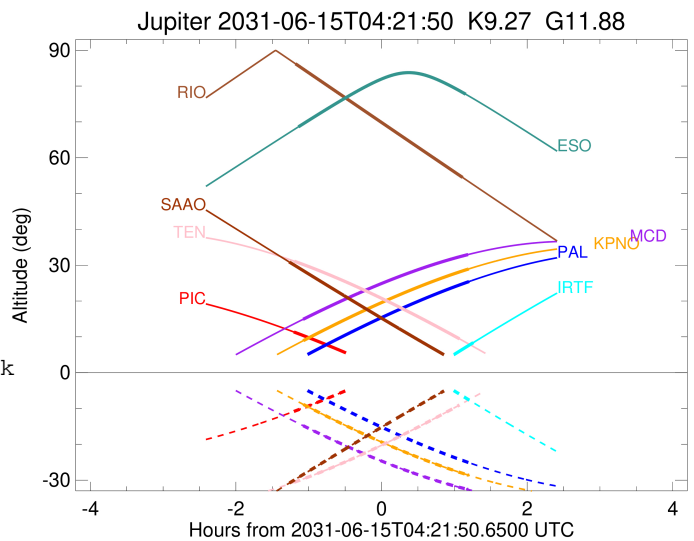
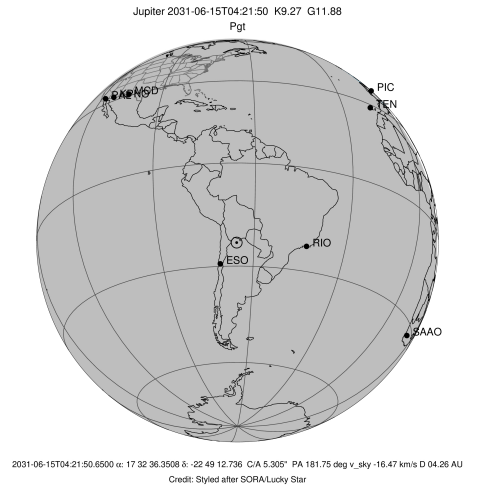


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:17:29.288	8.95	-8.87	71491.3	16.18	18.35
Jupiter	E	2031-06-15T05:33:38.256	28.94	-28.62	71491.2	17.69	20.02

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-06-15T04:25:15.920
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       : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude           : 9.268
G magnitude           : 11.881
RP magnitude          : 11.049
BP magnitude          : 12.604
DUPflag              : 0
Distance (au)         : 4.265
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)   : 126.78
B (ring opening deg) : -2.60
PA of pole (deg)     : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (") : 6.794
C/A sky separation (km) : 21014.0
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
    
```

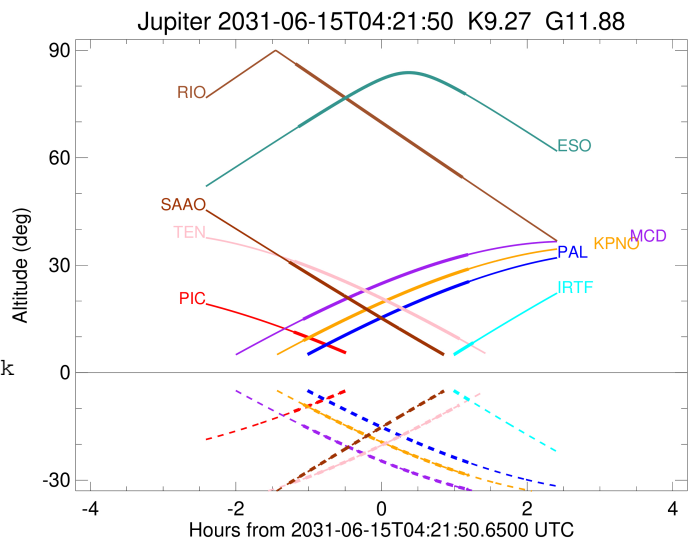
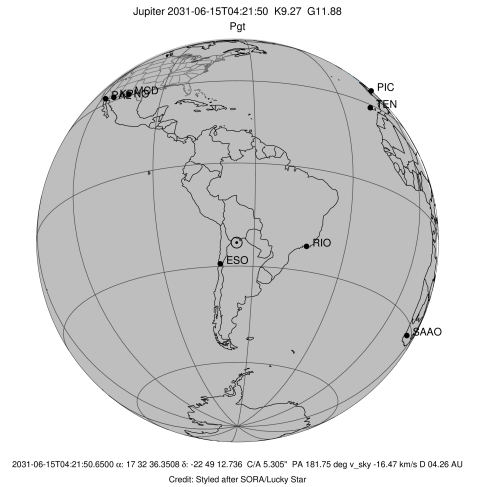


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:17:13.636	14.89	-14.79	71491.3	16.31	18.48
Jupiter	E	2031-06-15T05:33:00.446	32.95	-32.59	71491.1	17.73	20.06

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-06-15T04:17:53.930
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      : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude         : 9.268
G magnitude         : 11.881
RP magnitude        : 11.049
BP magnitude        : 12.604
DUPflag            : 0
Distance (au)       : 4.265
f0 (km)             : 0.00
g0 (km)             : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)  : 127.41
B (ring opening deg) : -2.60
PA of pole (deg)    : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (") : 6.725
C/A sky separation (km) : 20800.8
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
    
```

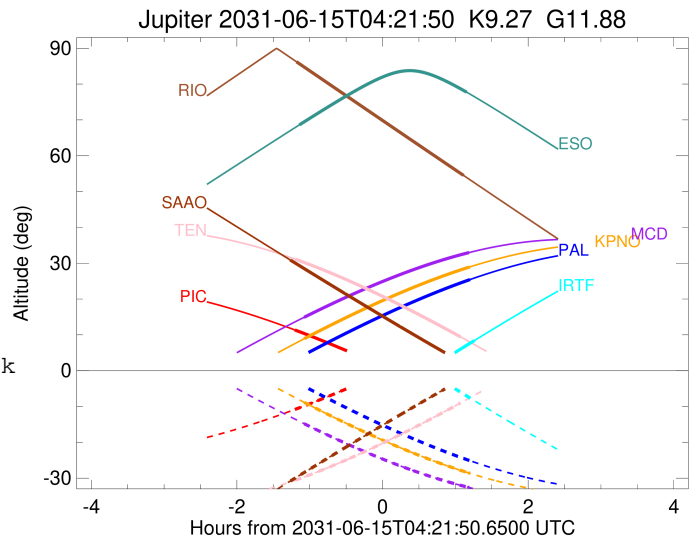
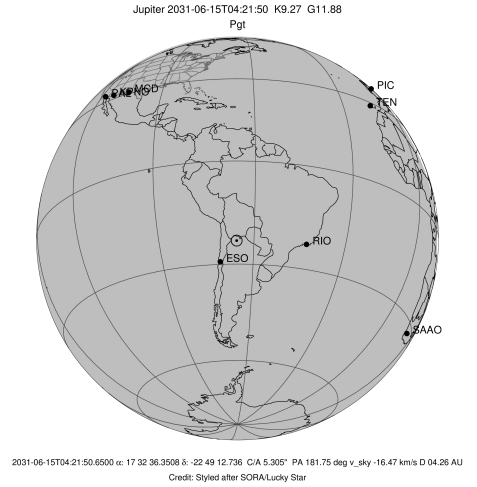


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:09:59.312	31.11	-30.57	71491.2	16.85	19.09
Jupiter	E	2031-06-15T05:26:09.818	9.43	-9.01	71491.2	16.83	19.06

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-06-15T04:27:46.940
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      : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude          : 9.268
G magnitude          : 11.881
RP magnitude         : 11.049
BP magnitude         : 12.604
DUPflag             : 0
Distance (au)       : 4.265
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)  : 126.15
B (ring opening deg) : -2.60
PA of pole (deg)    : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (") : 5.920
C/A sky separation (km) : 18311.5
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
    
```

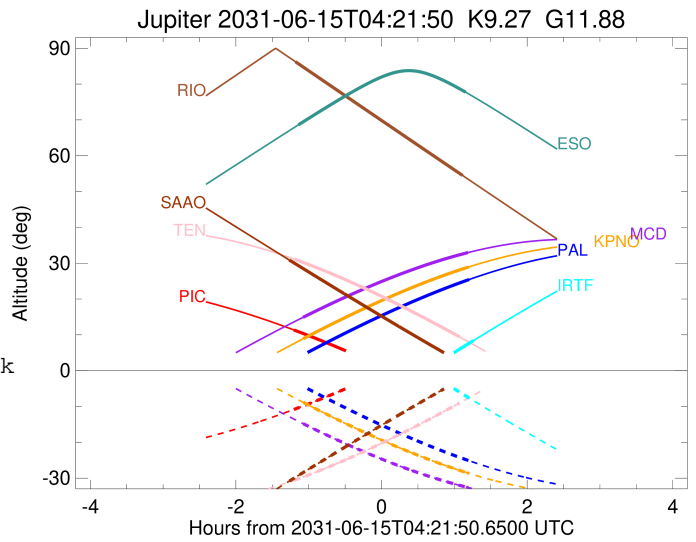
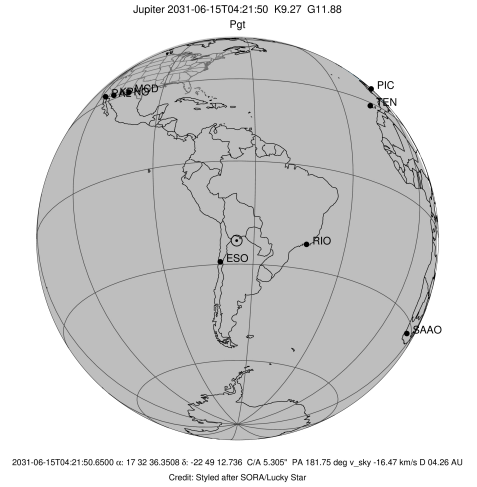


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:17:36.005	-22.15x	21.97x	71491.5	13.89	15.78
Jupiter	E	2031-06-15T05:37:24.300	8.37	-8.33	71491.3	15.77	17.88

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-06-15T04:19:43.470
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      : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude          : 9.268
G magnitude          : 11.881
RP magnitude         : 11.049
BP magnitude         : 12.604
DUPflag             : 0
Distance (au)       : 4.265
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)  : 127.65
B (ring opening deg) : -2.60
PA of pole (deg)    : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (") : 5.288
C/A sky separation (km) : 16358.1
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
    
```

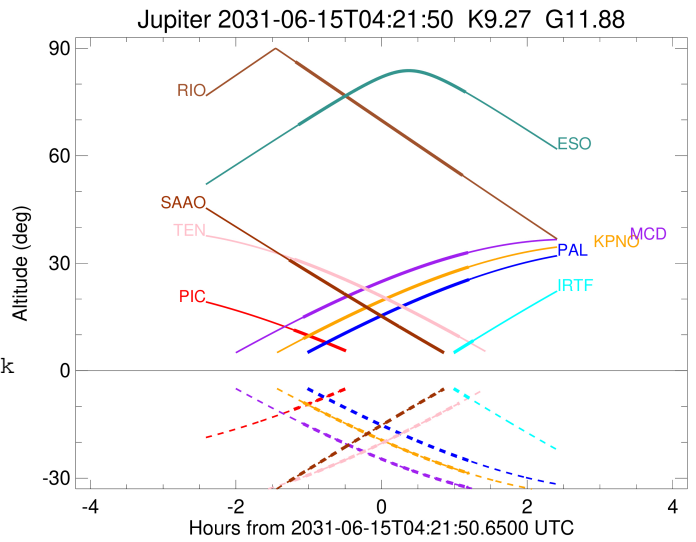
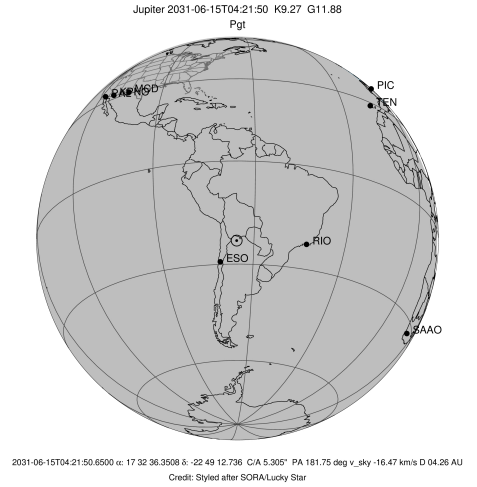


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:11:01.525	86.20	-85.89	71491.5	12.94	14.71
Jupiter	E	2031-06-15T05:28:36.317	54.50	-54.38	71491.5	13.32	15.15


```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-06-15T04:22:20.450
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      : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude          : 9.268
G magnitude          : 11.881
RP magnitude         : 11.049
BP magnitude         : 12.604
DUPflag             : 0
Distance (au)       : 4.265
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)  : 127.45
B (ring opening deg) : -2.60
PA of pole (deg)    : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation (" ) : 5.085
C/A sky separation (km) : 15727.9
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
    
```

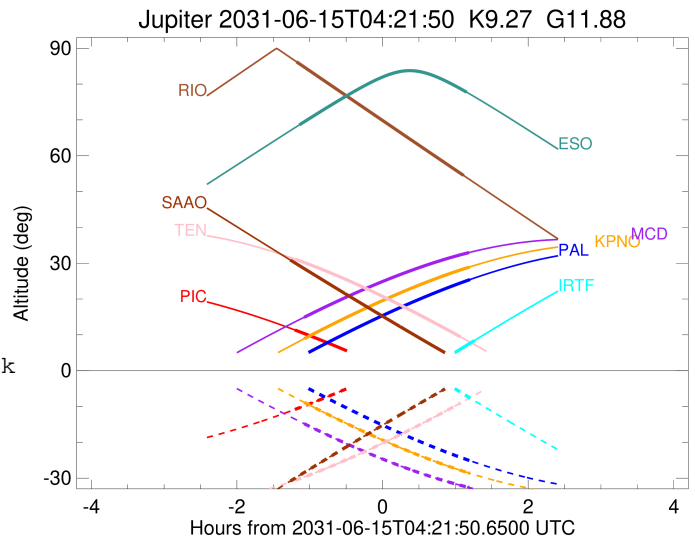
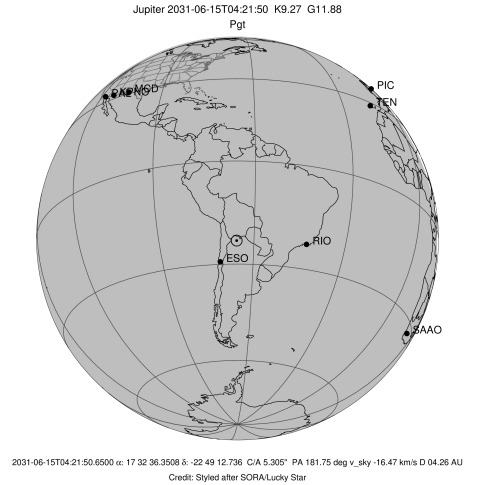


x: target alt < 5.0 deg or sun > -5.0 deg

Target	I/E	UTC	alt	alt-sun	radius	lat-geo	lat-geodetic
Jupiter	I	2031-06-15T03:13:23.646	68.61	-69.05	71491.6	12.17	13.85
Jupiter	E	2031-06-15T05:31:14.032	77.72	-77.80	71491.5	13.06	14.85

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-06-15T04:16:27.570
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       : 4117468735884230272
2Mass ID (if available) : 17323636-2249114
ICRS Star Coord at Epoch: 17h 32m 36.35075s -22:49:12.73585s
RUWE (>1.4 is poor) : 0.74
K magnitude           : 9.268
G magnitude           : 11.881
RP magnitude         : 11.049
BP magnitude         : 12.604
DUPflag              : 0
Distance (au)        : 4.265
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -16.47
Sun-Target sep (deg) : 179.49
Sun-Moon sep (deg)   : 127.43
B (ring opening deg) : -2.60
PA of pole (deg)     : 2.11
Pole direction: RA (deg): 268.05692
Dec (deg): 64.49651
C/A sky separation ("): 4.417
C/A sky separation (km): 13662.8
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	2031-06-15T03:05:53.147	30.88	-30.81	71491.7	11.15	12.69
Jupiter	E	2031-06-15T05:27:32.567	2.27x	-2.37x	71491.7	10.83	12.34