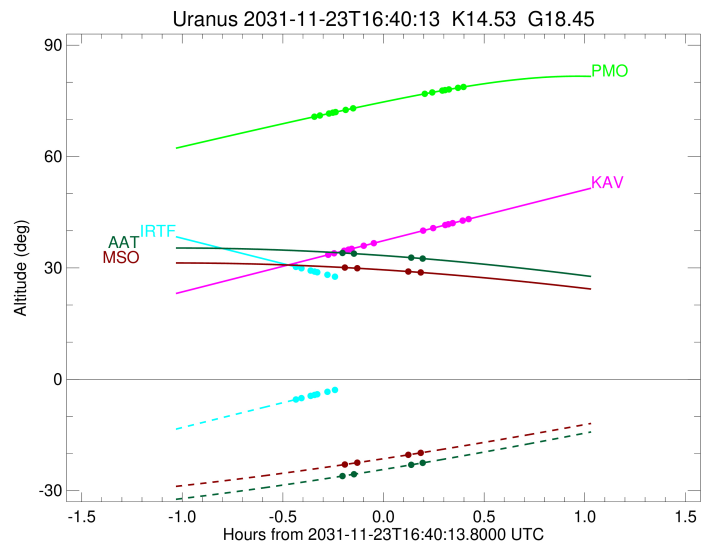
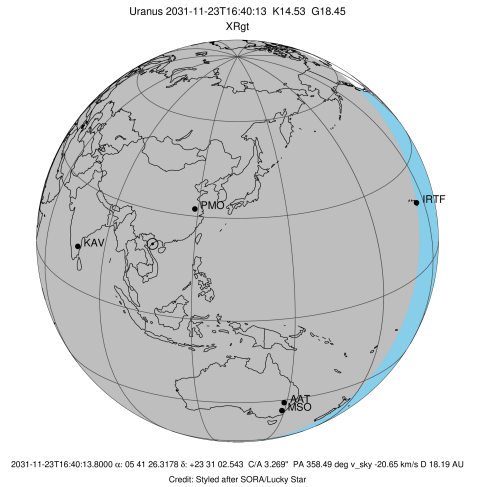


target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T16:41:12.600
 Event type : XRgt
 : No Uranus occs
 : Ring occs: geocentric, topocentric
 Observer code : PMO
 Location : Purple Mtn Obs. Nanking
 Latitude (deg) : 32.06667
 E. Longitude (deg) : 118.82089
 Altitude (km) : 0.364
 Gaia source ID : 3404366863232344064
 2Mass ID (if available) : 05412631+2331028
 ICRS Star Coord at Epoch: 05h 41m 26.31780s +23:31:02.54282s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.528
 G magnitude : 18.447
 RP magnitude : 17.335
 BP magnitude : 19.671
 DUPflag : 0
 Distance (au) : 18.192
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.65
 Sun-Target sep (deg) : 154.99
 Sun-Moon sep (deg) : 89.26
 B (ring opening deg) : 78.73
 PA of pole (deg) : 43.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.198
 C/A sky separation (km) : 42192.8
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



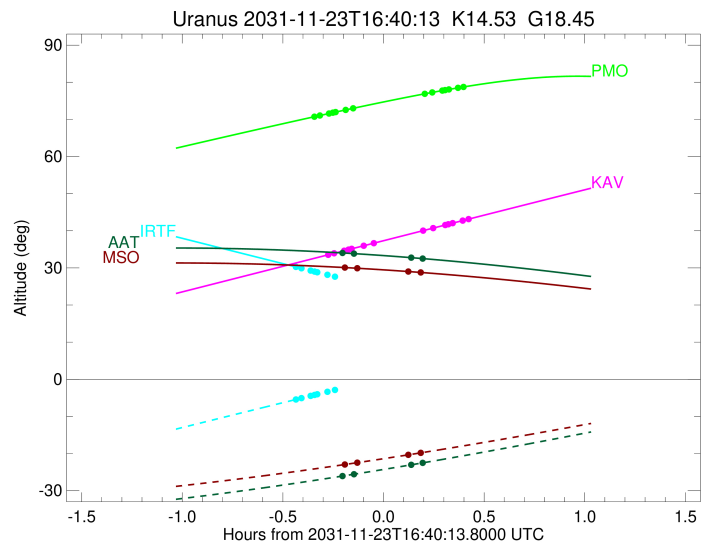
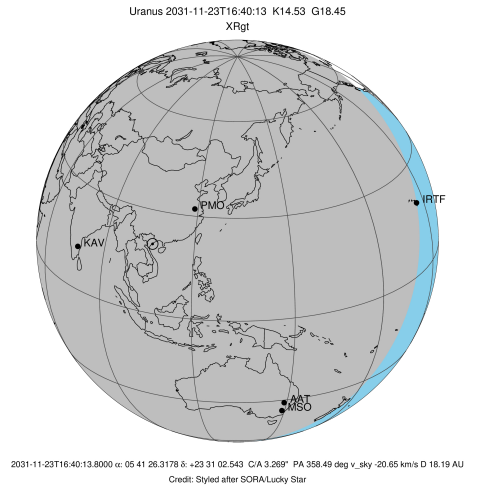
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-23T16:19:07.297		70.63	-76.90	51521.75	-11.97		
lambda	I	2031-11-23T16:21:17.068		71.05	-76.66	50026.71	-11.11		
delta	I	2031-11-23T16:24:00.600		71.59	-76.34	48300.35	-9.98		
gamma	I	2031-11-23T16:25:10.002		71.82	-76.20	47625.15	-9.47		
eta	I	2031-11-23T16:25:58.361		71.98	-76.10	47176.12	-9.10		
beta	I	2031-11-23T16:28:56.838		72.56	-75.72	45680.52	-7.64		
alpha	I	2031-11-23T16:31:08.447		72.98	-75.42	44748.89	-6.48		

No planet occultations

alpha	E	2031-11-23T16:52:35.154		76.90	-72.07	44751.99	6.48		
beta	E	2031-11-23T16:54:45.275		77.27	-71.70	45671.92	7.64		
eta	E	2031-11-23T16:57:44.740		77.76	-71.18	47176.12	9.11		
gamma	E	2031-11-23T16:58:32.663		77.89	-71.03	47621.44	9.48		
delta	E	2031-11-23T16:59:42.387		78.08	-70.83	48300.35	9.99		
lambda	E	2031-11-23T17:02:25.740		78.50	-70.34	50026.71	11.12		
epsilon	E	2031-11-23T17:04:28.025		78.80	-69.97	51434.47	11.99		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-11-23T16:35:54.830
Event type           : XRgt
: No Uranus occs
: Ring occs: geocentric, topocentric
Observer code        : IRTF
Location             : Mauna Kea/IRTF
Latitude (deg)       : 19.82622
E. Longitude (deg)   : 204.52800
Altitude (km)        : 4.168
Gaia source ID       : 3404366863232344064
2Mass ID (if available) : 05412631+2331028
ICRS Star Coord at Epoch: 05h 41m 26.31780s +23:31:02.54282s
RUWE (>1.4 is poor) : 1.01
K magnitude          : 14.528
G magnitude          : 18.447
RP magnitude         : 17.335
BP magnitude         : 19.671
DUPflag             : 0
Distance (au)        : 18.192
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -20.65
Sun-Target sep (deg) : 154.99
Sun-Moon sep (deg)   : 88.75
B (ring opening deg) : 78.73
PA of pole (deg)     : 43.72
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.198
C/A sky separation (km) : 42190.3
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural161.bsp
vgr2.ural161.bsp
peph.ural160.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
    
```

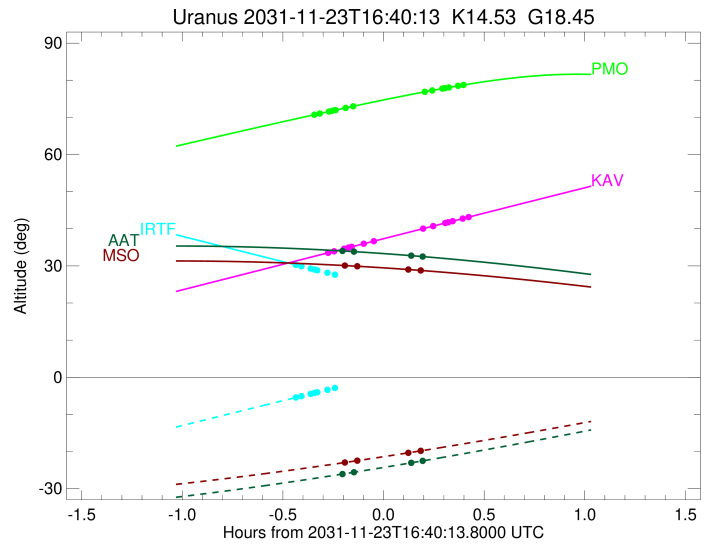
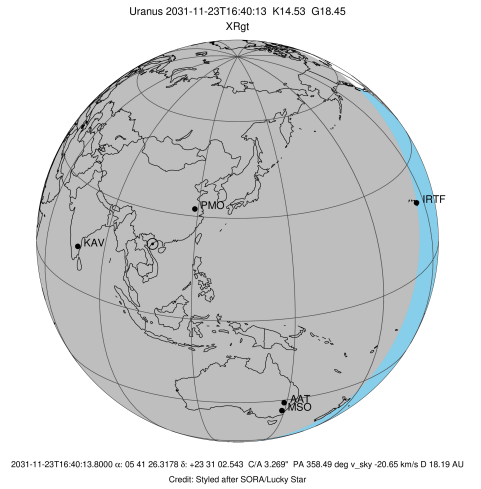


Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-23T16:13:36.229		30.39	-5.56	51523.30	-11.88		
lambda	I	2031-11-23T16:15:47.123		29.89	-5.08	50026.71	-11.02		
delta	I	2031-11-23T16:18:31.922		29.27	-4.47x	48300.35	-9.91		
gamma	I	2031-11-23T16:19:41.868		29.01	-4.21x	47625.10	-9.39		
eta	I	2031-11-23T16:20:30.598		28.82	-4.03x	47176.12	-9.03		
beta	I	2031-11-23T16:23:30.450		28.14	-3.37x	45680.47	-7.58		
alpha	I	2031-11-23T16:25:42.990		27.65	-2.89x	44749.02	-6.43		

No planet occultations

alpha	E	2031-11-23T16:47:26.541		22.75	1.87x	44751.94	6.42		
beta	E	2031-11-23T16:49:37.927		22.26	2.34x	45671.74	7.56		
eta	E	2031-11-23T16:52:39.342		21.59	3.00x	47176.12	9.01		
gamma	E	2031-11-23T16:53:27.802		21.40	3.17x	47621.42	9.37		
delta	E	2031-11-23T16:54:38.328		21.14	3.43x	48300.35	9.88		
lambda	E	2031-11-23T16:57:23.617		20.52	4.02x	50026.71	10.99		
epsilon	E	2031-11-23T16:59:27.153		20.06	4.47x	51431.55	11.84		

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T16:44:01.290
 Event type : XRgt
 : No Uranus occs
 : 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 : 3404366863232344064
 2Mass ID (if available) : 05412631+2331028
 ICRS Star Coord at Epoch: 05h 41m 26.31780s +23:31:02.54282s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.528
 G magnitude : 18.447
 RP magnitude : 17.335
 BP magnitude : 19.671
 DUPflag : 0
 Distance (au) : 18.192
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.65
 Sun-Target sep (deg) : 154.99
 Sun-Moon sep (deg) : 88.91
 B (ring opening deg) : 78.73
 PA of pole (deg) : 43.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.283
 C/A sky separation (km) : 43315.1
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ural11.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ural11.bsp
 ural161.bsp
 vgr2.ural161.bsp
 peph.ural160.bsp
 earthstns_itrfr93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 naif0012.tls
 earth_flat_IAU.spk



b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

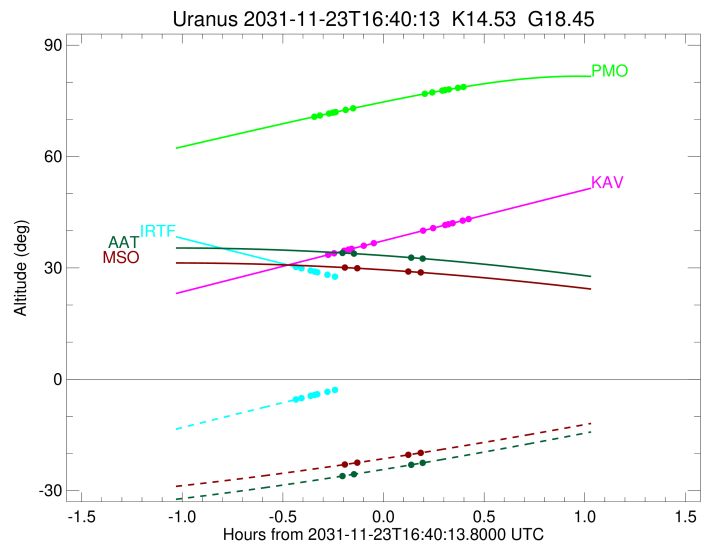
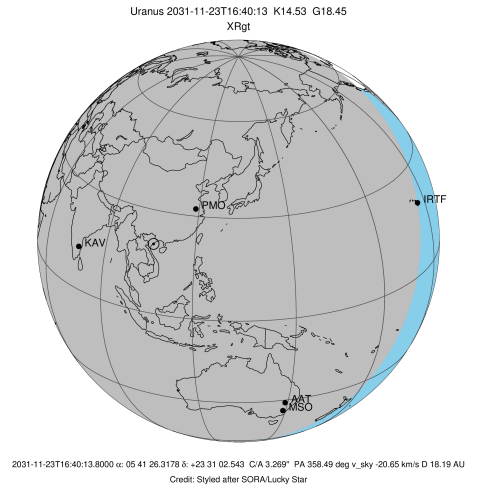
Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2031-11-23T16:23:11.562		33.41	-58.41	51527.29	-11.18		
lambda	I	2031-11-23T16:25:32.041		33.94	-58.95	50026.71	-10.22		
delta	I	2031-11-23T16:28:32.129		34.63	-59.64	48300.35	-8.93		
gamma	I	2031-11-23T16:29:50.391		34.93	-59.94	47624.88	-8.32		
eta	I	2031-11-23T16:30:45.744		35.15	-60.15	47176.12	-7.88		
beta	I	2031-11-23T16:34:19.873		35.97	-60.97	45680.09	-6.06		
alpha	I	2031-11-23T16:37:16.484		36.64	-61.65	44750.17	-4.43		

No planet occultations

alpha	E	2031-11-23T16:52:06.937		40.05	-65.04	44752.38	4.44		
beta	E	2031-11-23T16:55:01.878		40.72	-65.70	45673.27	6.07		
eta	E	2031-11-23T16:58:36.707		41.54	-66.50	47176.12	7.90		
gamma	E	2031-11-23T16:59:31.534		41.75	-66.71	47621.59	8.35		
delta	E	2031-11-23T17:00:49.988		42.05	-67.00	48300.35	8.95		
lambda	E	2031-11-23T17:03:49.548		42.74	-67.67	50026.71	10.25		
epsilon	E	2031-11-23T17:06:02.384		43.24	-68.17	51447.37	11.22		

```

target                : Uranus
target radius (km)   : 25559.00
C/A epoch            : 2031-11-23T16:39:12.660
Event type           : XRgt
: No Uranus occs
: 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       : 3404366863232344064
2Mass ID (if available) : 05412631+2331028
ICRS Star Coord at Epoch: 05h 41m 26.31780s +23:31:02.54282s
RUWE (>1.4 is poor) : 1.01
K magnitude          : 14.528
G magnitude          : 18.447
RP magnitude         : 17.335
BP magnitude         : 19.671
DUPflag             : 0
Distance (au)        : 18.192
f0 (km)              : 0.000
g0 (km)              : 0.000
skyplane vel. (km/s) : -20.65
Sun-Target sep (deg) : 154.99
Sun-Moon sep (deg)   : 88.87
B (ring opening deg) : 78.73
PA of pole (deg)     : 43.72
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 3.666
C/A sky separation (km) : 48367.0
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLvl1.spk
urall1.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.urall1.bsp
ural61.bsp
vgr2.ural61.bsp
peph.ural60.bsp
earthstns_itr93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
  
```



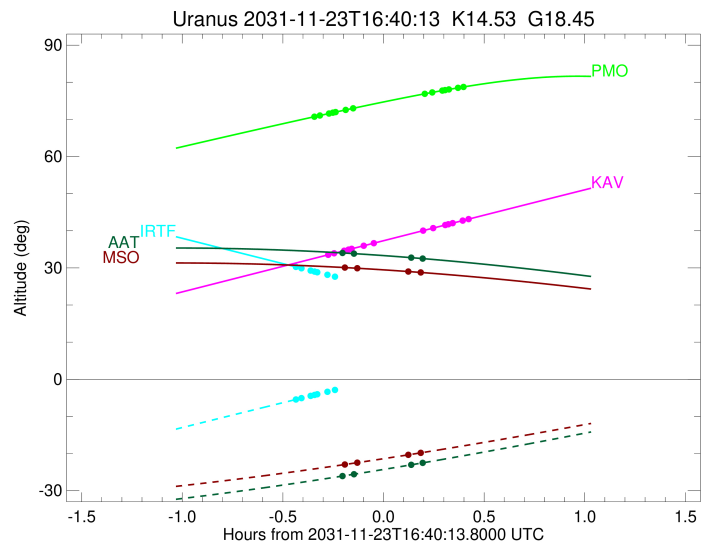
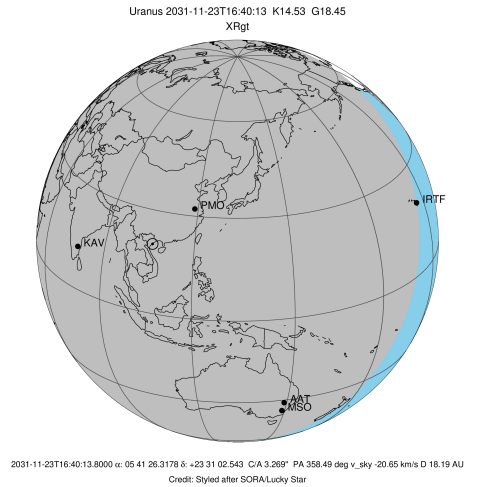
```

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
-----
epsilon   I  2031-11-23T16:27:01.078  34.08 -26.21  51551.79  -6.81
lambda    I  2031-11-23T16:31:28.427  33.84 -25.58  50026.71  -4.59

No planet occultations

lambda    E  2031-11-23T16:48:26.724  32.76 -23.05  50026.71  4.59
epsilon   E  2031-11-23T16:52:46.662  32.44 -22.38  51501.21  6.81
  
```

target : Uranus
 target radius (km) : 25559.00
 C/A epoch : 2031-11-23T16:39:16.150
 Event type : XRgt
 : No Uranus occs
 : 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 : 3404366863232344064
 2Mass ID (if available) : 05412631+2331028
 ICRS Star Coord at Epoch: 05h 41m 26.31780s +23:31:02.54282s
 RUWE (>1.4 is poor) : 1.01
 K magnitude : 14.528
 G magnitude : 18.447
 RP magnitude : 17.335
 BP magnitude : 19.671
 DUPflag : 0
 Distance (au) : 18.192
 f0 (km) : 0.000
 g0 (km) : 0.000
 skyplane vel. (km/s) : -20.65
 Sun-Target sep (deg) : 154.99
 Sun-Moon sep (deg) : 88.82
 B (ring opening deg) : 78.73
 PA of pole (deg) : 43.72
 Pole direction: RA (deg): 257.31100
 Dec (deg): -15.17500
 C/A sky separation (") : 3.685
 C/A sky separation (km) : 48614.3
 NAIF SPICE kernels : RAJobs_U111+rgf15.spk
 URKALLvl.spk
 ura111.bsp
 IAU_URANUS_for_RINGFIT.tpc
 vgr2.ura111.bsp
 ura161.bsp
 vgr2.ura161.bsp
 peph.ura160.bsp
 earthstns_itrf93_040916.bsp
 earth_720101_070426.bpc
 earth_200101_990628_predict.bpc
 pg3f0000r.bsp
 pg490000r.bsp
 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
epsilon	I	2031-11-23T16:27:39.873		30.14	-23.10	51552.58	-6.49		
lambda	I	2031-11-23T16:32:28.228		29.90	-22.46	50026.71	-4.07		

No planet occultations

lambda	E	2031-11-23T16:47:34.408		29.02	-20.36	50026.71	4.07		
epsilon	E	2031-11-23T16:52:15.343		28.71	-19.69	51504.35	6.49		