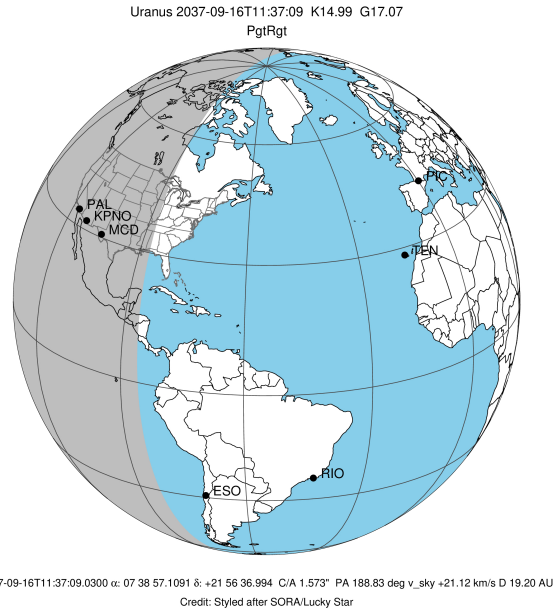
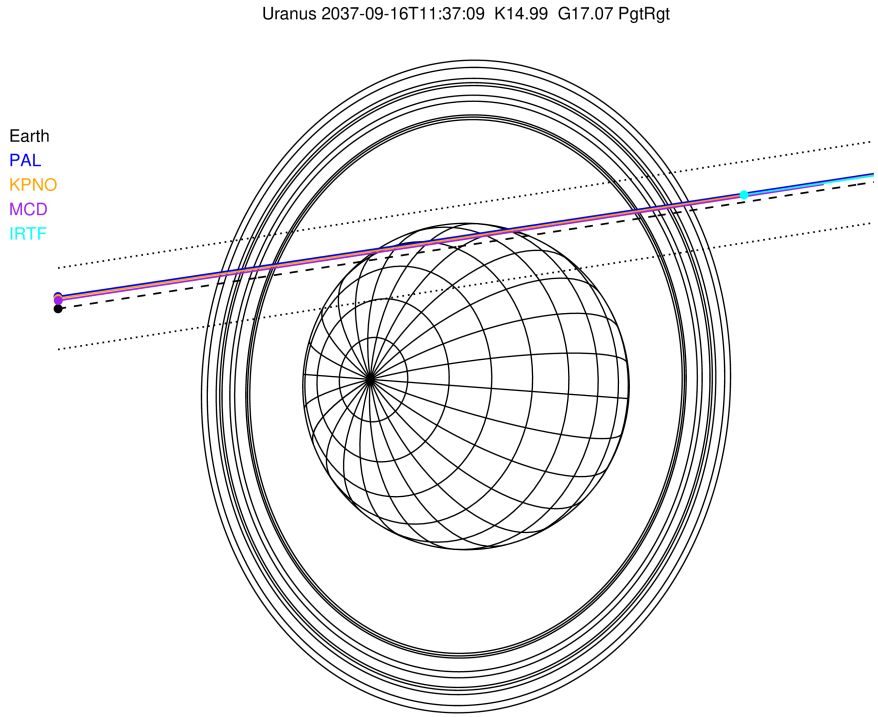
Stellar occultation prediction by rfrench@wellesley.edu Sun Jun 25 02:05:22 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2037-09-16T11:37:09.030
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Gaia source ID : 865449005501278592
2Mass ID (if available) : 07385711+2156370

ICRS Star Coord at Epoch: 07h 38m 57.10907s +21:56:36.99373s
RUWE (>1.4 is poor) : 0.94
K magnitude : 14.990
G magnitude : 17.072
RP magnitude : 16.366
BP magnitude : 17.647
DUPflag : 0
Distance (au) : 19.196
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : 21.12
Sun-Target sep (deg) : 60.60
Sun-Moon sep (deg) : 150.93
B (ring opening deg) : 53.97
PA of pole (deg) : 85.75

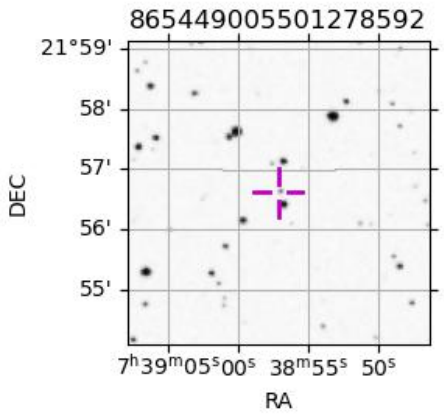
#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon





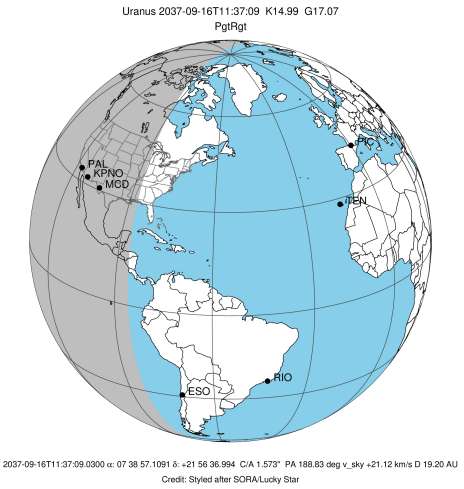
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

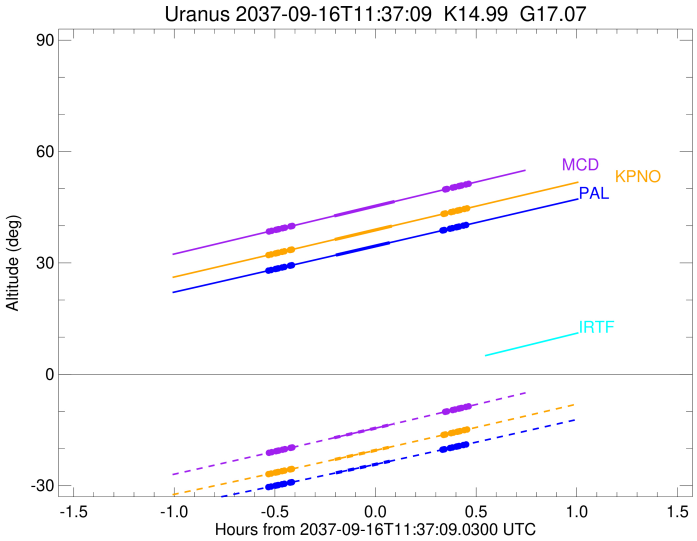
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1					PnnRnn
PAL	Palomar Mt (200")	33.4	243.1	++++++++++	+ +	++++++++++	SEP 16 11:05 - SEP 16 12:04	PieRie
PMO	Purple Mtn Obs. Nanki	32.1	118.8					PnnRnn
KPNO	Kitt Peak Natl Obs	32.0	248.4	++++++++++	+ +	++++++++++	SEP 16 11:05 - SEP 16 12:04	PieRie
MCD	McDonald Obs. 2.7m	30.7	256.0	++++++++++	+ +	++++++++++	SEP 16 11:05 - SEP 16 12:04	PieRie
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8					PnnRnn
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8					PnnRnn
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn



Uranus_2037-09-16T11_37_09.0300_PAL.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:18:57 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2037-09-16T11:33:14.510
Event type : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code : PAL
Location : Palomar Mt (200")
Latitude (deg) : 33.35622
E. Longitude (deg) : 243.13601
Altitude (km) : 1.706
Gaia source ID : 865449005501278592
2Mass ID (if available) : 07385711+2156370
ICRS Star Coord at Epoch: 07h 38m 57.10907s +21:56:36.99373s
RUWE (>1.4 is poor) : 0.94
K magnitude : 14.990
G magnitude : 17.072
RP magnitude : 16.366
BP magnitude : 17.647
DUPflag : 0
Distance (au) : 19.196
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : 21.12
Sun-Target sep (deg) : 60.60
Sun-Moon sep (deg) : 150.57
B (ring opening deg) : 53.97
PA of pole (deg) : 85.75
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (") : 1.681
C/A sky separation (km) : 23400.8
NAIF SPICE kernels : RAJobs_U111+rgf15.spk
URKALLv1.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	2037-09-16T11:05:28.598		27.97	-30.35	50812.65	-22.71		
lambda	I	2037-09-16T11:06:03.199		28.09	-30.24	50026.71	-22.66		
delta	I	2037-09-16T11:07:19.771		28.35	-30.00	48300.35	-22.42		
gamma	I	2037-09-16T11:07:49.666		28.46	-29.91	47631.50	-22.32		
eta	I	2037-09-16T11:08:10.100		28.53	-29.84	47176.12	-22.25		
beta	I	2037-09-16T11:09:19.366		28.77	-29.63	45643.39	-21.99		
alpha	I	2037-09-16T11:10:00.901		28.91	-29.49	44726.78	-21.81		
4	I	2037-09-16T11:11:38.318		29.25	-29.19	42616.46	-21.39		
5	I	2037-09-16T11:11:58.274		29.32	-29.12	42177.30	-21.30		
6	I	2037-09-16T11:12:17.777		29.38	-29.06	41807.07	-21.20		
Uranus	I	2037-09-16T11:25:19.491		32.09	-26.57	25426.26		20.14	21.01
Uranus	E	2037-09-16T11:41:24.200		35.45	-23.43	25545.24		-6.34	-6.64
6	E	2037-09-16T11:57:04.606		38.73	-20.32	41820.25	21.13		
5	E	2037-09-16T11:57:28.671		38.82	-20.24	42308.36	21.22		
4	E	2037-09-16T11:57:40.177		38.86	-20.21	42556.62	21.31		
alpha	E	2037-09-16T11:59:19.560		39.20	-19.87	44685.37	21.72		
beta	E	2037-09-16T12:00:04.122		39.36	-19.73	45661.08	21.90		
eta	E	2037-09-16T12:01:12.803		39.60	-19.50	47176.12	22.15		
gamma	E	2037-09-16T12:01:32.938		39.67	-19.43	47622.85	22.22		
delta	E	2037-09-16T12:02:03.359		39.78	-19.33	48300.35	22.32		
lambda	E	2037-09-16T12:03:20.290		40.04	-19.07	50026.71	22.56		
epsilon	E	2037-09-16T12:04:09.972		40.22	-18.90	51150.79	22.60		

Uranus_2037-09-16T11_37_09.0300_KPNO.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:23:20 2023

```
target                  : Uranus
target radius (km)      :  25559.00
C/A epoch               : 2037-09-16T11:33:24.220
Event type              : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code           : KPNO
Location                : Kitt Peak Natl Obs
Latitude (deg)          :  31.96333
E. Longitude (deg)      : 248.40000
Altitude (km)           :   2.120
Gaia source ID          : 865449005501278592
2Mass ID (if available) : 07385711+2156370
ICRS Star Coord at Epoch: 07h 38m 57.10907s +21:56:36.99373s
RUWE (>1.4 is poor)     :   0.94
K magnitude             : 14.990
G magnitude             : 17.072
RP magnitude            : 16.366
BP magnitude            : 17.647
DUPflag                 : 0
Distance (au)           : 19.196
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    :  21.12
Sun-Target sep (deg)    :   60.60
Sun-Moon sep (deg)      :  150.62
B (ring opening deg)    :   53.97
PA of pole (deg)        :   85.75
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (")  :   1.662
C/A sky separation (km) :  23134.6
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.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
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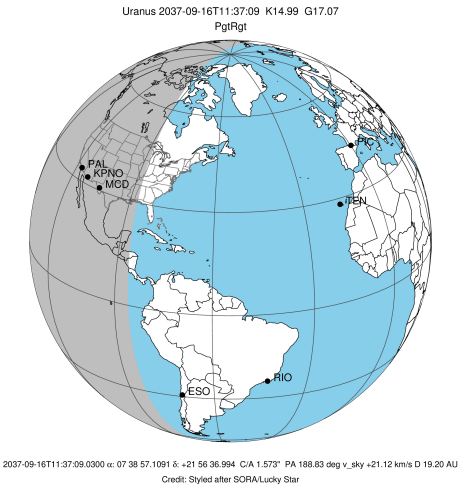
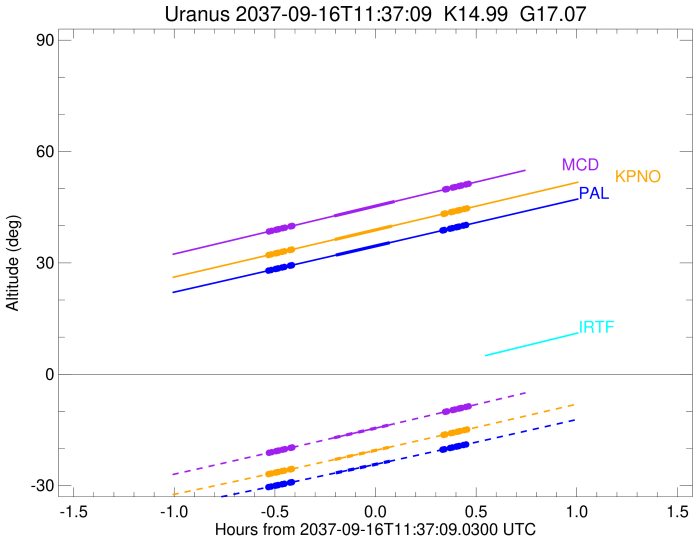
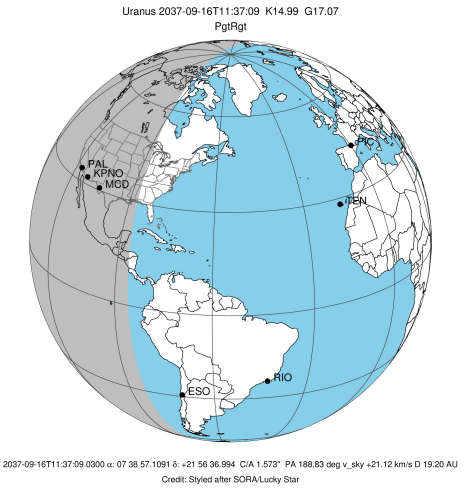




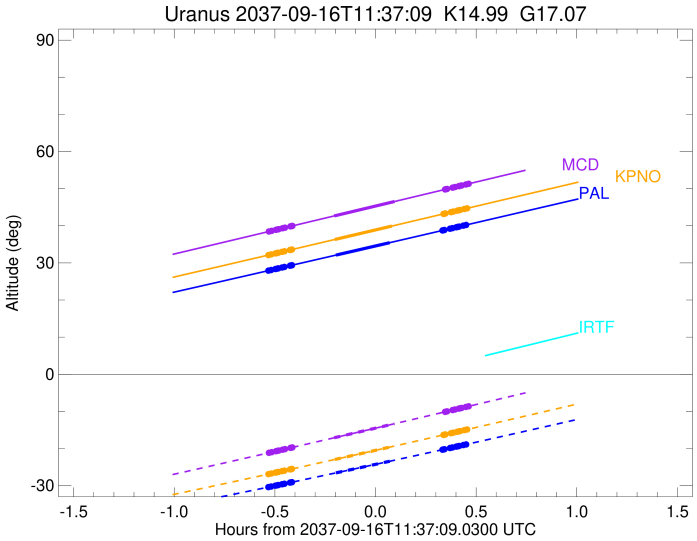
b: ring blocked by planet x: target alt < 5.0 deg or sun > -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2037-09-16T11:05:29.259		32.17	-26.85	50814.08	-22.74		
lambda	I	2037-09-16T11:06:03.871		32.29	-26.74	50026.71	-22.70		
delta	I	2037-09-16T11:07:20.313		32.56	-26.48	48300.35	-22.46		
gamma	I	2037-09-16T11:07:50.151		32.67	-26.39	47631.51	-22.37		
eta	I	2037-09-16T11:08:10.543		32.74	-26.32	47176.12	-22.30		
beta	I	2037-09-16T11:09:19.649		32.98	-26.09	45643.46	-22.04		
alpha	I	2037-09-16T11:10:01.069		33.13	-25.95	44727.03	-21.87		
4	I	2037-09-16T11:11:38.214		33.47	-25.63	42616.43	-21.46		
5	I	2037-09-16T11:11:58.120		33.54	-25.57	42176.85	-21.37		
6	I	2037-09-16T11:12:17.533		33.61	-25.50	41807.31	-21.28		
Uranus	I	2037-09-16T11:25:00.625		36.30	-22.96	25416.84		20.88	21.78
Uranus	E	2037-09-16T11:42:02.406		39.92	-19.50	25541.50		-7.16	-7.49
6	E	2037-09-16T11:57:22.903		43.19	-16.35	41820.54	21.21		
5	E	2037-09-16T11:57:46.897		43.28	-16.26	42308.59	21.29		
4	E	2037-09-16T11:57:58.333		43.32	-16.22	42556.32	21.38		
alpha	E	2037-09-16T11:59:37.425		43.67	-15.88	44685.42	21.78		
beta	E	2037-09-16T12:00:21.871		43.83	-15.73	45661.21	21.95		
eta	E	2037-09-16T12:01:30.383		44.07	-15.49	47176.12	22.20		
gamma	E	2037-09-16T12:01:50.473		44.14	-15.42	47622.82	22.27		
delta	E	2037-09-16T12:02:20.833		44.25	-15.32	48300.35	22.37		
lambda	E	2037-09-16T12:03:37.624		44.52	-15.05	50026.71	22.59		
epsilon	E	2037-09-16T12:04:27.325		44.70	-14.88	51153.02	22.64		

Uranus_2037-09-16T11_37_09.0300_MCD.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:25:28 2023




```
target                  : Uranus
target radius (km)      :  25559.00
C/A epoch               : 2037-09-16T11:33:43.130
Event type              : PgtRgt
: Uranus occs: geocentric, topocentric
: Ring occs: geocentric, topocentric
Observer code           : MCD
Location                : McDonald Obs. 2.7m
Latitude (deg)          :  30.67158
E. Longitude (deg)      : 255.97844
Altitude (km)           :   2.075
Gaia source ID          : 865449005501278592
2Mass ID (if available) : 07385711+2156370
ICRS Star Coord at Epoch: 07h 38m 57.10907s +21:56:36.99373s
RUWE (>1.4 is poor)     :   0.94
K magnitude             : 14.990
G magnitude             : 17.072
RP magnitude            : 16.366
BP magnitude            : 17.647
DUPflag                 : 0
Distance (au)           : 19.196
f0 (km)                 :       0.000
g0 (km)                 :       0.000
skyplane vel. (km/s)    :  21.12
Sun-Target sep (deg)    :   60.60
Sun-Moon sep (deg)      :  150.71
B (ring opening deg)    :   53.97
PA of pole (deg)        :   85.75
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (")  :   1.641
C/A sky separation (km) :  22847.6
NAIF SPICE kernels      : RAJobs_U111+rgf15.spk
URKALLv1.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	2037-09-16T11:05:37.820		38.51	-21.10	50815.69	-22.77		
lambda	I	2037-09-16T11:06:12.466		38.64	-20.98	50026.71	-22.72		
delta	I	2037-09-16T11:07:28.811		38.91	-20.72	48300.35	-22.50		
gamma	I	2037-09-16T11:07:58.603		39.02	-20.62	47631.52	-22.40		
eta	I	2037-09-16T11:08:18.962		39.09	-20.55	47176.12	-22.33		
beta	I	2037-09-16T11:09:27.936		39.34	-20.31	45643.53	-22.09		
alpha	I	2037-09-16T11:10:09.255		39.49	-20.17	44727.30	-21.92		
4	I	2037-09-16T11:11:46.165		39.84	-19.83	42616.40	-21.52		
5	I	2037-09-16T11:12:06.029		39.91	-19.76	42176.37	-21.44		
6	I	2037-09-16T11:12:25.359		39.98	-19.70	41807.58	-21.35		
Uranus	I	2037-09-16T11:24:50.350		42.65	-17.11	25406.98		21.63	22.56
Uranus	E	2037-09-16T11:42:50.405		46.54	-13.32	25537.31		-7.97	-8.35
6	E	2037-09-16T11:57:51.592		49.78	-10.13	41820.84	21.28		
5	E	2037-09-16T11:58:15.519		49.87	-10.05	42308.83	21.37		
4	E	2037-09-16T11:58:26.887		49.91	-10.01	42556.00	21.45		
alpha	E	2037-09-16T12:00:05.710		50.27	-9.66	44685.47	21.84		
beta	E	2037-09-16T12:00:50.049		50.43	-9.50	45661.34	22.00		
eta	E	2037-09-16T12:01:58.408		50.67	-9.26	47176.12	22.24		
gamma	E	2037-09-16T12:02:18.459		50.74	-9.18	47622.80	22.31		
delta	E	2037-09-16T12:02:48.765		50.85	-9.08	48300.35	22.40		
lambda	E	2037-09-16T12:04:05.436		51.13	-8.80	50026.71	22.63		
epsilon	E	2037-09-16T12:04:55.172		51.31	-8.63	51155.31	22.67		