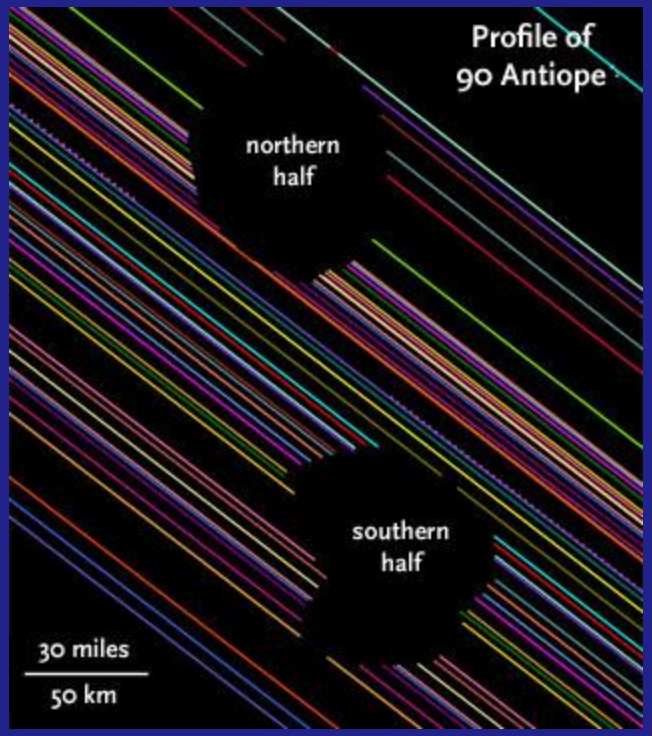
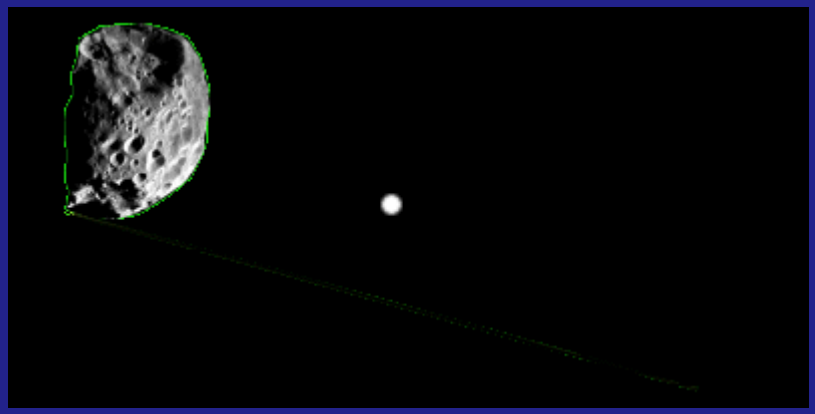
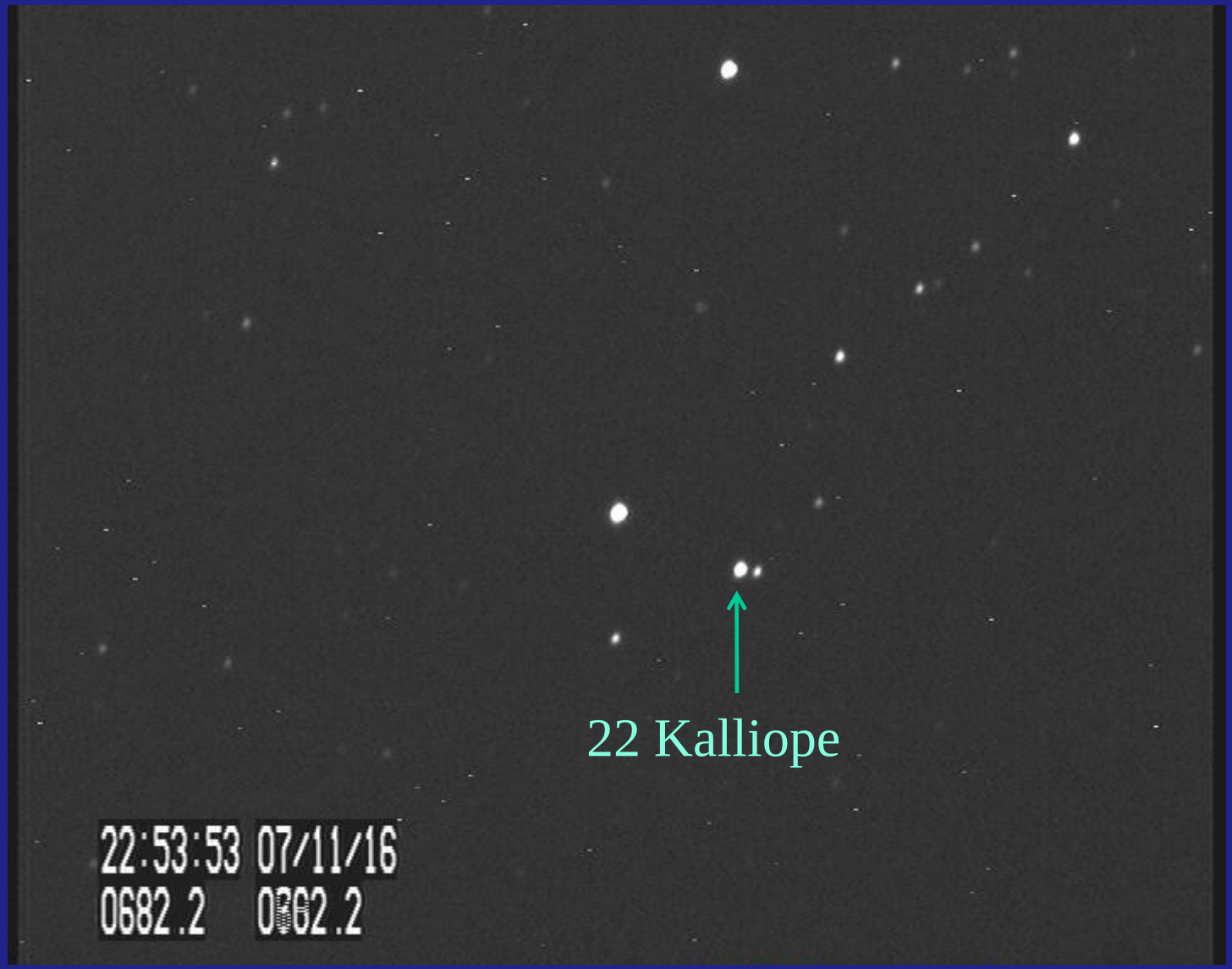
Le occultazioni asteroidali.
Un campo di ricerca per gli astrofili



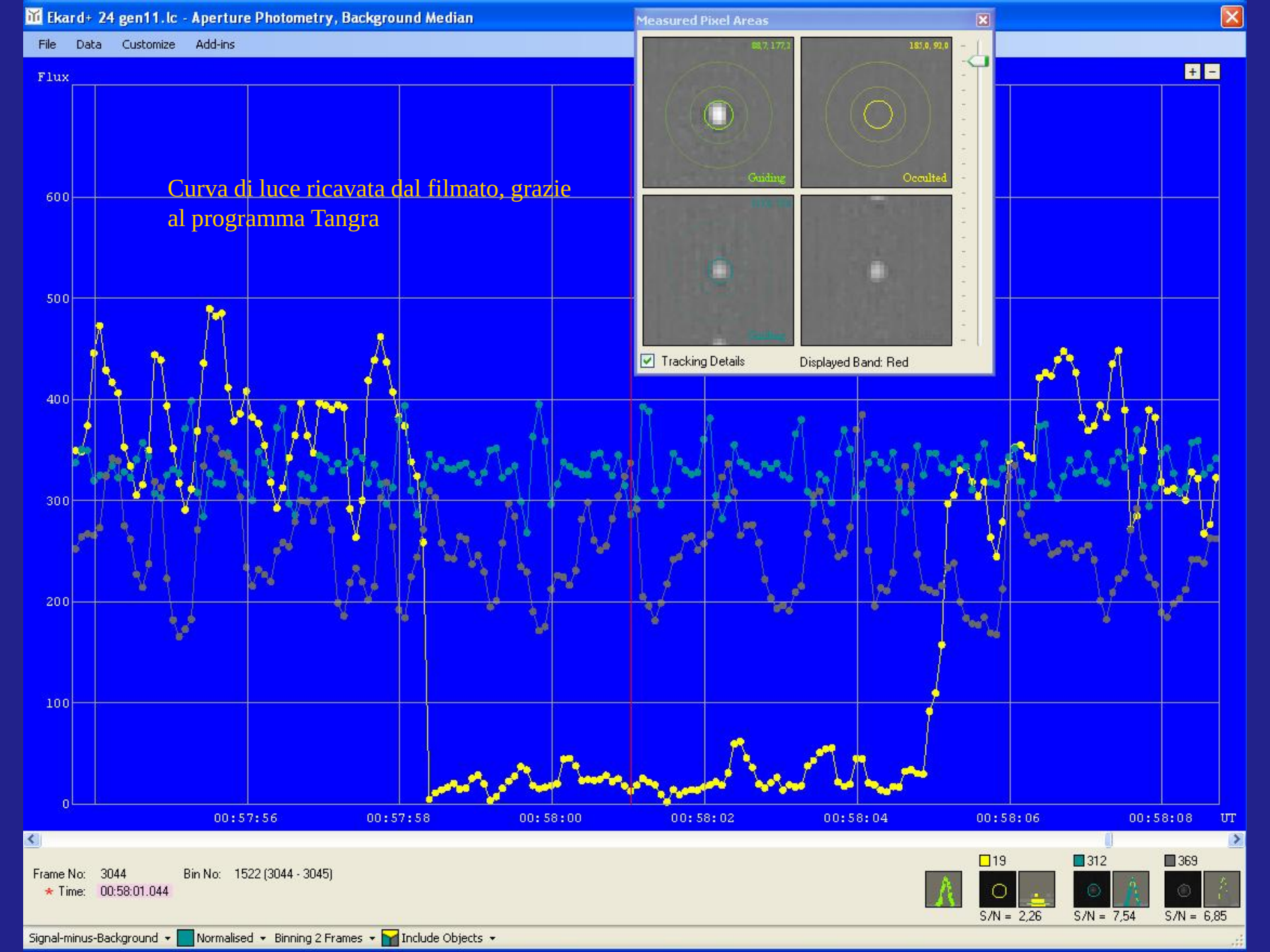


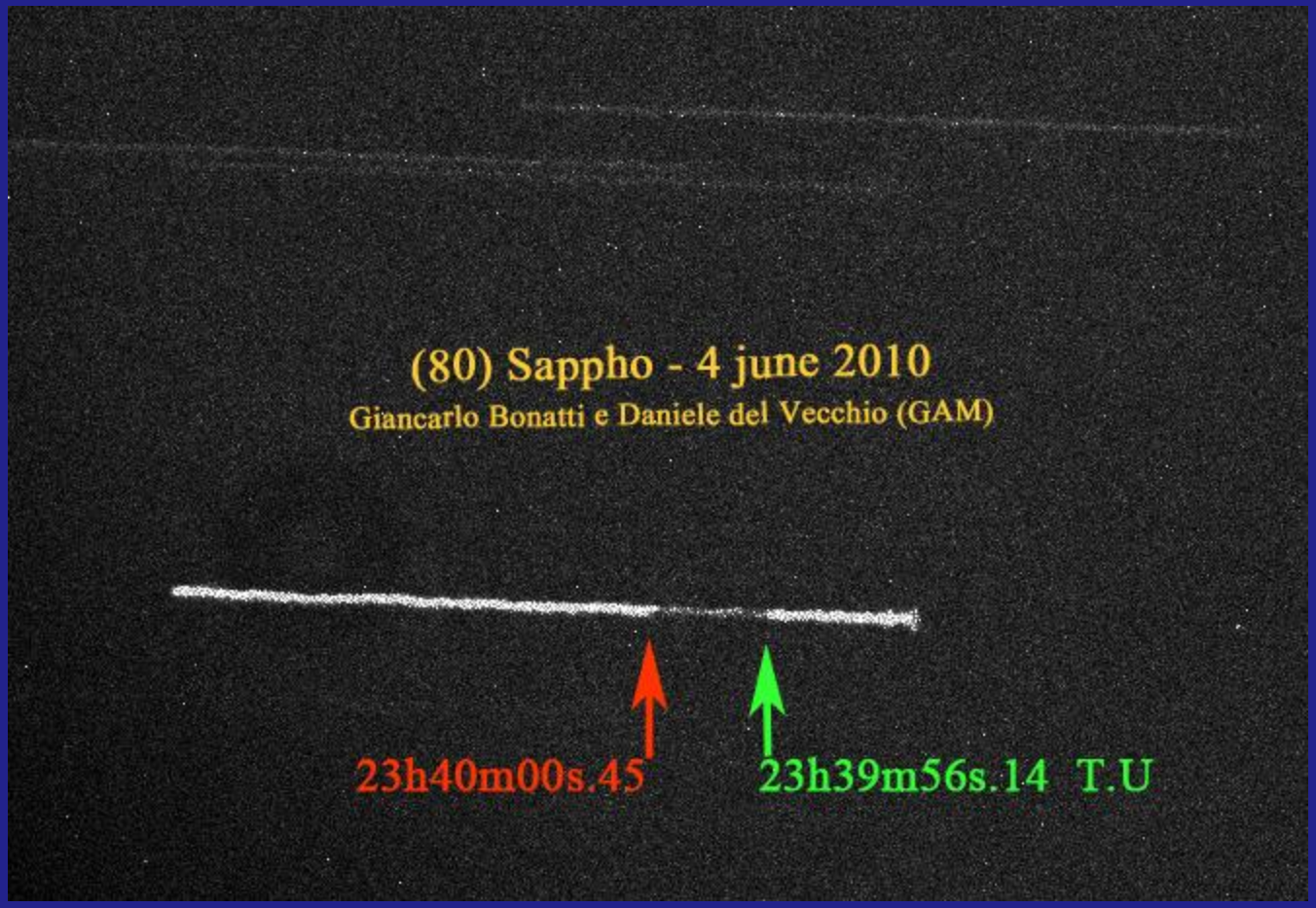
Gruppo Astrofili Massesi

Incontro CAAT Montelupo F.no – 11 dic 2016

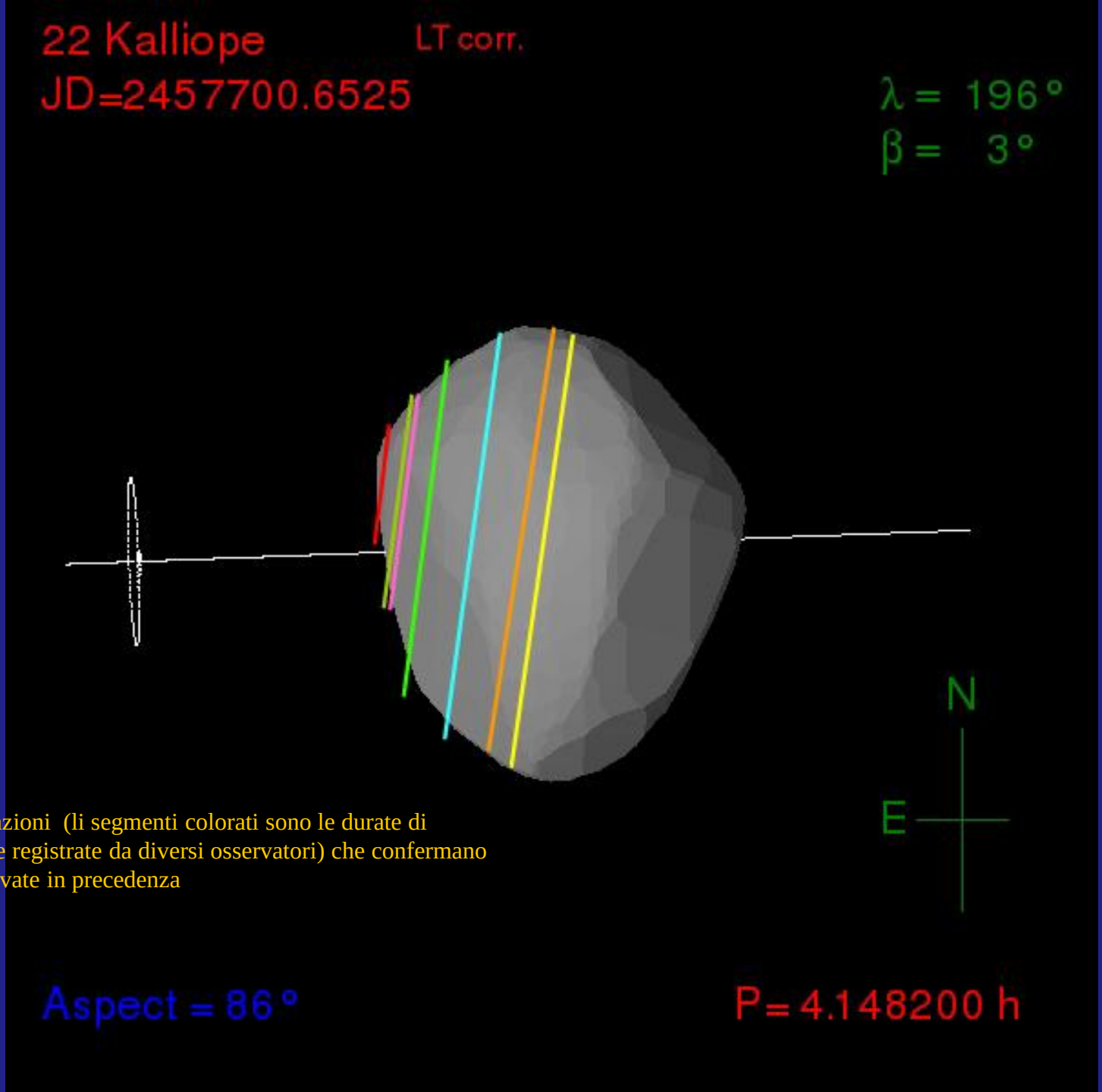


Un frame da una registrazione video di occultazione – a Montelupo fu presentato un filmato che non può essere inserito nella versione .pdf

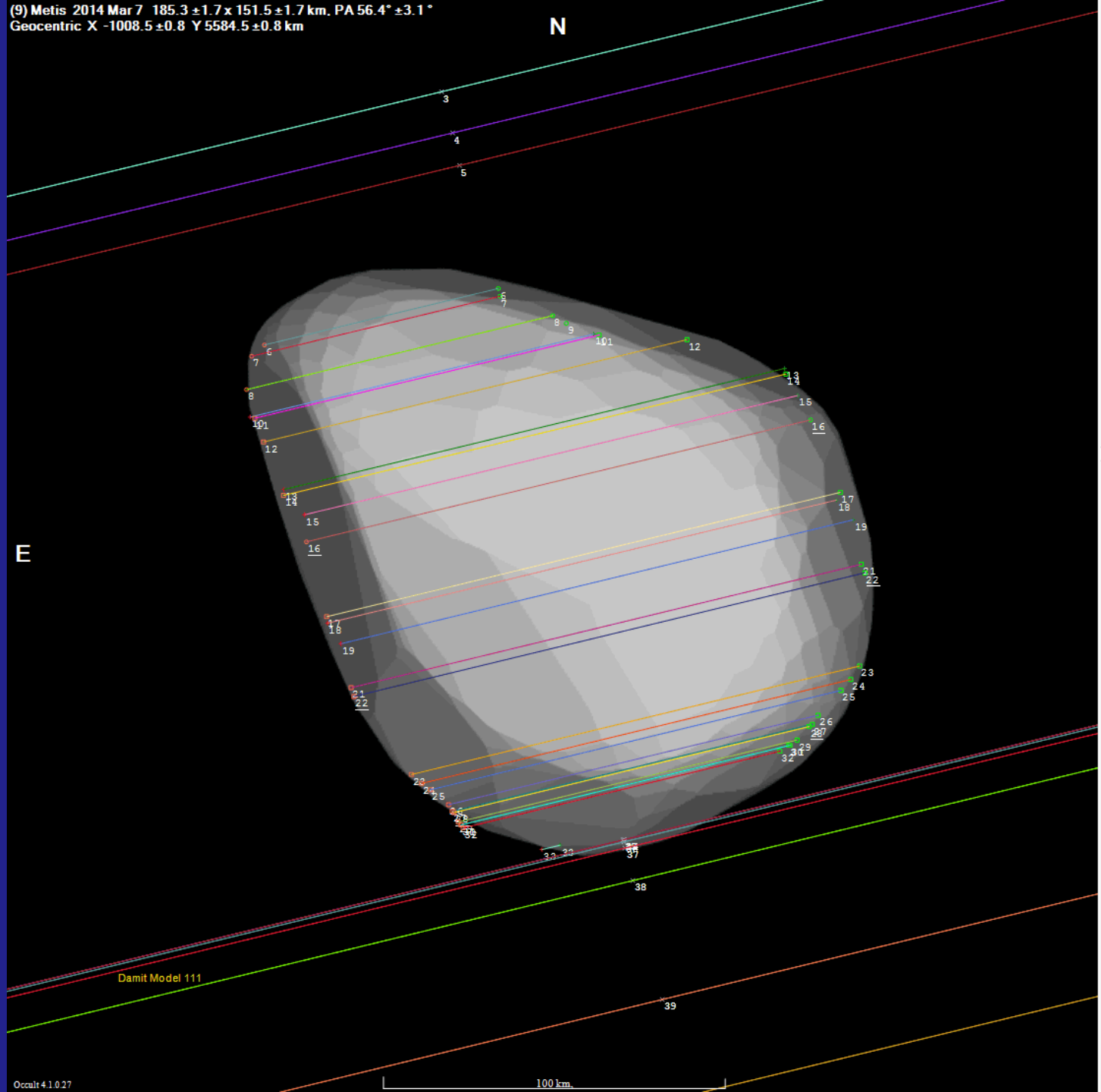

Ekard+ 24 gen11.lc - Aperture Photometry, Background Median
File
Data
Customize
Add-ins
Measured Pixel Areas
Guiding
Occulted
Tracking Details
Displayed Band: Red
Flux
Curva di luce ricavata dal filmato, grazie al programma Tangra
600
500
400
300
200
100
0
00:57:56
00:57:58
00:58:00
00:58:02
00:58:04
00:58:06
00:58:08
UT
Frame No: 3044
Time: 00:58:01.044
Bin No: 1522 (3044 - 3045)
19
312
369
S/N = 2,26
S/N = 7,54
S/N = 6,85
Signal-minus-Background
Normalised
Binning 2 Frames
Include Objects



Una osservazione mediante strisciata in CCD. Le occultazioni possono essere seguite anche in visuale



Due osservazioni (li segmenti colorati sono le durate di occultazione registrate da diversi osservatori) che confermano sagome ricavate in precedenza



Find best fit

Center X -24.9 0.0
Center Y 148.1 0.0
Major axis (km) 185.3 0.0
Minor axis (km) 151.5 0.0
Orientation 56.4 0.0

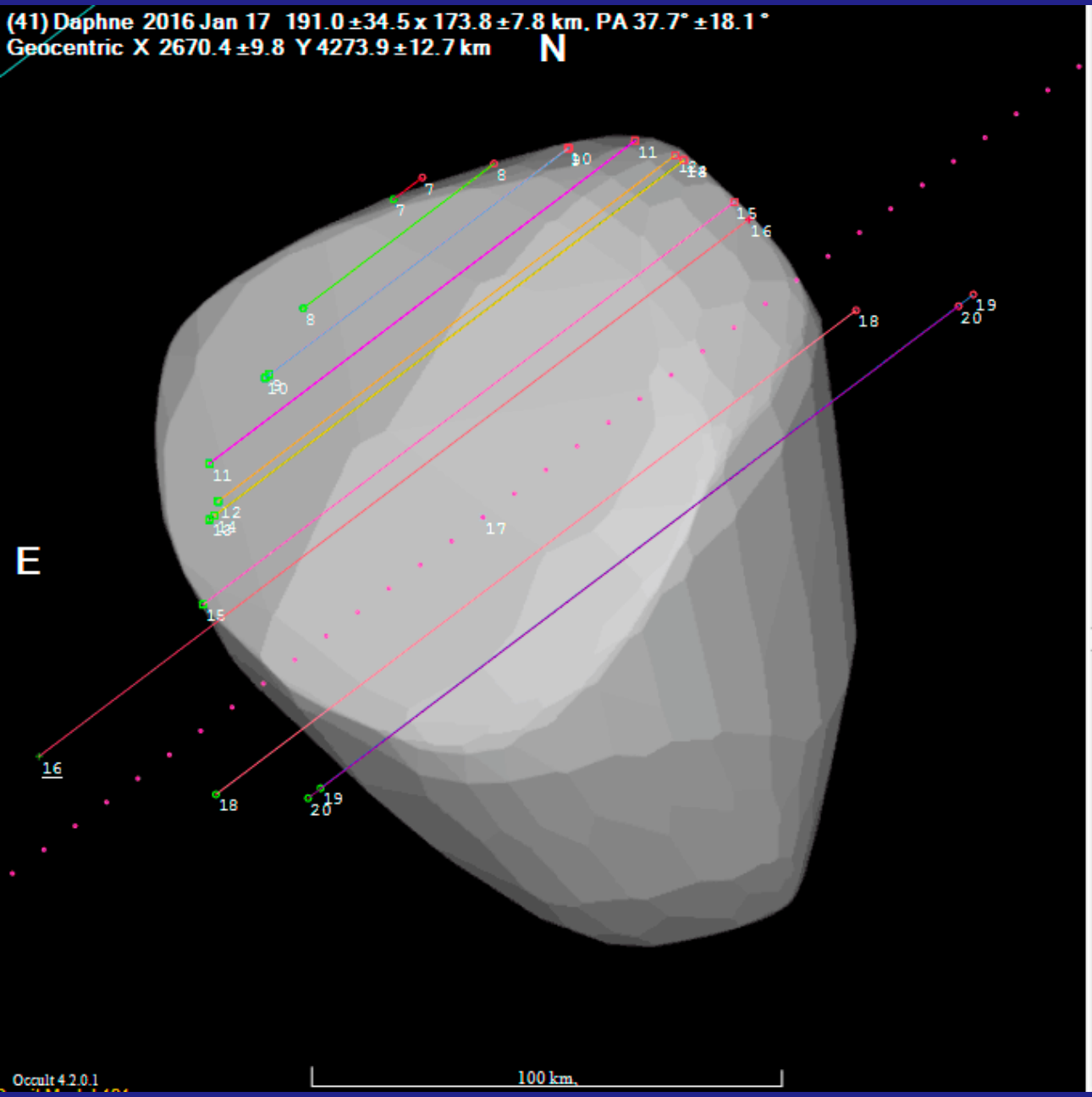
a/b=1.22
dM=-0.22
Motion 7.65km/s, X

Double star or double asteroid
Sepn (masec) 0.0 0.0
PA of 2nd 0.0 0.0
Show: Both Primary Secondary
A= 10.0 B= 10.0 PA= 0.0

Circular Include Miss events
Plot scale Quality Excellent

RMS fit -0.4 ±7.2 km

1 (M)	Tomas Janik, CZ
2 (M)	Henk Bulder, NL
3 (M)	Lex Blommers, NL
4 (M)	Oliver Kloes, DE
5 (M)	A Gabel/J Ohlert/G Piehler
6	Gregor Krannich, DE
7	O. Farago/A. Eberle, DE
8	T Pauwels/P Vingerhoets, B
9	Bernd Gaehrken, DE
10	Rene Bourtembourg, BE
11	Rolf Apitzsch, DE
12	F. Van Den Abbeel, BE
13	Roland Boninsegna, BE
14	Jean Vilar, FR
15	Stephane Razemon, FR
16	Wim Nobel, FR
17	Eberhard Bredner, FR
18	Stefan Meister, CH
19	Mike Kohl, CH
20 (P)	Preston prediction
21	Jonas Schenker, CH
22	Jose De Queiroz, CH
23	F Vachier/G Sautot/E Vauth
24	S Sposetti/B Bernardi, CH
25	S Sposetti/B Bernardi, CH
26	Stefano Sposetti, CH
27	Stefano Sposetti, CH
28	Eric Frappa, FR
29	Andrea Manna, CH
30	Eric Frappa, FR
31	Marco Iten, CH
32	Arnaud Leroy, FR
33	Fausto Delucchi, CH
34 (M)	Stefano Basso, IT
35 (M)	Carlo Gualdoni, IT
36 (M)	Christian Gros, FR
37 (M)	Jean Lecacheux, FR
38 (M)	Alain Figer, FR
39 (M)	Simone Bolzoni, IT
42 (M)	Pietro Baruffetti, IT
43 (M)	Claudio Costa, IT
44 (M)	E. Frappa/A. Klotz, FR
45 (M)	Hilari Pallares, ES



Find best fit

Center X	35.3	☑ 0.0	
Center Y	-80.4	☑ 0.0	
Major axis (km)	191.0	☑ 0.0	a/b=1.10
Minor axis (km)	173.8	☑ 0.0	dM=-0.10
Orientation	37.7	☑ 0.0	Motion 6.66km/s, X

Double star or double asteroid

Sepn (masec)	0.0	☐ 0.0
PA of 2nd	0.0	☐ 0.0

Show: (•) Both ( ) Primary ( ) Secondary

A= 10.0 B= 10.0 PA= 0.0

☐ Circular ☑ Include Miss events

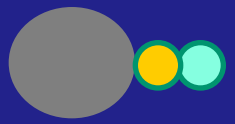
Plot scale

Quality: Not fitted

RMS fit -0.2 ±5.0 km

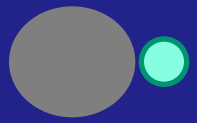
1	(M)	Stefano Sposetti, CH
2	(M)	Pietro Baruffetti, IT
3	(M)	Benoit Goffin, BE
4	(M)	Guy Huys, BE
5	(M)	Roland Decellier, BE
6	(M)	Steve Hubbard, UK
7		Matthieu Conjat, FR
8		Jean-Louis Penninckx, FR
9		F Signoret/JB Pioppa, FR
10		G Aufranc/J Camponovo/V Hou
11		Jean Lecacheux, FR
12		Daniel Verilhac, FR
13		Olivier Dechambre, FR
14		Guy Brabant, FR
15		Eberhard Bredner, FR
16		Michel Deconinck, FR
17	(P)	Prediction
18		Patrice Le Guen, FR
19		Lionel Ruiz, FR
20		Luc Maurin, FR

Esempio di osservazione che smentisce la sagoma ricavata in precedenza



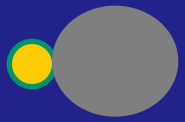
Mv 7+5+6 = 4,52

$$m_1 - m_2 = -2{,}5 \log_{10}\left(\frac{I_1}{I_2}\right)$$

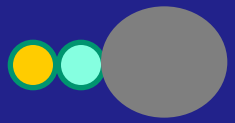


Mv 7 +6 = 5,64

Mv 7 = 7,00

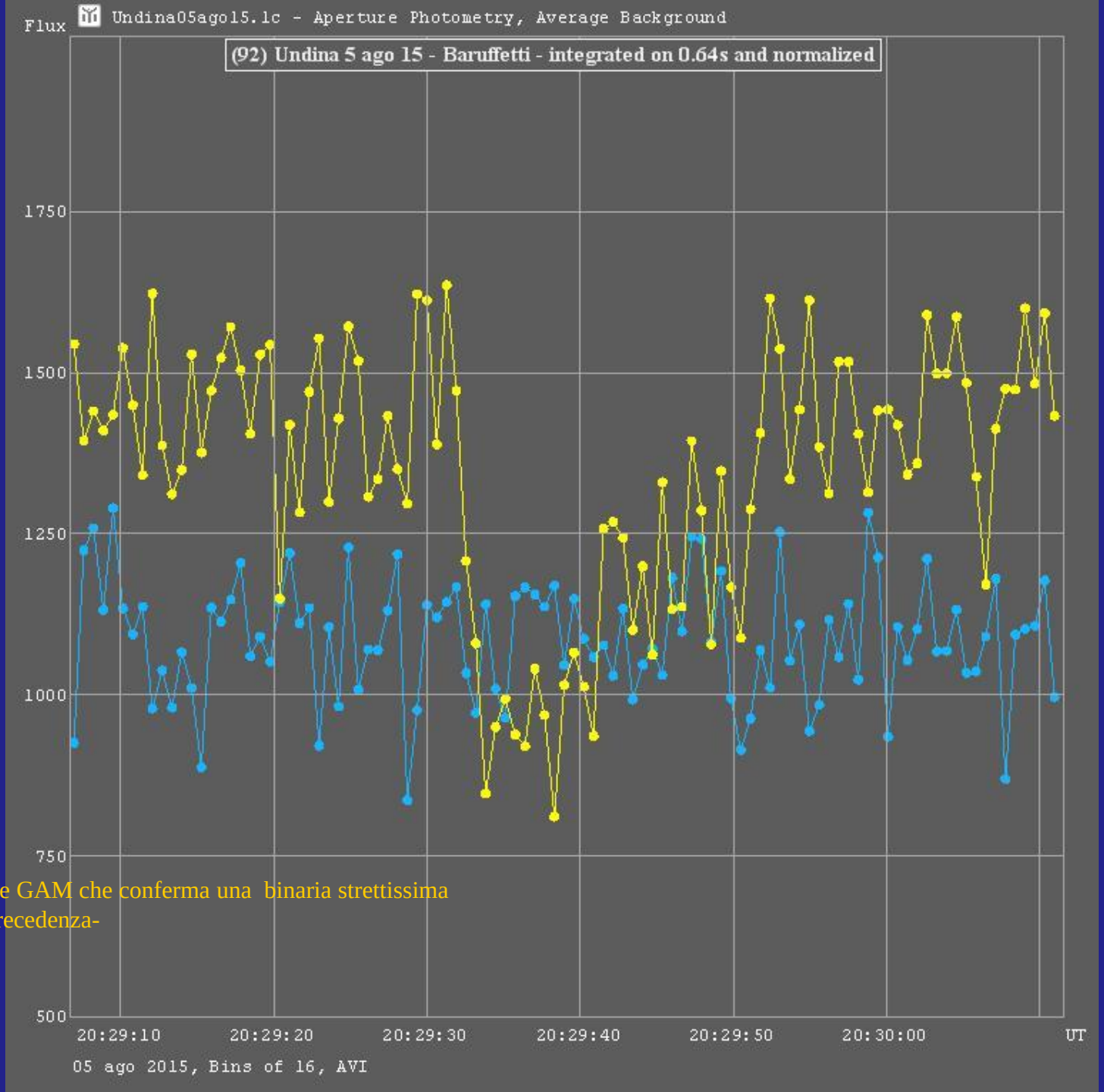


Mv 5+7 = 4,85

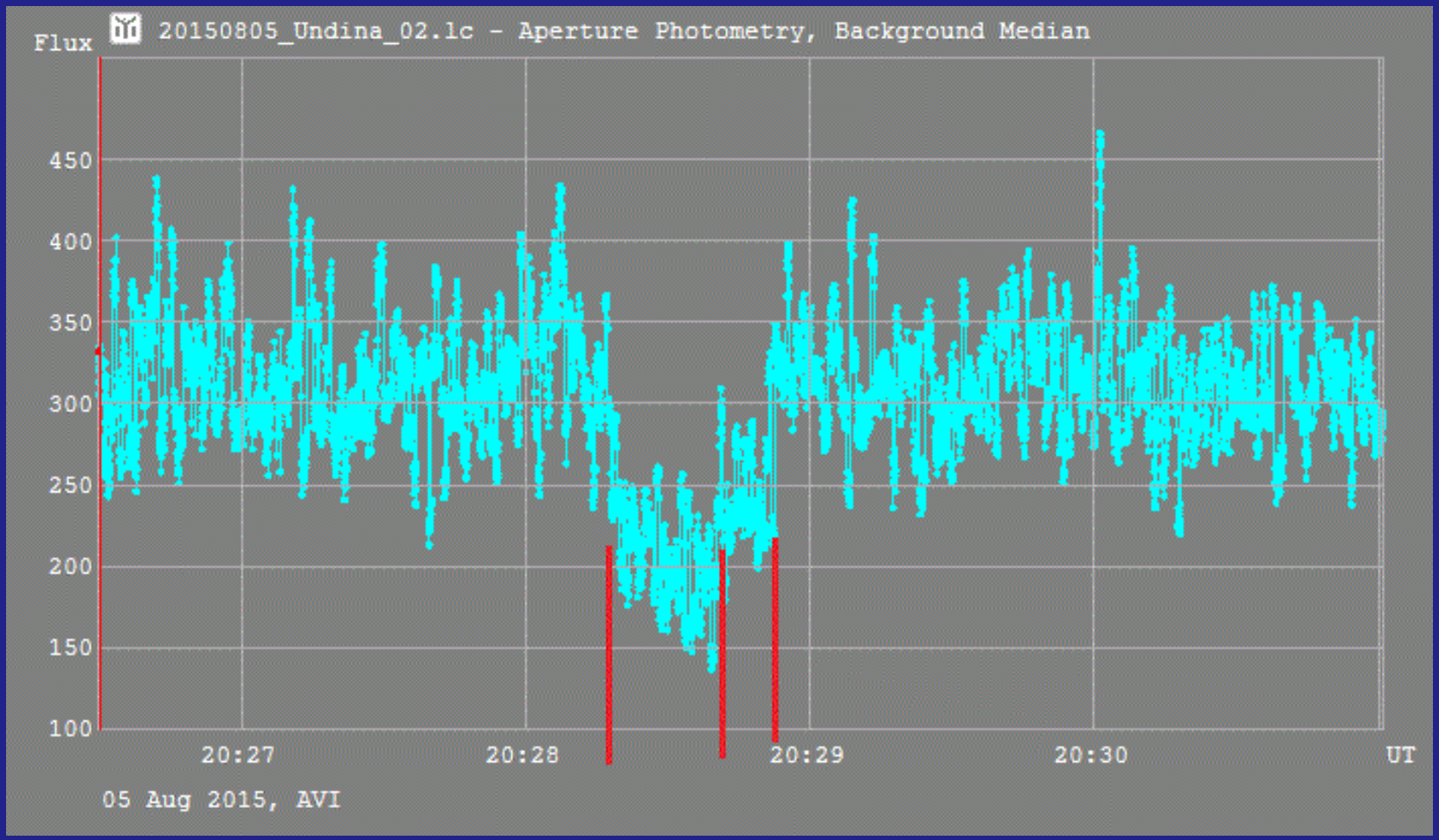


Mv 5+6+7 = 4,52

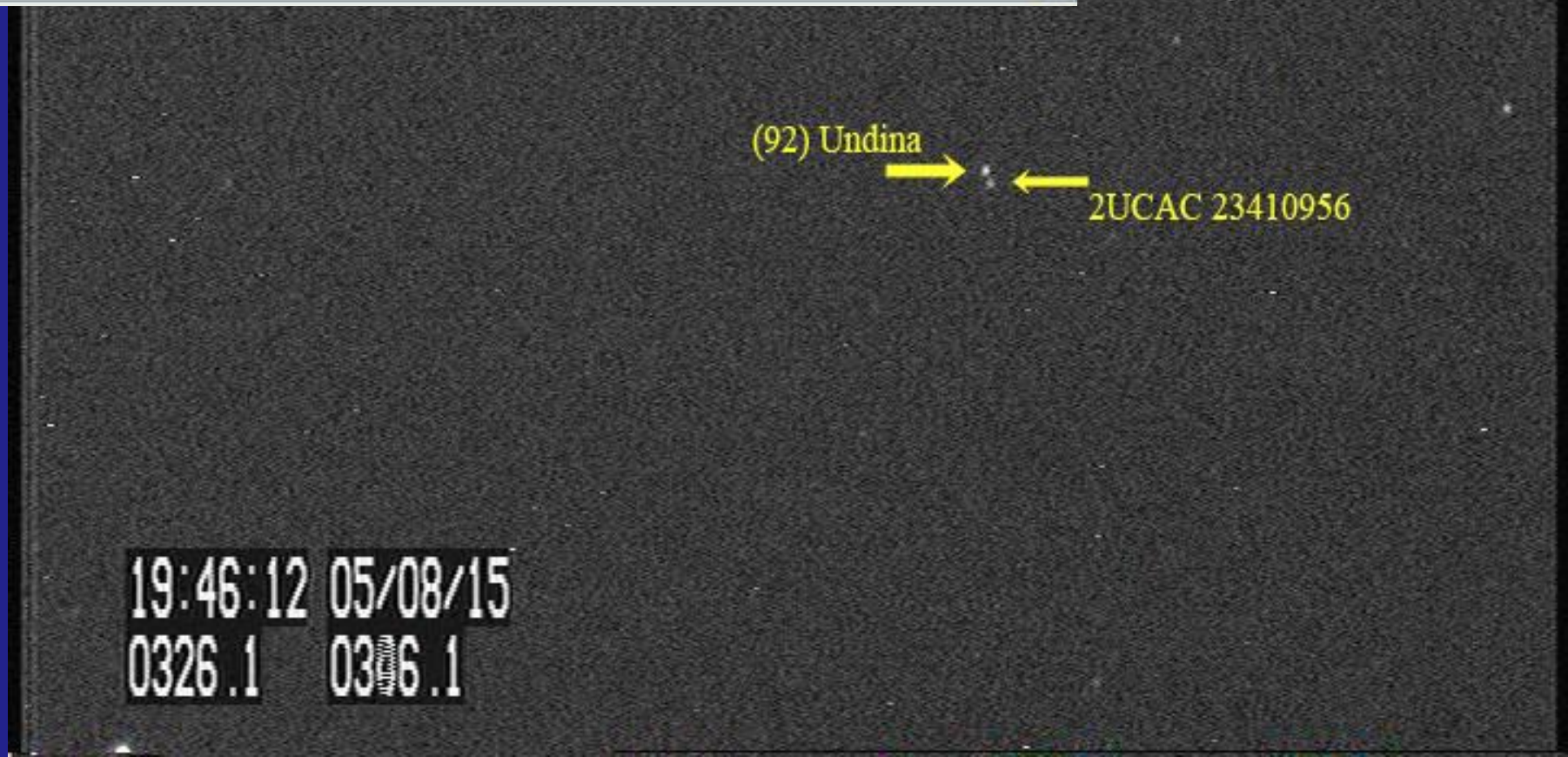
La combinazione delle magnitudini nel caso l'asteroide occulti una stella binaria strettissima-

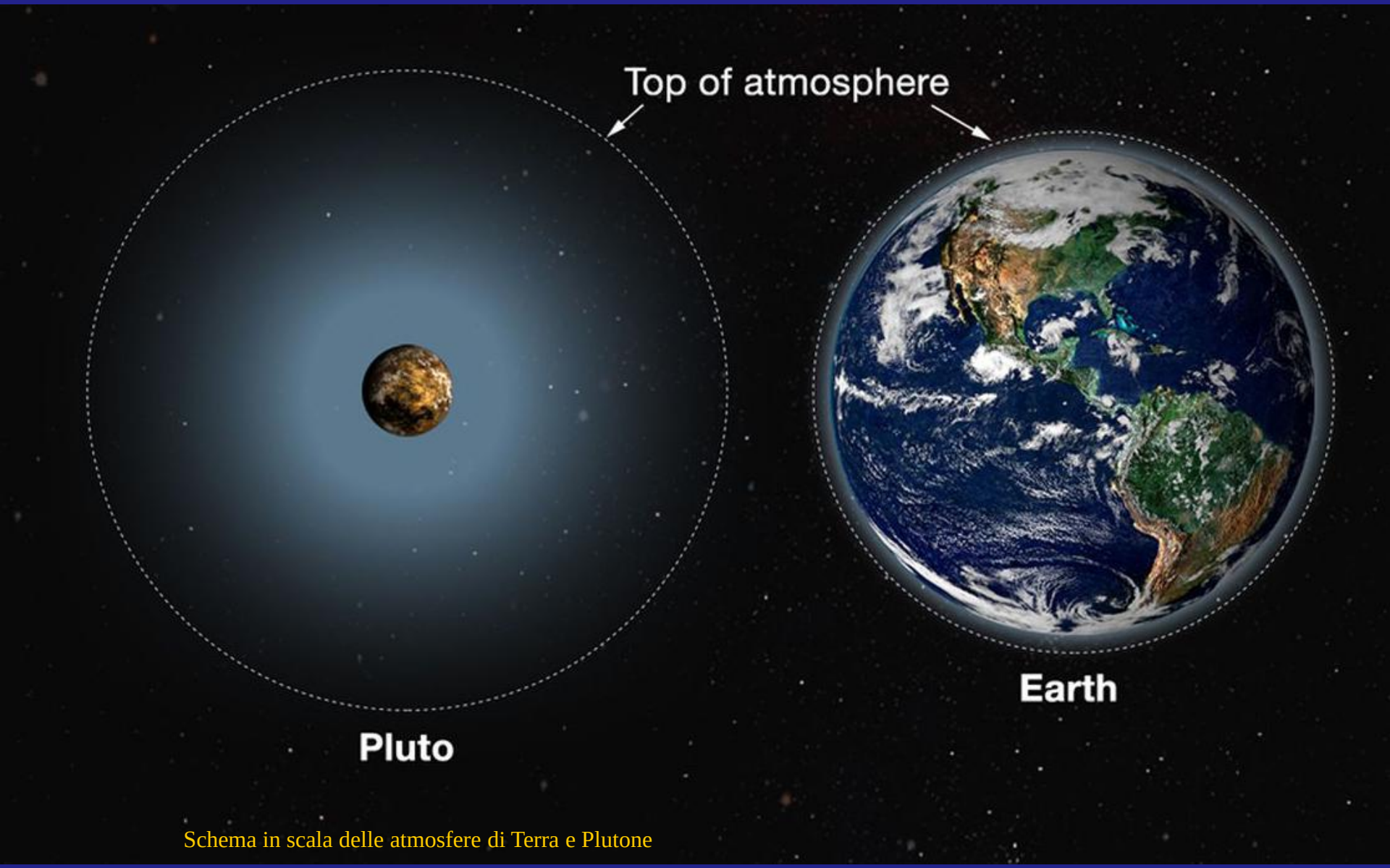


Una osservazione GAM che conferma una binaria strettissima sconosciuta in precedenza-

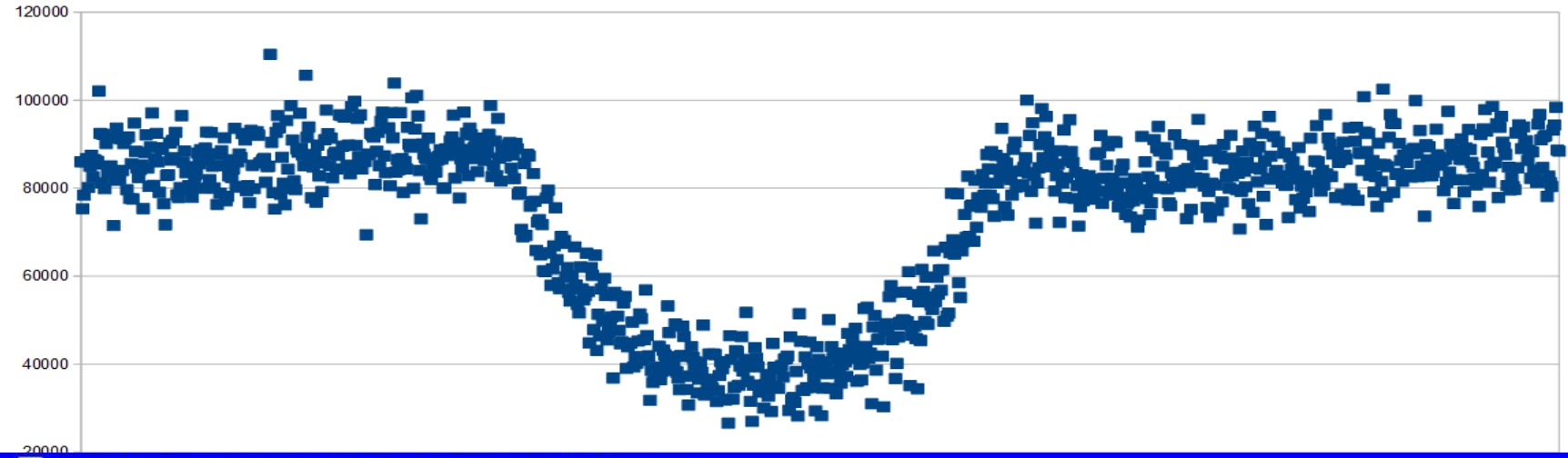

Flux
20150805_Undina_02.lc - Aperture Photometry, Background Median
450
400
350
300
250
200
150
100
20:27
20:28
20:29
20:30
UT
05 Aug 2015, AVI

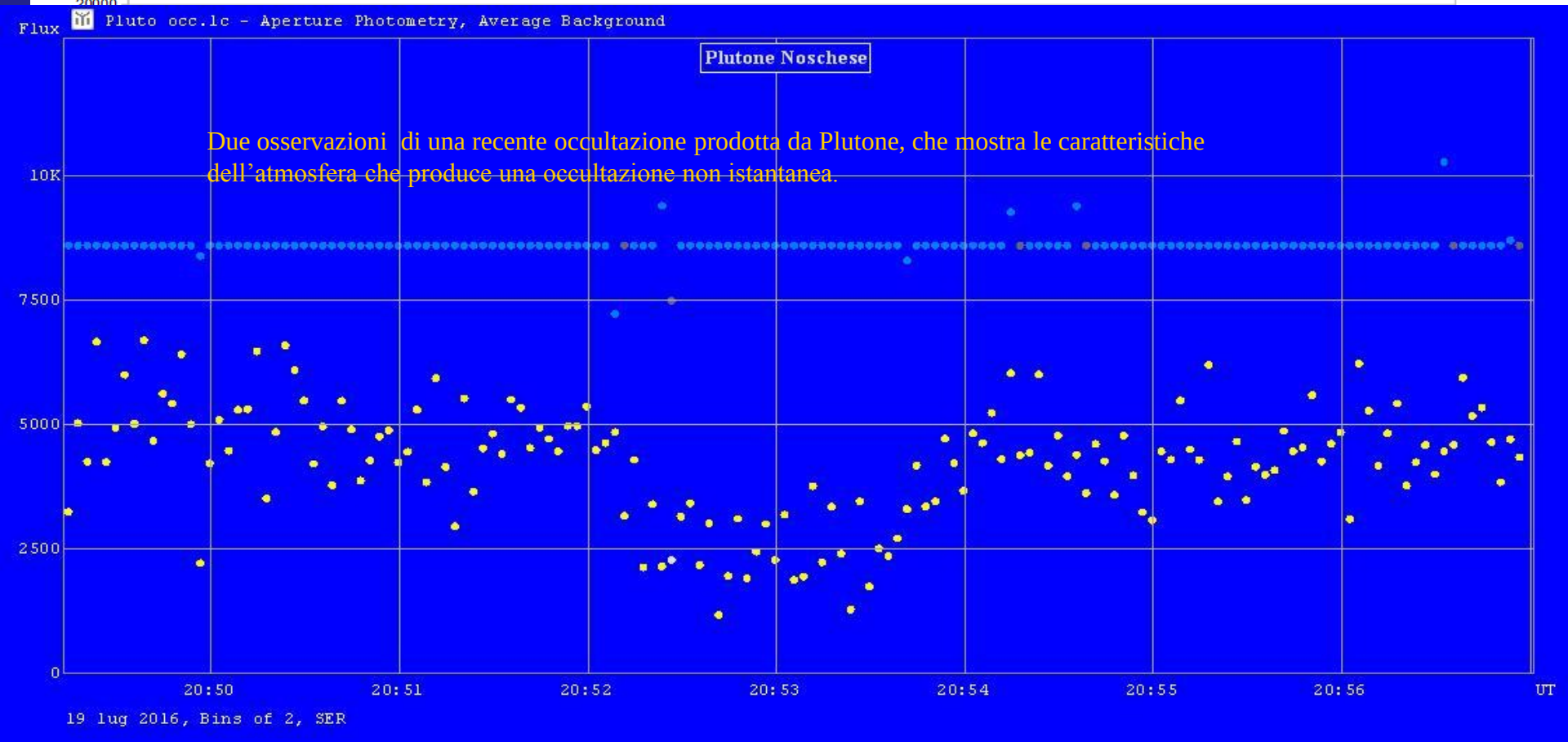
6828-01457-1	88.7	233.3	2013 Aug 3	2238	Vilpuri
7444-01434-1	31.2	-67.6	2013 Aug 15	481	Emita
2U30429828	380.0	240.0	2013 Aug 15	611	Valeria
4UC602-035724	23.0	-103.0	2013 Oct 5	120	Lachesis
0646-00730-1	247.0	265.7	2013 Oct 21	617	Patroclus
1950-02320-1	152.9 ± 0.8	105.8 ± 0.7	2013 Dec 28	141	Lumen
0801-01593-1	1.2	-67.7	2014 Jan 18	664	Judith
5227-00026-1	3.0	2.0	2014 Dec 9	3950	Yoshida
2U27496405	10.0 ± 0.5	225.8 ± 2.5	2015 Feb 12	107	Camilla
0283-00694-1	42.1 ± 0.7	127.9 ± 1.4	2015 Apr 2	90	Antiope
0283-00694-1	89.3	-27.3	2015 Apr 2	90	Antiope
0283-00694-1	46.4 ± 1.8	145.1 ± 2.6	2015 Apr 2	90	Antiope
4UC344-090563	41.0	-113.0	2015 Aug 5	92	Undina
1981-01493-1	211.0	-50.7	2016 Mar 17	412	Elisabetha
2U31329020	10.0	57.0	2016 Mar 19	695	Bella



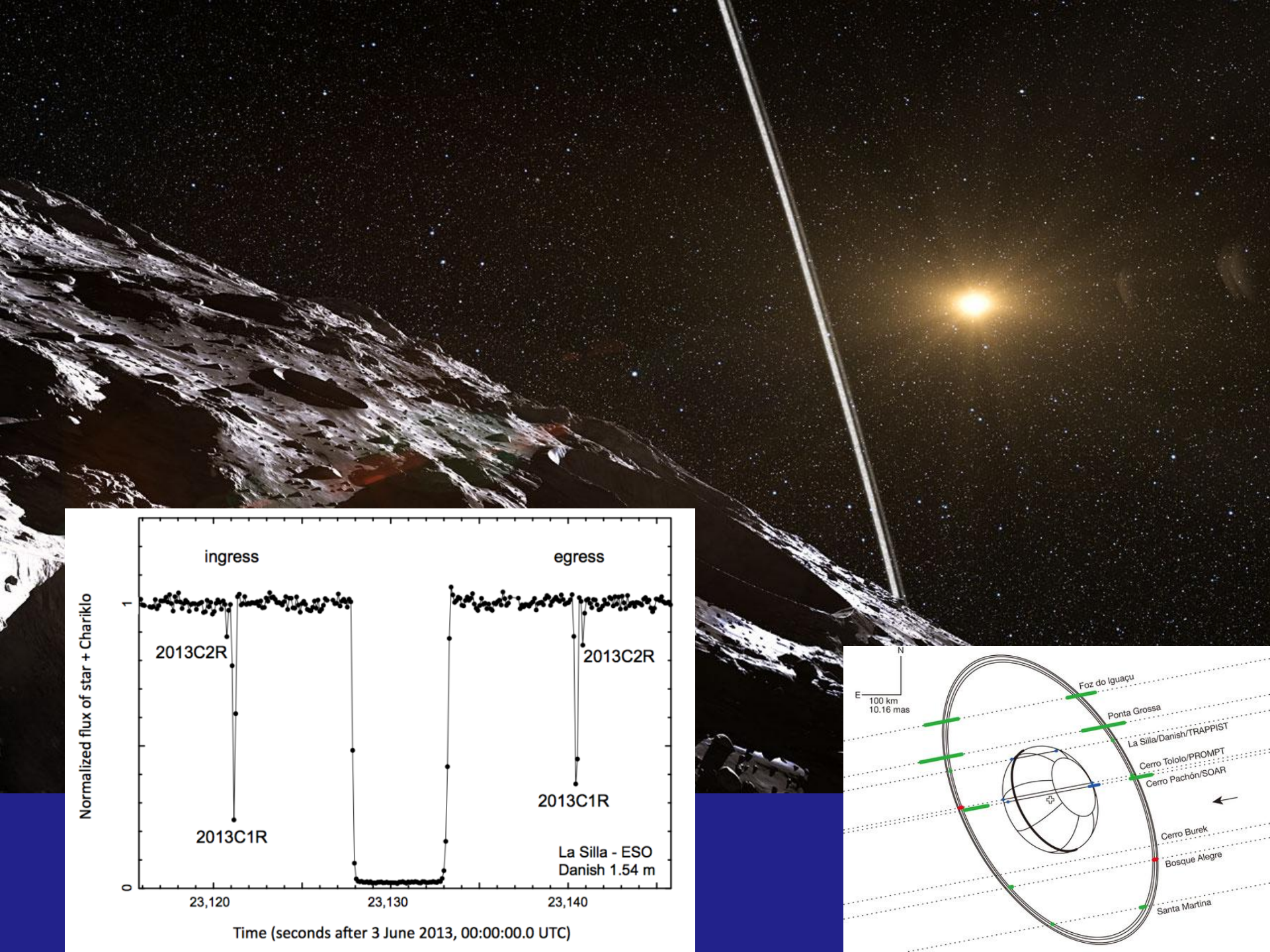


Schema in scala delle atmosfere di Terra e Plutone

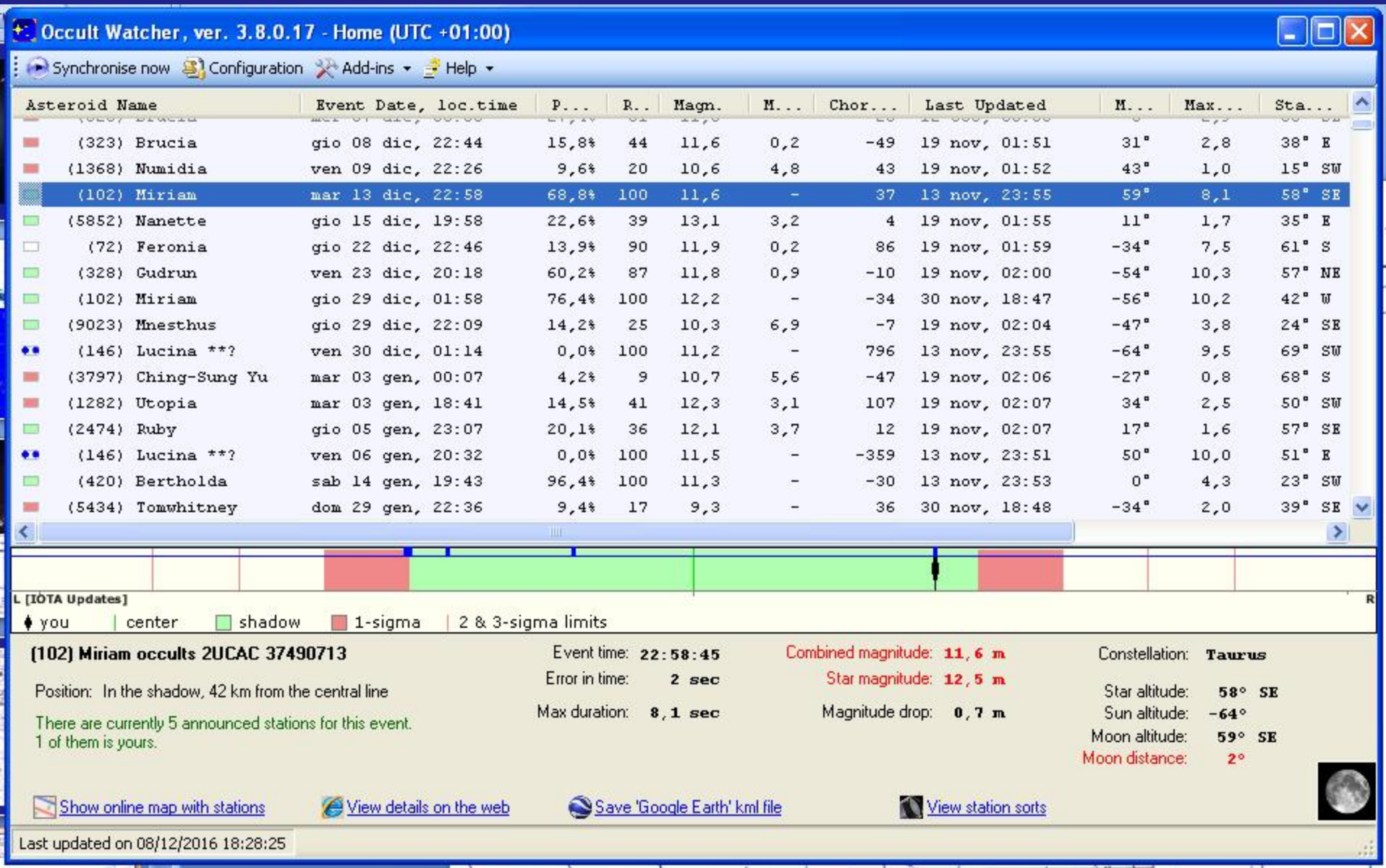


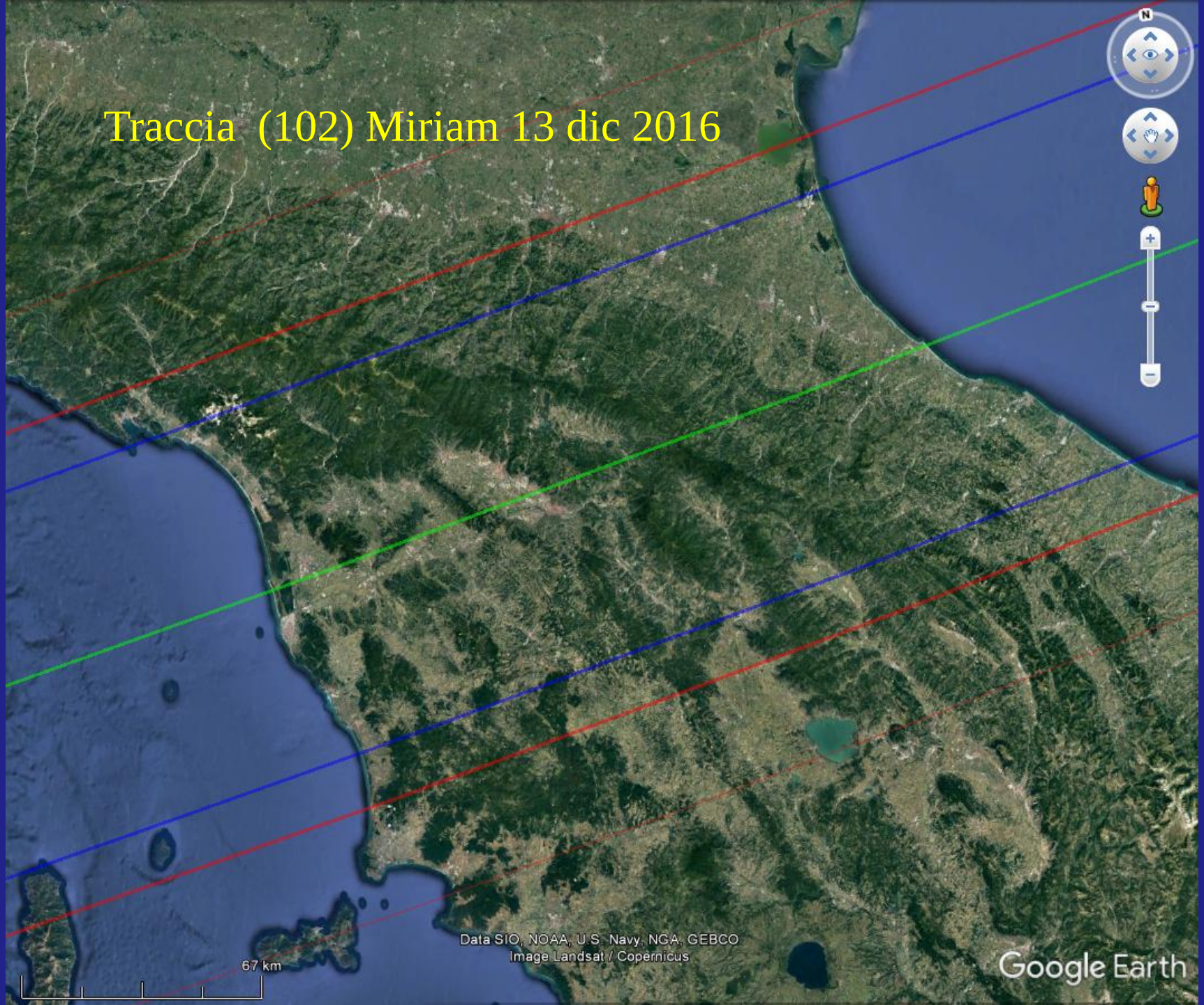


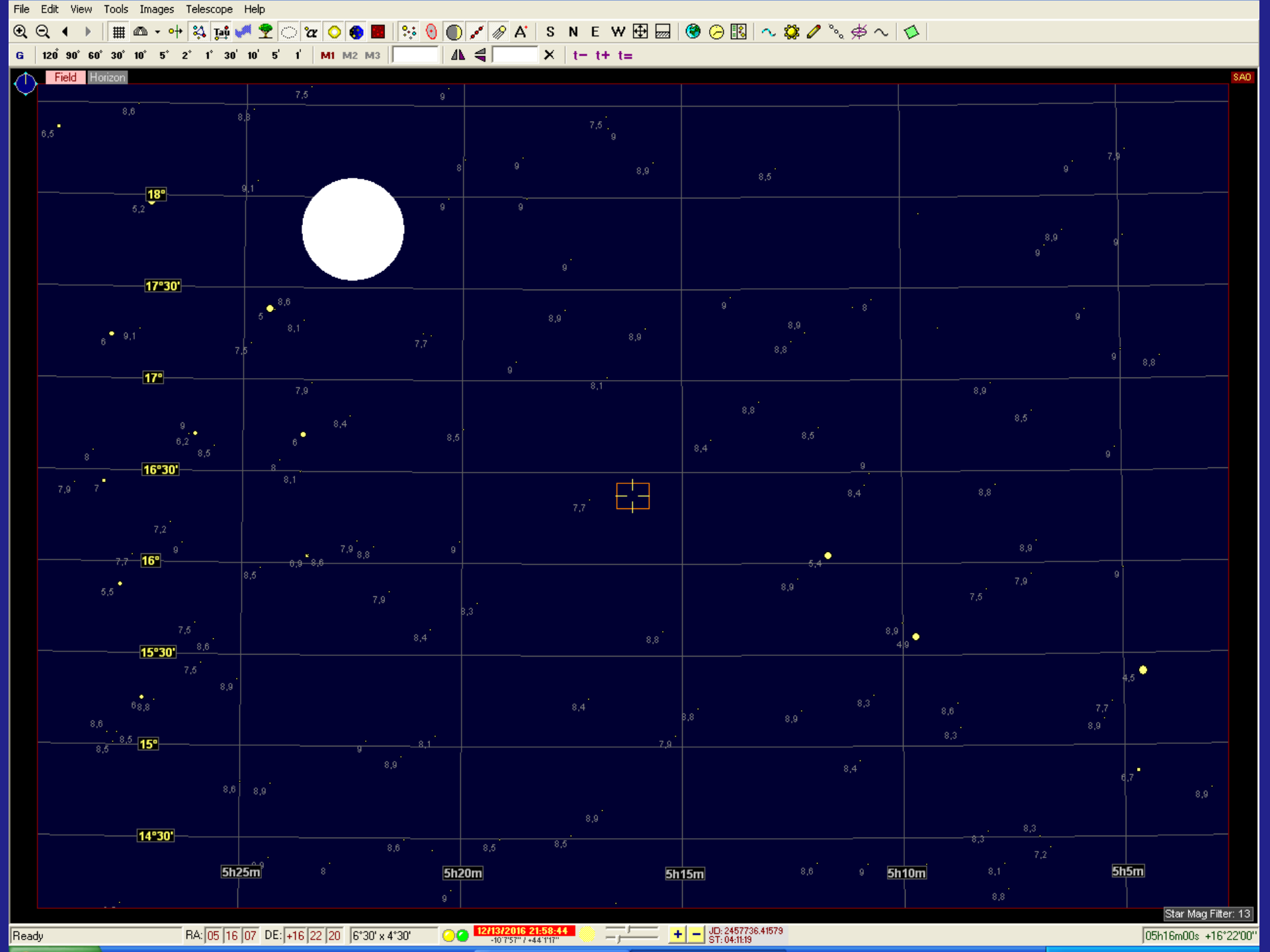
Due osservazioni di una recente occultazione prodotta da Plutone, che mostra le caratteristiche dell'atmosfera che produce una occultazione non istantanea.


ingress
egress
2013C2R
2013C2R
2013C1R
2013C1R
La Silla - ESO
Danish 1.54 m
Normalized flux of star + Chariklo
1
0
23,120
23,130
23,140
Time (seconds after 3 June 2013, 00:00:00.0 UTC)
N
E
100 km
10.16 mas
Foz do Iguaçu
Ponta Grossa
La Silla/Danish/TRAPPIST
Cerro Tololo/PROMPT
Cerro Pachón/SOAR
Cerro Burek
Bosque Alegre
Santa Martina

Le prossime…


Occult Watcher, ver. 3.8.0.17 - Home (UTC +01:00)
Synchronise now
Configuration
Add-ins
Help
Asteroid Name | Event Date, loc.time | P... | R.. | Magn. | M... | Chor... | Last Updated | M... | Max... | Sta...
(323) Brucia | gio 08 dic, 22:44 | 15,8% | 44 | 11,6 | 0,2 | -49 | 19 nov, 01:51 | 31° | 2,8 | 38° E
(1368) Numidia | ven 09 dic, 22:26 | 9,6% | 20 | 10,6 | 4,8 | 43 | 19 nov, 01:52 | 43° | 1,0 | 15° SW
(102) Miriam | mar 13 dic, 22:58 | 68,8% | 100 | 11,6 | - | 37 | 13 nov, 23:55 | 59° | 8,1 | 58° SE
(5852) Nanette | gio 15 dic, 19:58 | 22,6% | 39 | 13,1 | 3,2 | 4 | 19 nov, 01:55 | 11° | 1,7 | 35° E
(72) Feronia | gio 22 dic, 22:46 | 13,9% | 90 | 11,9 | 0,2 | 86 | 19 nov, 01:59 | -34° | 7,5 | 61° S
(328) Gudrun | ven 23 dic, 20:18 | 60,2% | 87 | 11,8 | 0,9 | -10 | 19 nov, 02:00 | -54° | 10,3 | 57° NE
(102) Miriam | gio 29 dic, 01:58 | 76,4% | 100 | 12,2 | - | -34 | 30 nov, 18:47 | -56° | 10,2 | 42° W
(9023) Mnesthus | gio 29 dic, 22:09 | 14,2% | 25 | 10,3 | 6,9 | -7 | 19 nov, 02:04 | -47° | 3,8 | 24° SE
(146) Lucina **? | ven 30 dic, 01:14 | 0,0% | 100 | 11,2 | - | 796 | 13 nov, 23:55 | -64° | 9,5 | 69° SW
(3797) Ching-Sung Yu | mar 03 gen, 00:07 | 4,2% | 9 | 10,7 | 5,6 | -47 | 19 nov, 02:06 | -27° | 0,8 | 68° S
(1282) Utopia | mar 03 gen, 18:41 | 14,5% | 41 | 12,3 | 3,1 | 107 | 19 nov, 02:07 | 34° | 2,5 | 50° SW
(2474) Ruby | gio 05 gen, 23:07 | 20,1% | 36 | 12,1 | 3,7 | 12 | 19 nov, 02:07 | 17° | 1,6 | 57° SE
(146) Lucina **? | ven 06 gen, 20:32 | 0,0% | 100 | 11,5 | - | -359 | 13 nov, 23:51 | 50° | 10,0 | 51° E
(420) Bertholda | sab 14 gen, 19:43 | 96,4% | 100 | 11,3 | - | -30 | 13 nov, 23:53 | 0° | 4,3 | 23° SW
(5434) Tomwhitney | dom 29 gen, 22:36 | 9,4% | 17 | 9,3 | - | 36 | 30 nov, 18:48 | -34° | 2,0 | 39° SE
L [IOTA Updates] R
you | center | shadow | 1-sigma | 2 & 3-sigma limits
(102) Miriam occults 2UCAC 37490713
Position: In the shadow, 42 km from the central line
There are currently 5 announced stations for this event.
1 of them is yours.
Event time: 22:58:45
Error in time: 2 sec
Max duration: 8,1 sec
Combined magnitude: 11,6 m
Star magnitude: 12,5 m
Magnitude drop: 0,7 m
Constellation: Taurus
Star altitude: 58° SE
Sun altitude: -64°
Moon altitude: 59° SE
Moon distance: 2°
Show online map with stations
View details on the web
Save 'Google Earth' kml file
View station sorts
Last updated on 08/12/2016 18:28:25


Traccia (102) Miriam 13 dic 2016
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
67 km
Google Earth

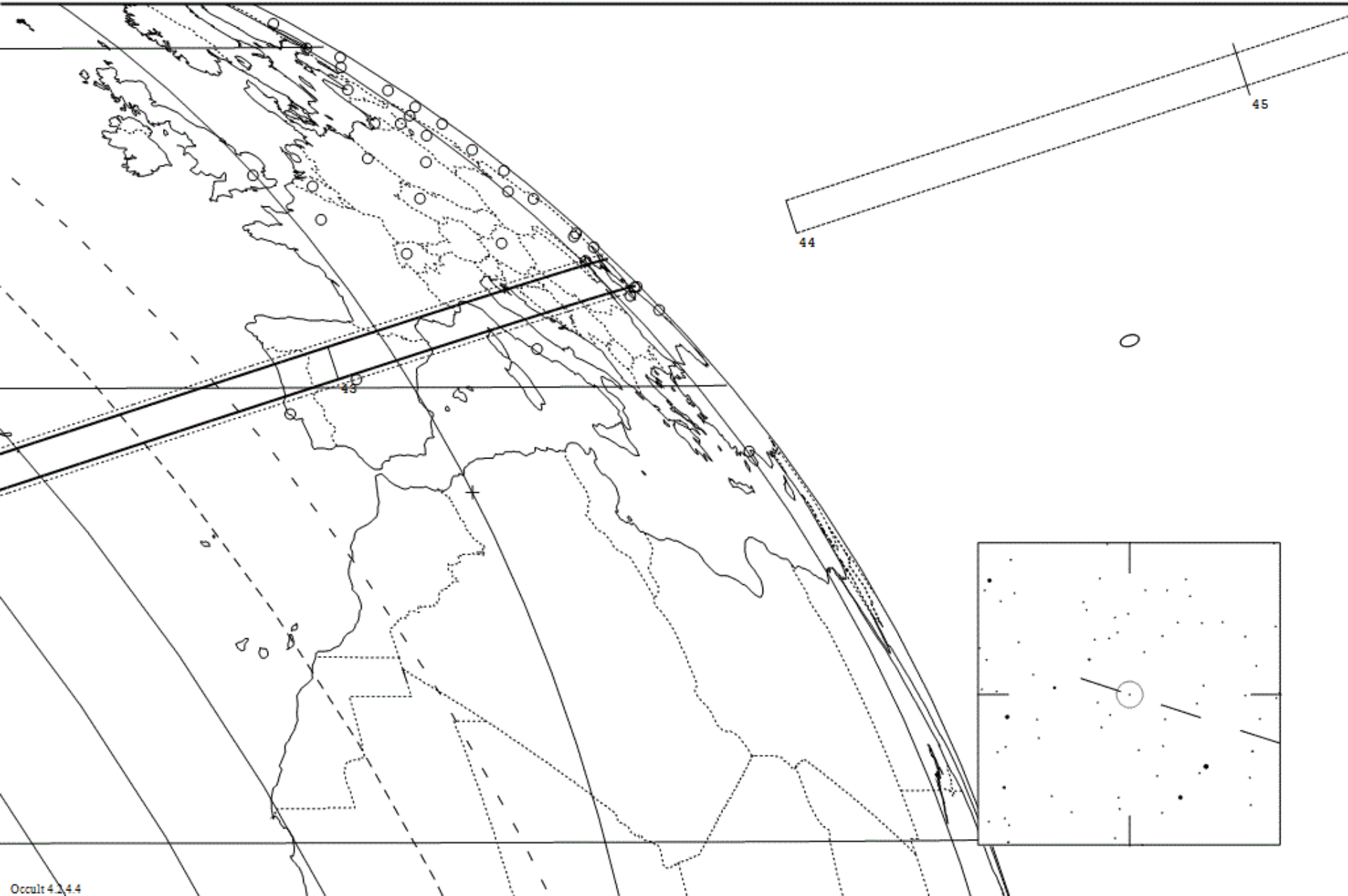

File Edit View Tools Images Telescope Help
Field Horizon
SAO
18°
17°30'
17°
16°30'
16°
15°30'
15°
14°30'
5h25m
5h20m
5h15m
5h10m
5h5m
Star Mag Filter: 13
Ready
RA: 05 16 07 DE: +16 22 20
6°30' x 4°30'
12/13/2016 21:58:44
JD: 2457736.41579
ST: 04:11:19
05h16m00s +16°22'00"

420 Bertholda occults TYC 0576-01087-1 on 2017 Jan 14 from 18h 38m to 18h 44m UT

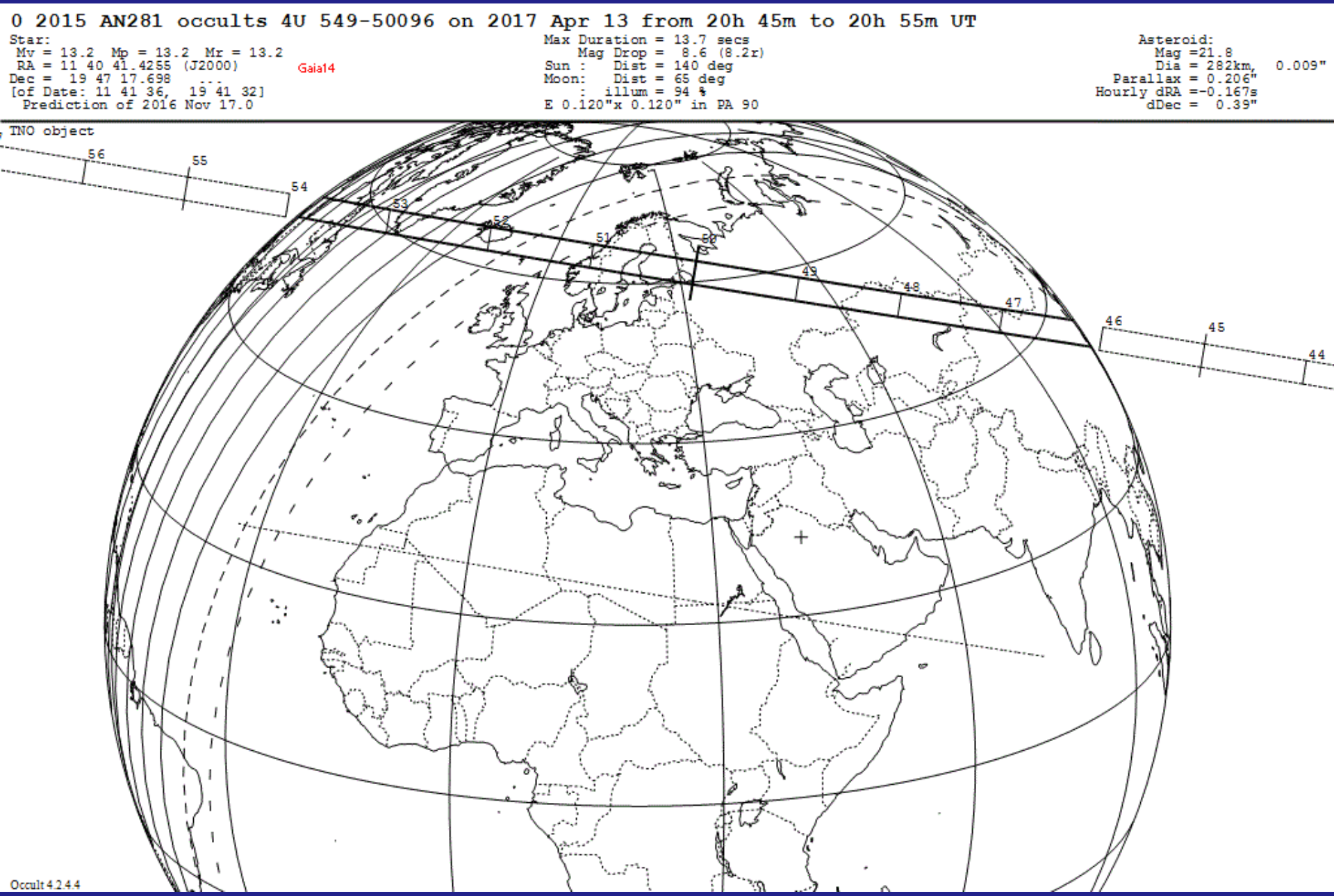
Star:
Mv = 11.3
RA = 23 9 46.4912 (J2000)
Dec = 0 10 41.505 ...
[of Date: 23 10 38, 0 16 11]
Prediction of 2016 Nov 12.0

Max Duration = 4.3 secs
Mag Drop = 3.4
Sun : Dist = 54 deg
Moon: Dist =156 deg
: illum = 93 %
E 0.014"x 0.008" in PA 73

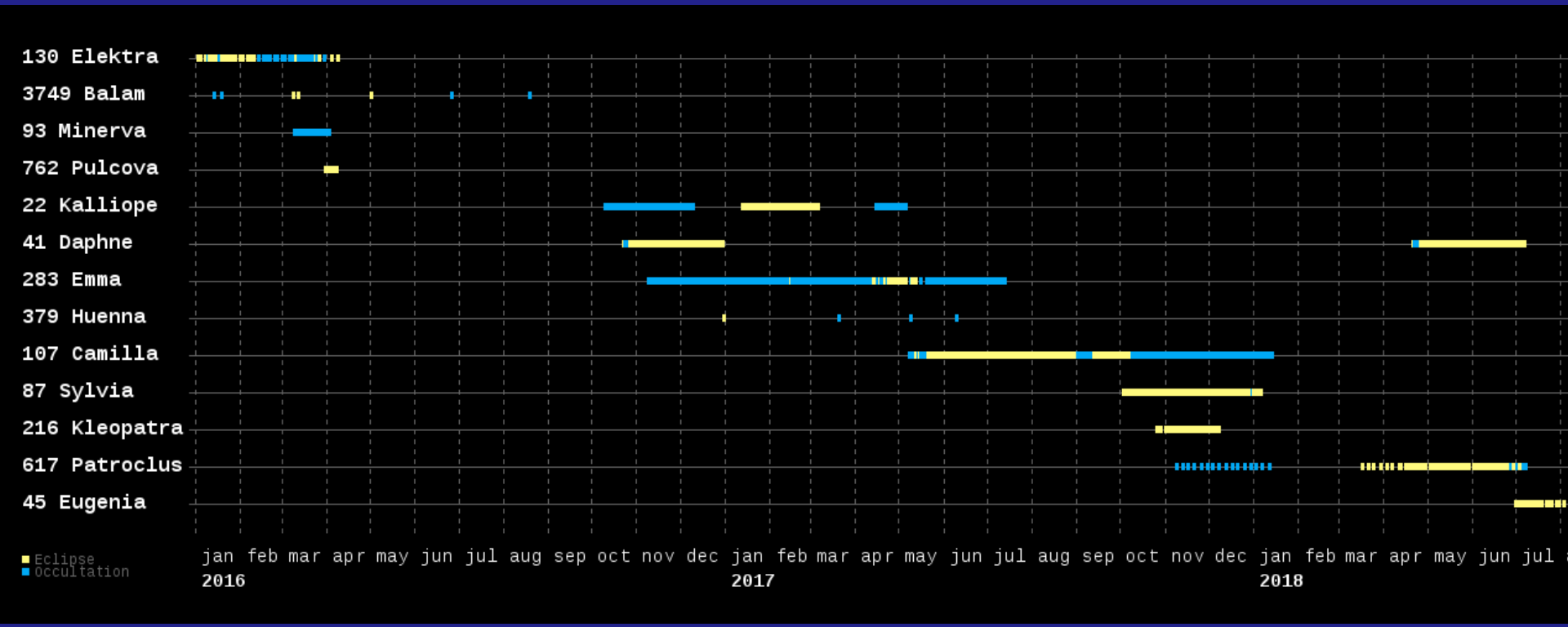
Asteroid:
Mag =14.7
Dia = 144km, 0.050"
Parallax = 2.230"
Hourly dRA = 2.647s
dDec = 13.02"




Traccia (420) Bertholda 14 gen 2017
79 km
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google


0 2015 AN281 occults 4U 549-50096 on 2017 Apr 13 from 20h 45m to 20h 55m UT
Star:
Mv = 13.2 Mp = 13.2 Mr = 13.2
RA = 11 40 41.4255 (J2000)
Dec = 19 47 17.698
[of Date: 11 41 36, 19 41 32]
Prediction of 2016 Nov 17.0
Gaia14
Max Duration = 13.7 secs
Mag Drop = 8.6 (8.2r)
Sun : Dist = 140 deg
Moon: Dist = 65 deg
: illum = 94 %
E 0.120"x 0.120" in PA 90
Asteroid:
Mag =21.8
Dia = 282km, 0.009"
Parallax = 0.206"
Hourly dRA =-0.167s
dDec = 0.39"
TNO object
56
55
54
53
52
51
50
49
48
47
46
45
44
Occult 4.2.4.4

Per palati astrofili sopraffini…



Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Conditions for mutual events:
- Asteroidal system at annual equinoxe
- The orbital plane of Linus is close to the Sun‘s line of sight.

What can be observed:
- Eclipses and occultations by the two bodies itself

Mutual Events of Binary Asteroid (22) Kalliope in 2016 and 2017

Top 7 mutual events for Europe ~10.5 mag
(calculated by F. Vachier, IMCCE)

(sorted by mag drop)

Date	*Time (UT)*	*Dur*	*Event*	*Drop*
2016-12-10	05:15 - 05:57	00:42	S1 occ K	0.132
2017-01-15	04:15 - 05:41	01:26	S1 ecl K	0.121
2016-12-04	19:25 - 21:06	01:41	K occ S1	0.118
2017-01-16	23:10 - 00:56	01:45	K ecl S1	0.117
2016-12-03	00:17 - 02:09	01:51	S1 occ K	0.115
2017-01-18	18:14 - 20:14	02:00	S1 ecl K	0.113
2016-12-01	05:03 - 07:05	02:02	K occ S1	0.111

Opposition of (22) Kalliope: 2016 Dec 28