Center of Research in Astronomy, Astrophysics and Geophysics
(Algiers Observatory)

Analysis of stellar occultation from the observation of 2011 WG57, 2005 RM45 and 38628 Huya KBO targets in Algiers Observatory

Presented by :
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Outline

- Introduction
- Presentation of the stellar occultation by **2011 WG57, 2005 RM45** and **38628 Huya** Kuiper Object
- Participative Astronomy in the field of the stellar occultation by asteroids in Algeria
- Study of stellar occultation by Near Earth Asteroids
- Near Futur prospects
- Summary

Introduction

When I came in 2014 to participate in the 33rd ESOP in Prague, I was just starting to get results with very little knowledge but I was very interested to study stellar occultation by asteroids.

Now, after several participations in ESOP, I have accumulated a great experience and I share my passion with others occultationnists around the world.

Algiers Observatory in 1890

Algiers Observatory now

The Centre for Research in Astronomy Astrophysics and Geophysics (CRAAG) comes from the creation of the Algiers Observatory in 1890.

64 asteroids were discovered including 858 El Djezair on May 26th 1916 and 859 Bouzareah on October 2nd 1916 by the french astronomer Frederic Sy. The first asteroid has the arabic name of the city of Algiers and the second has the arabic name of the village where the observatory built.

Today in the CRAAG, we are very interested to study and observe stellar occultation by asteroids and we have obtained some positive results.

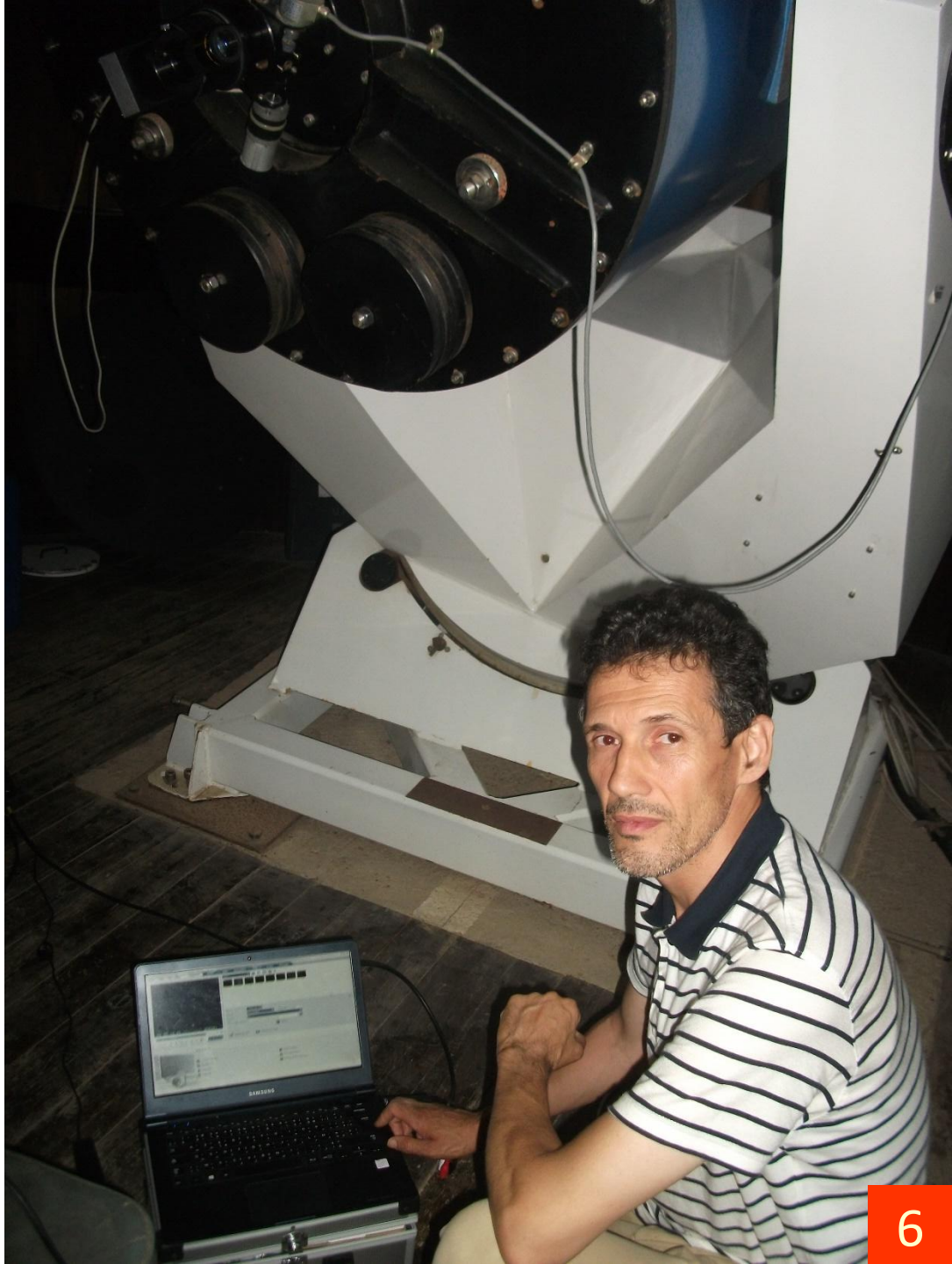
Here are the instruments that we use for observation :

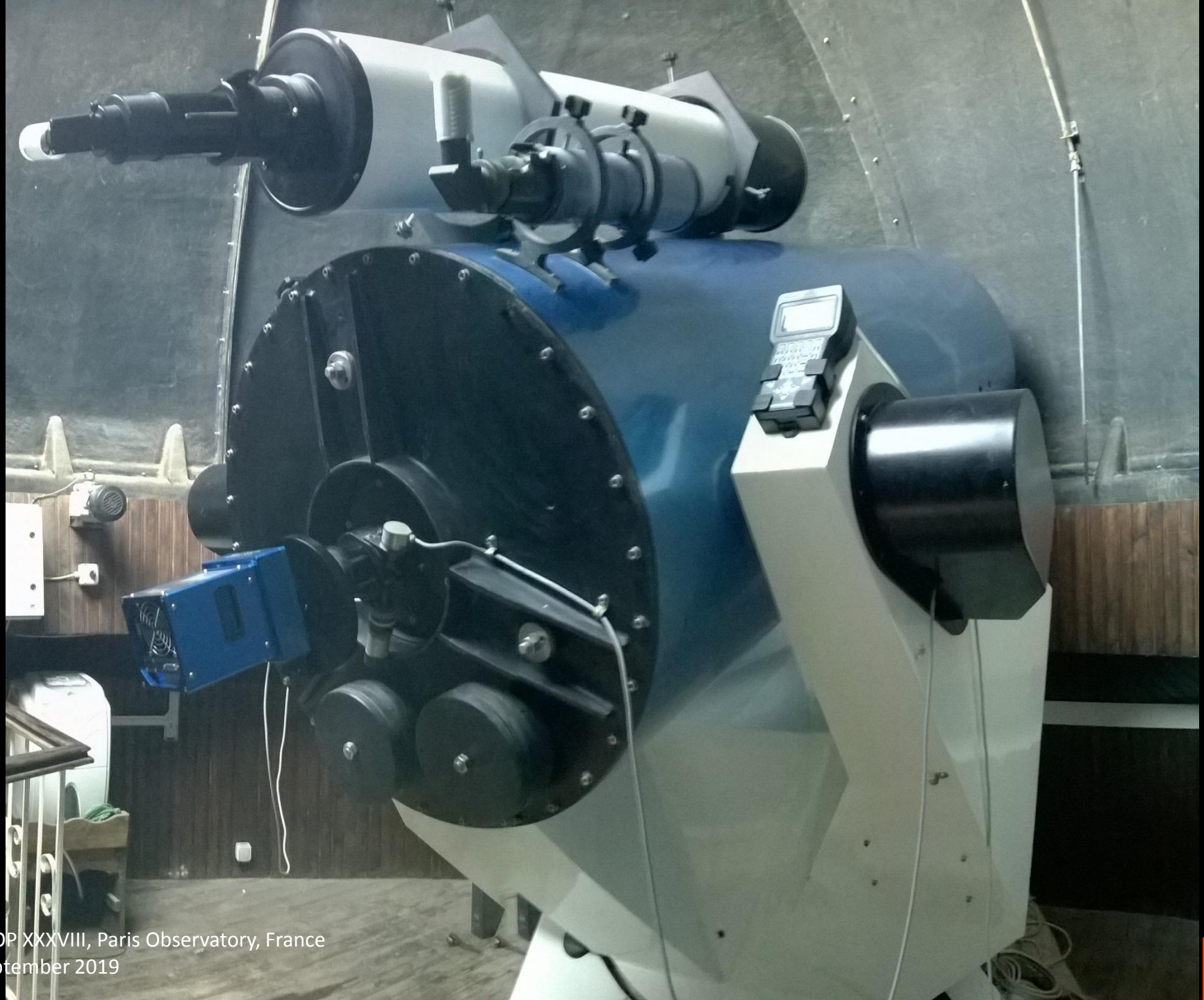
1 – Instruments that we can be moved throughout Algiers

- Two Celestron 8 with CGEM mount
- One Celestron 11 with CGEM mount
- One Celestron 11 with CGE Pro mount
- One Meade 12 LX200

2 – Fixed Instruments at Algiers Observatory

- A 200 mm Apochromatique Refractor guide F/D 9
- Richtey-Chretien Telescope 810 mm F=6400 mm





Since July 2019, we have got 3 kits of IOTA occultation which contains, a video camera Watec 910HX/RC (CCIR/PAL), a IOTA video time Inserter and a Grabber.

We wish to buy 2 camera QHY174GPS Mono in 2020.

Presentation of stellar occultation by 2011 WG57, 2005 RM45 and 38628 Huya Kuiper Object

Since my last year I have observed 8 stellar occultations by asteroids, by **Lysithea** (satellite of Jupiter), centaur and a Kuiper object.

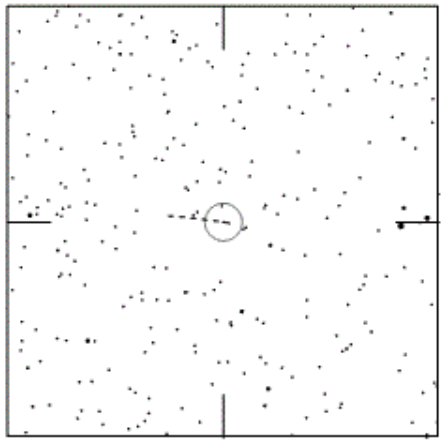
I obtained **two positives occultations**.

0 2011 WG157 occults TYC 2852-01417-1 on 2018 Nov 7 from 19h 1m to 19h 10m UT

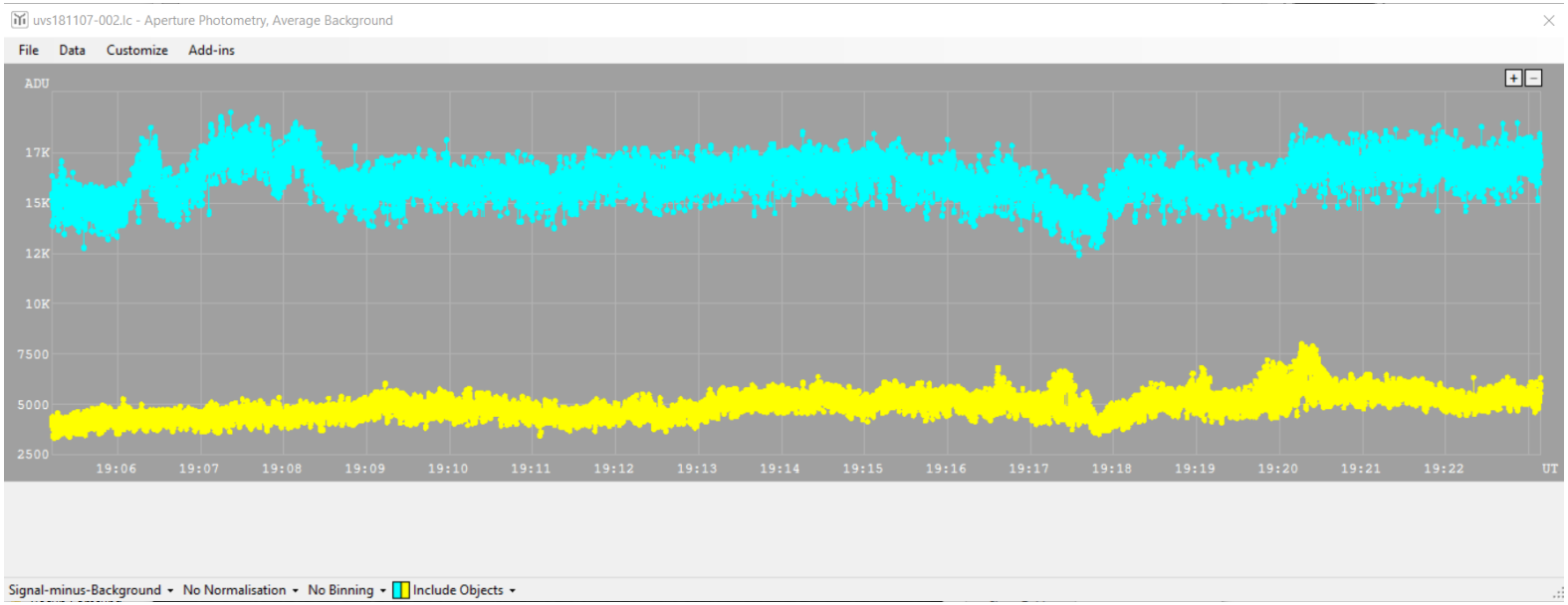
Star:
Mag V = 11.9
RA = 3 18 26.2066 (J2000)
Dec = 40 8 28.948 ...
[of Date: 3 19 41, 40 12 29]
Prediction of 2018 Sep 14.0

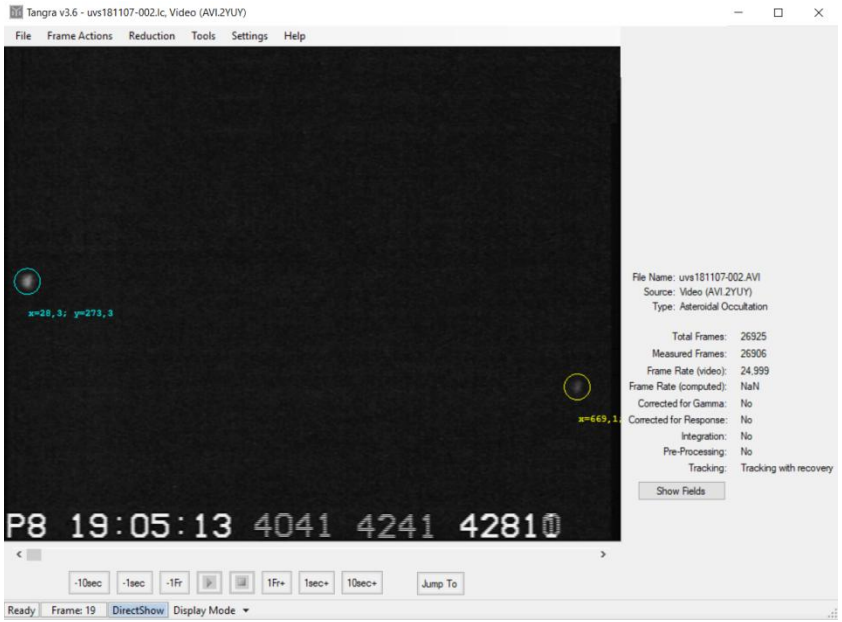
Max Duration = 4.8 secs
Mag Drop = 10.1 (0.0r)
Sun : Dist = 156°
Moon: Dist = 152°
: illum = 0 %
E 1.369"x 0.533" in PA 65

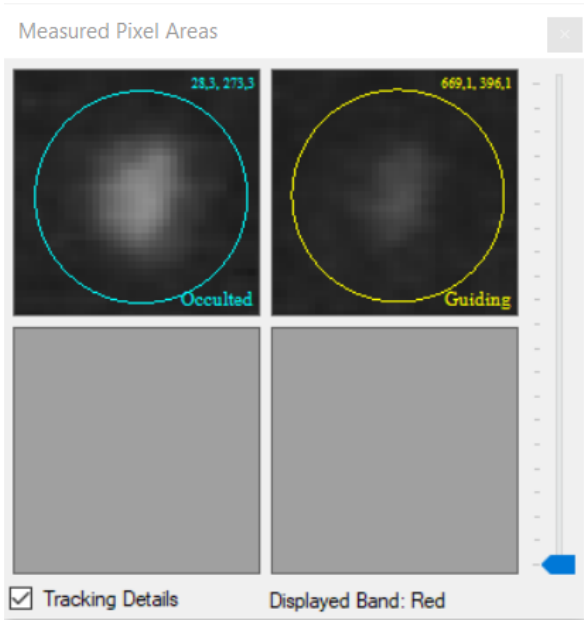
Asteroid:
Mag = 22.1
Dia = 117km, 0.005"
Parallax = 0.295"
Hourly dRA =-0.349s
dDec = -0.60"



Occult 4.5.11.0, Preston2017May18 Errors: Known errors


uvs181107-002.lc - Aperture Photometry, Average Background
File Data Customize Add-ins
ADU
17K
15K
12K
10K
7500
5000
2500
19:06 19:07 19:08 19:09 19:10 19:11 19:12 19:13 19:14 19:15 19:16 19:17 19:18 19:19 19:20 19:21 19:22 UT
Signal-minus-Background
No Normalisation
No Binning
Include Objects


Tangra v3.6 - uvs181107-002.lc, Video (AVI.2YUY)
File Frame Actions Reduction Tools Settings Help
x=28,3; y=273,3
x=669,1
P8 19:05:13 4041 4241 42810
File Name: uvs181107-002.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 26925
Measured Frames: 26906
Frame Rate (video): 24.999
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: Tracking with recovery
Show Fields
-10sec -1sec -1Fr 1Fr+ 1sec+ 10sec+ Jump To
Ready Frame: 19 DirectShow Display Mode


Measured Pixel Areas
28,3, 273,3
669,1, 396,1
Occulted
Guiding
Tracking Details
Displayed Band: Red

145451 145451 2005RM43 occults UCAC4 534-010144 on 2018 Dec 24 from 2h 19m to 2h 29m UT

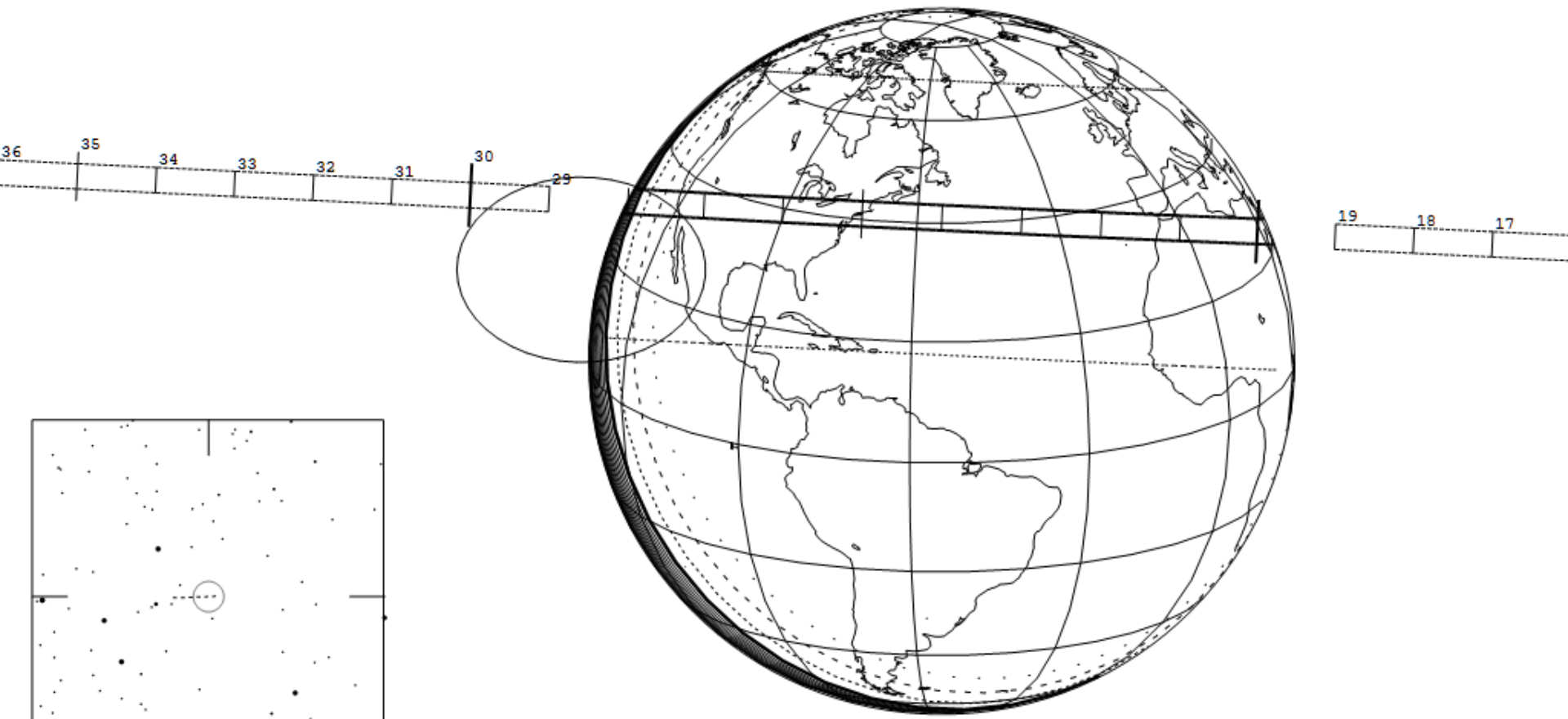
Star:
Mag V = 13.4; R = 9.9
RA = 4 52 51.2385 (J2000)
Dec = 16 45 24.165 ...
[of Date: 4 53 57, 16 47 8]
Prediction of 2018 Dec 12.0

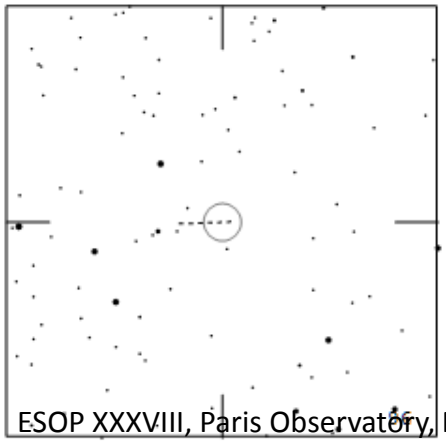
Max Duration = 19.3 secs
Mag Drop = 6.7 (9.8r)
Sun : Dist = 161°
Moon: Dist = 37°
: illum = 97 %
E 0.086"x 0.064" in PA 90

Asteroid:
Mag = 20.1
Dia = 457km, 0.017"
Parallax = 0.244"
Hourly dRA =-0.059s
dDec = 0.00"

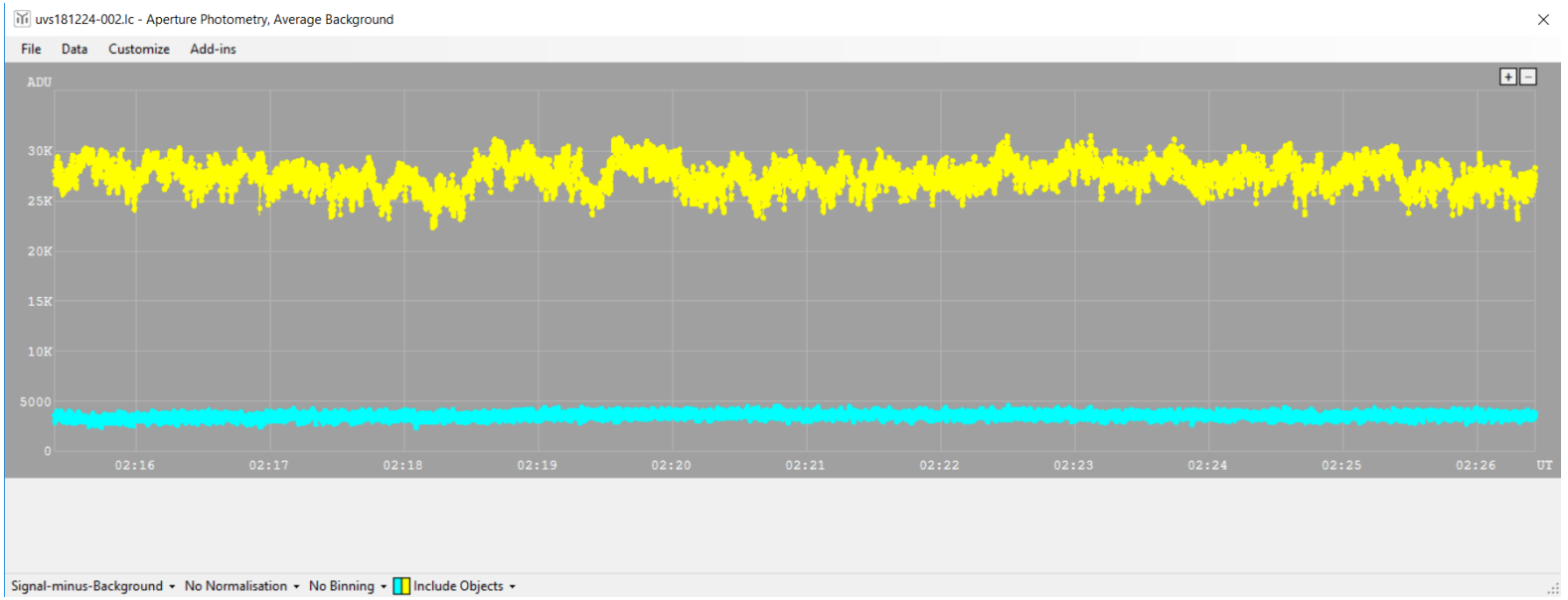
Prediction is from the LuckyStar feed. Report any observations to LESIA [Paris Obs]

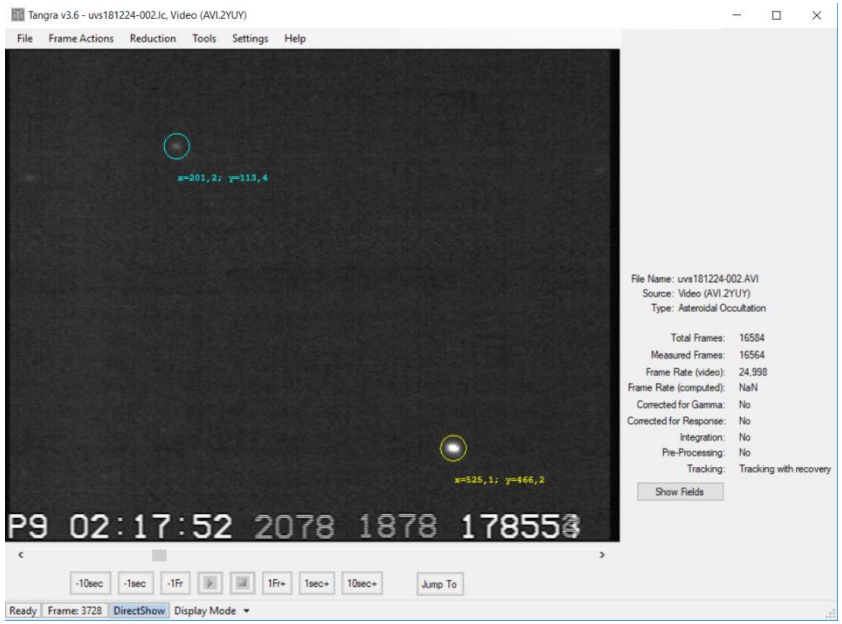
Centaur

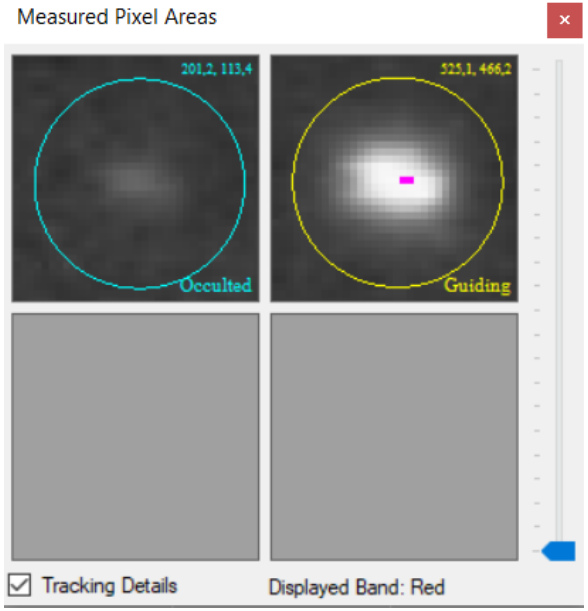


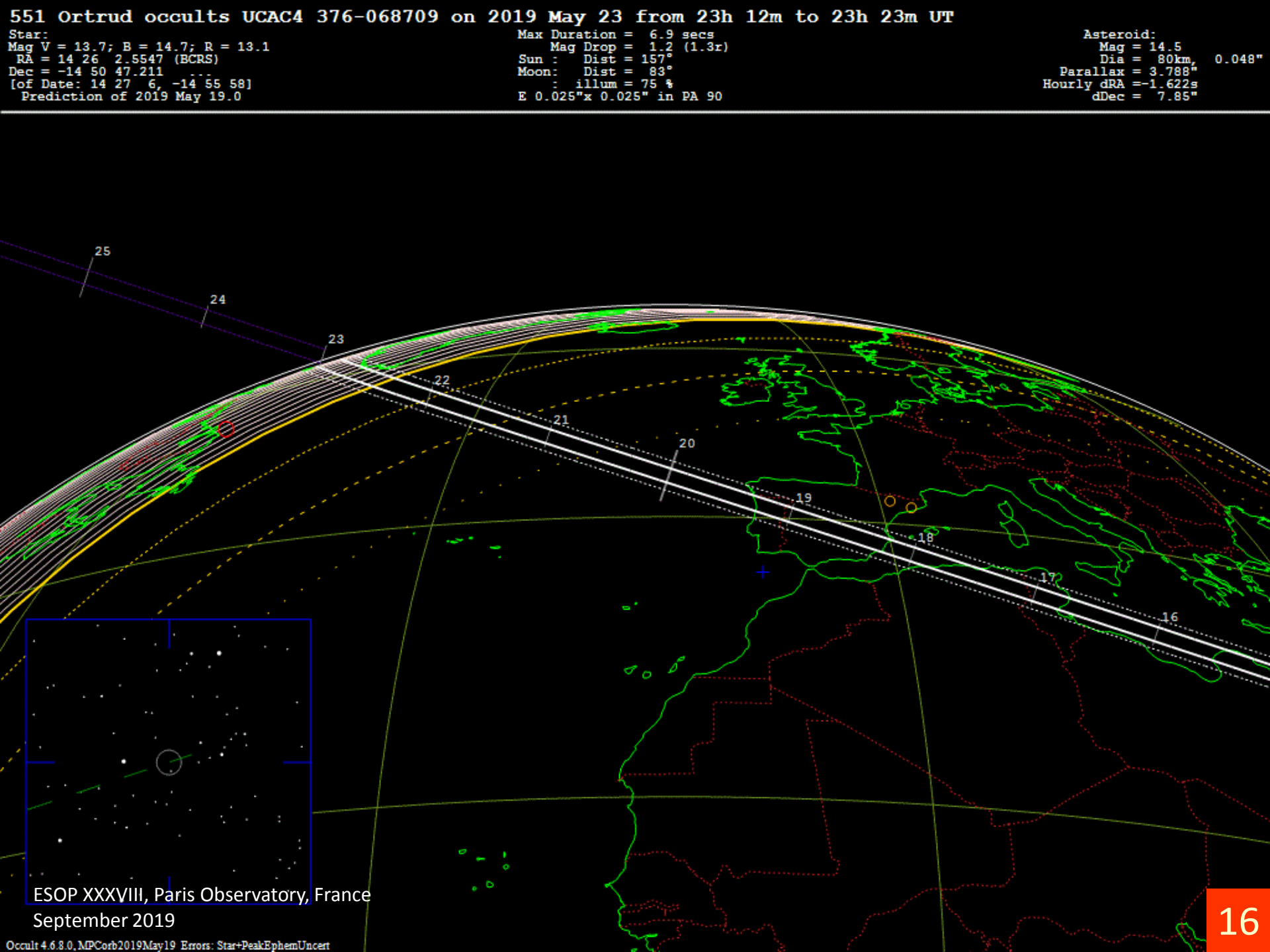


Occult 4.6.0.0, LuckyStar: GaiaDR1_NIMA ephem. Errors: Star+Asteroid

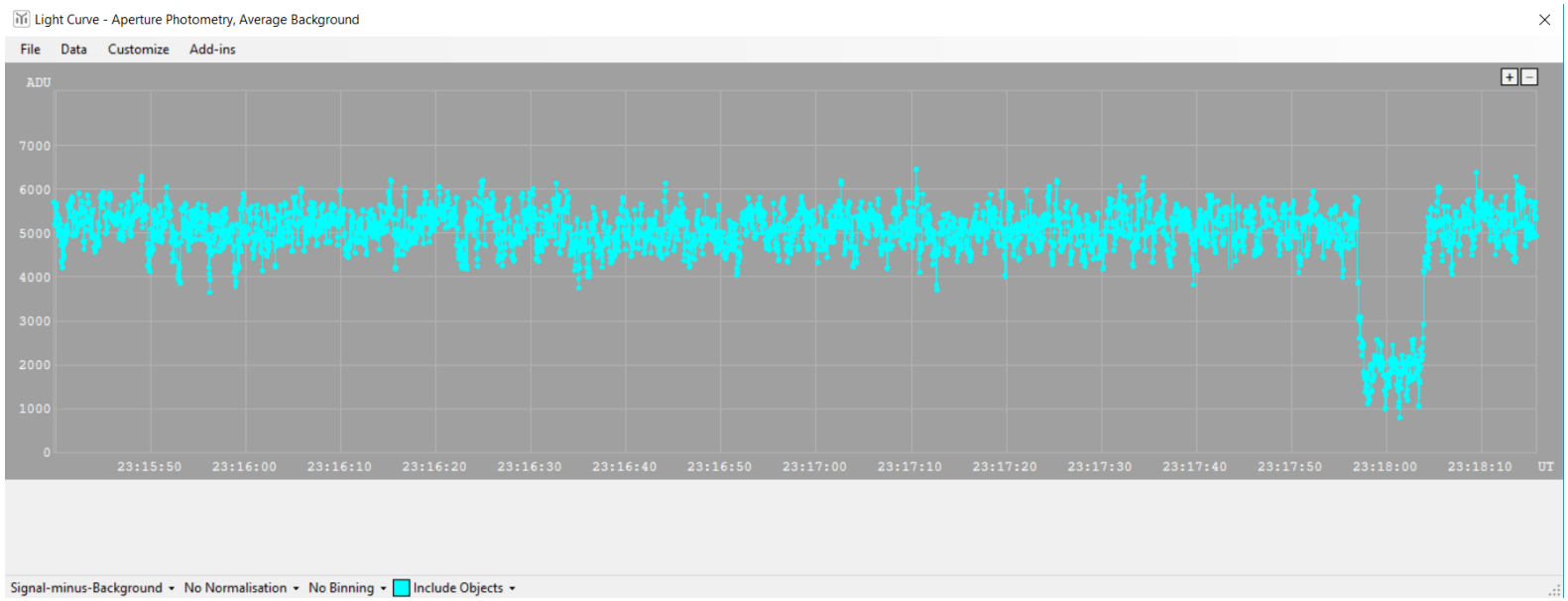

uvs181224-002.lc - Aperture Photometry, Average Background
File Data Customize Add-ins
ADU
30K
25K
20K
15K
10K
5000
0
02:16 02:17 02:18 02:19 02:20 02:21 02:22 02:23 02:24 02:25 02:26 UT
Signal-minus-Background
No Normalisation
No Binning
Include Objects

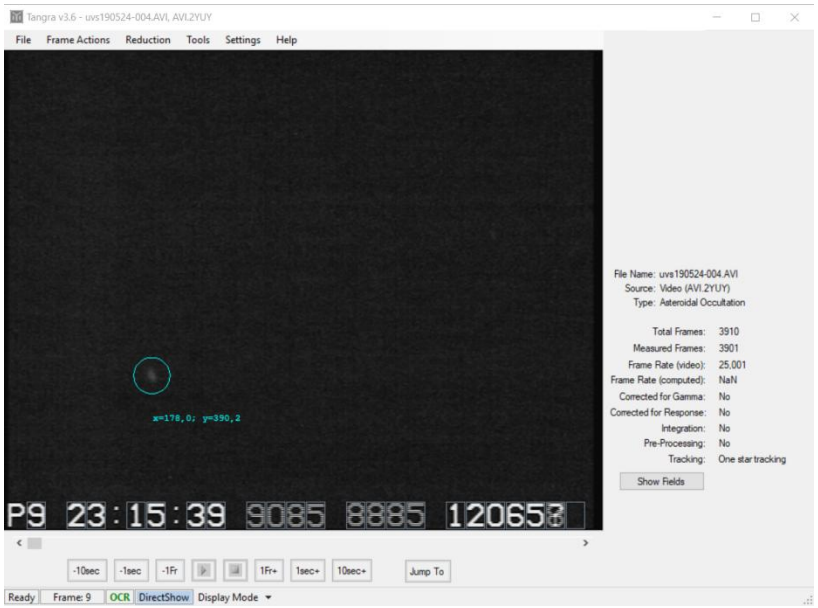

Tangra v3.6 - uvs181224-002.lc, Video (AVI.2YUY)
File Frame Actions Reduction Tools Settings Help
x=201,2; y=113,4
x=525,1; y=466,2
P9 02:17:52 2078 1878 178553
File Name: uvs181224-002.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 16584
Measured Frames: 16564
Frame Rate (video): 24,998
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: Tracking with recovery
Show Fields
-10sec -1sec -1Fr 1Fr+ 1sec+ 10sec+ Jump To
Ready Frame: 3728 DirectShow Display Mode

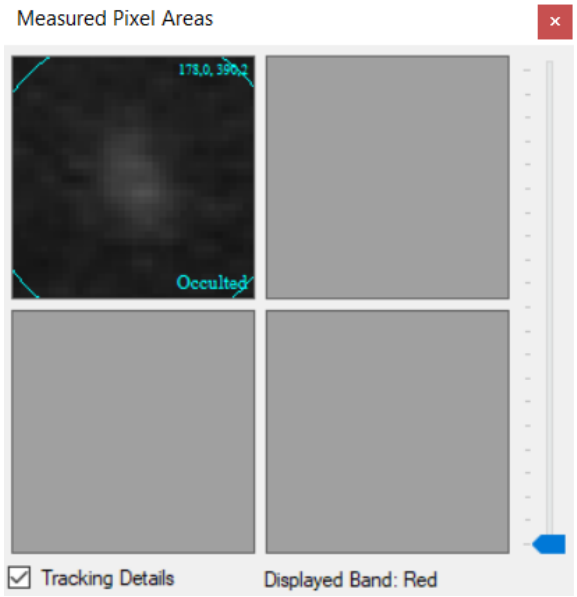

Measured Pixel Areas
201,2, 113,4
525,1, 466,2
Occulted
Guiding
Tracking Details
Displayed Band: Red



ESOP XXXVIII, Paris Observatory, France
September 2019


Light Curve - Aperture Photometry, Average Background
File
Data
Customize
Add-ins
ADU
7000
6000
5000
4000
3000
2000
1000
0
23:15:50
23:16:00
23:16:10
23:16:20
23:16:30
23:16:40
23:16:50
23:17:00
23:17:10
23:17:20
23:17:30
23:17:40
23:17:50
23:18:00
23:18:10
UT
Signal-minus-Background
No Normalisation
No Binning
Include Objects


File
Frame Actions
Reduction
Tools
Settings
Help
x=178,0; y=390,2
P9 23:15:39 9085 8885 120658
File Name: uvs190524-004.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 3910
Measured Frames: 3901
Frame Rate (video): 25,001
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: One star tracking
Show Fields
-10sec
-1sec
-1Fr
1Fr+
1sec+
10sec+
Jump To
Ready
Frame: 9
OCR
DirectShow
Display Mode

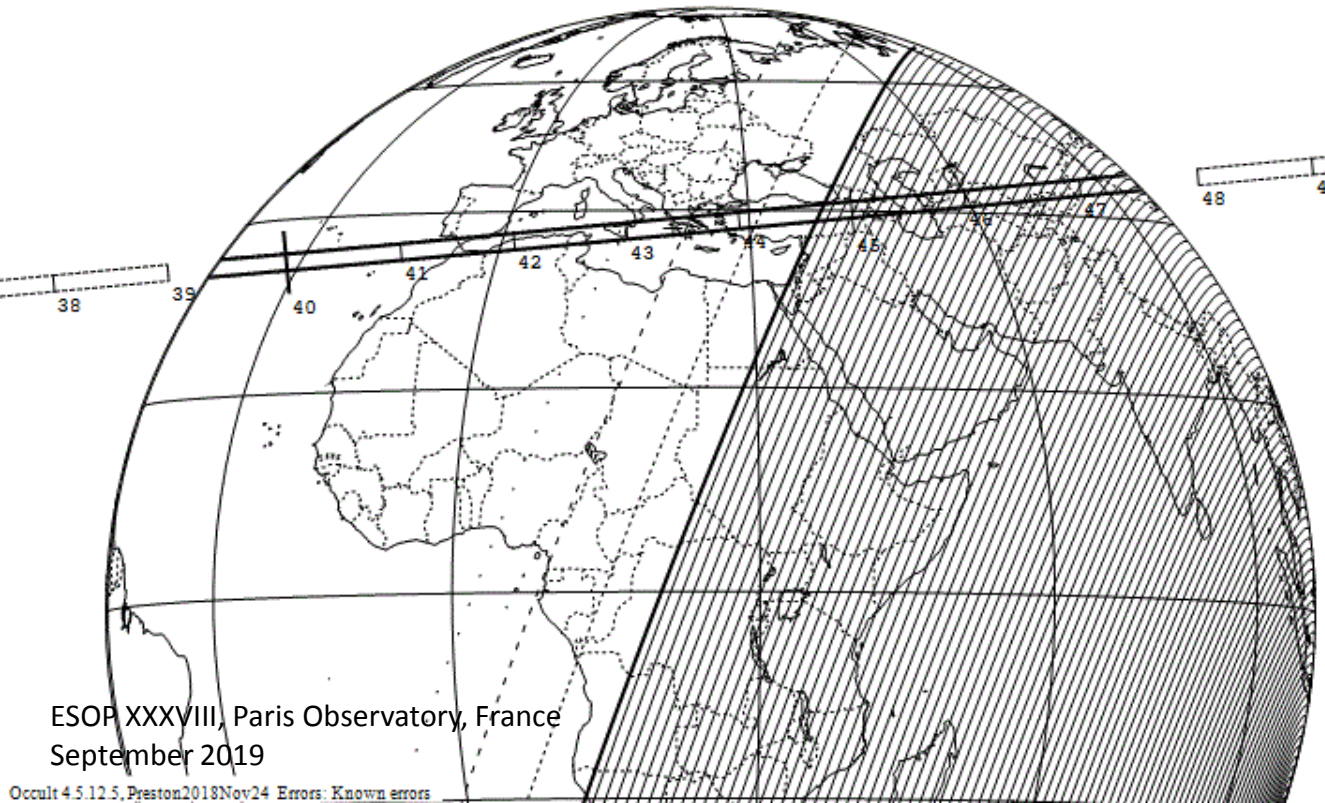

Measured Pixel Areas
178,0, 390,2
Occulted
Tracking Details
Displayed Band: Red

194 Prokne occults UCAC4-440-057201 on 2019 Jan 16 from 4h 39m to 4h 48m UT

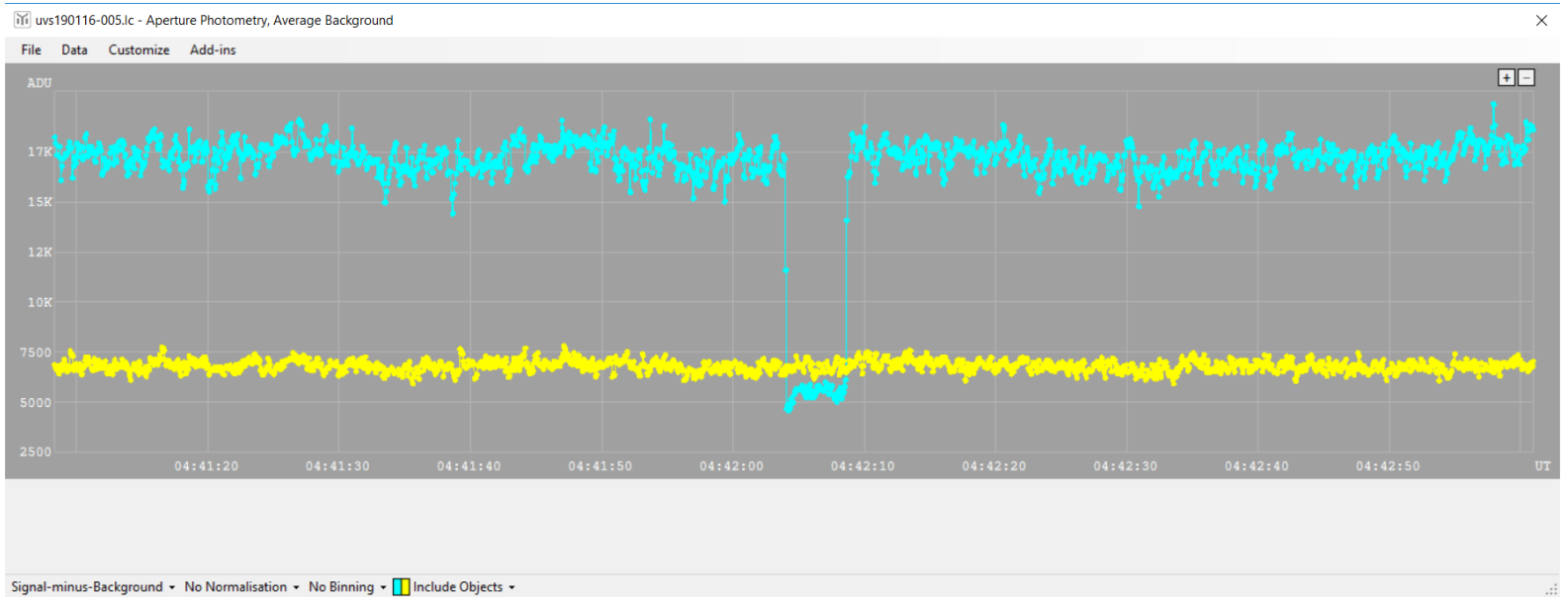
Star:
Mag V = 11.5
RA = 14 4 59.1950 (J2000)
Dec = - 2 1 18.505 ...
[of Date: 14 5 57, - 2 6 40]
Prediction of 2018 Nov 24.0

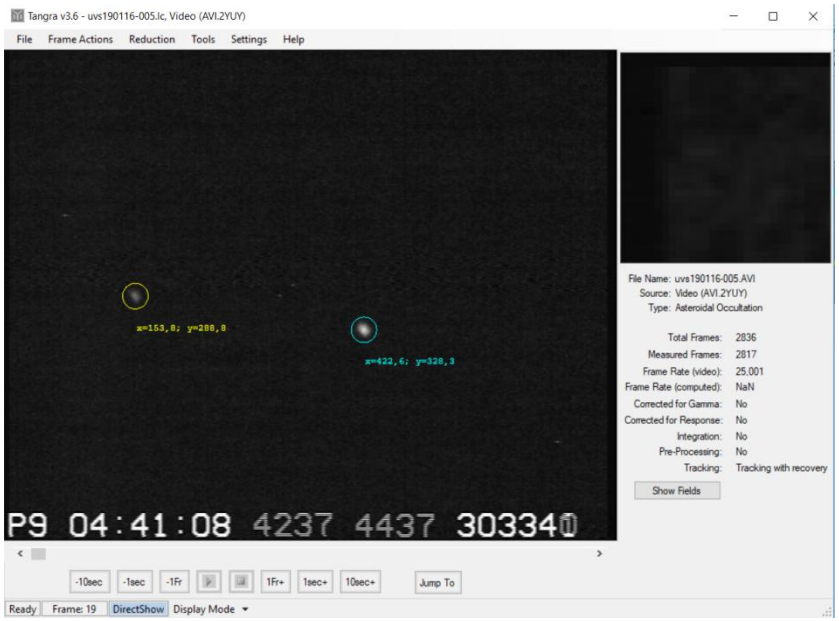
Max Duration = 8.5 secs
Mag Drop = 2.0 (0.0r)
Sun : Dist = 86°
Moon: Dist = 161°
: illum = 69 %
E 0.008"x 0.005" in PA 97

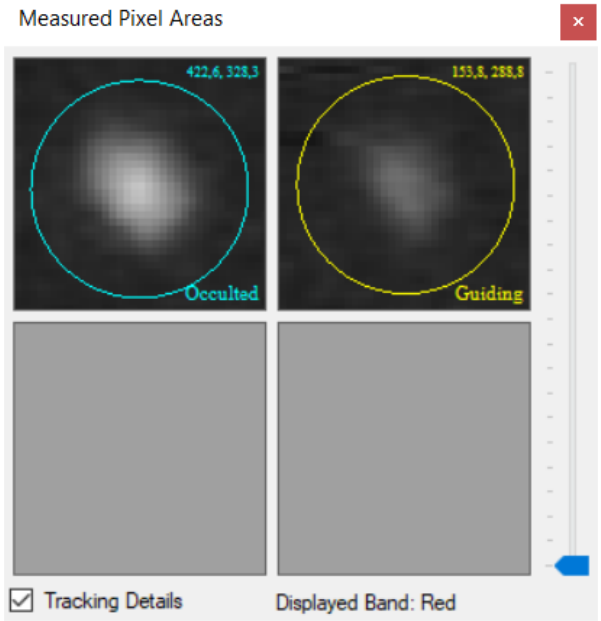
Asteroid:
Mag = 13.3
Dia = 171km, 0.083"
Parallax = 3.109"
Hourly dRA = 2.355s
dDec = 3.28"

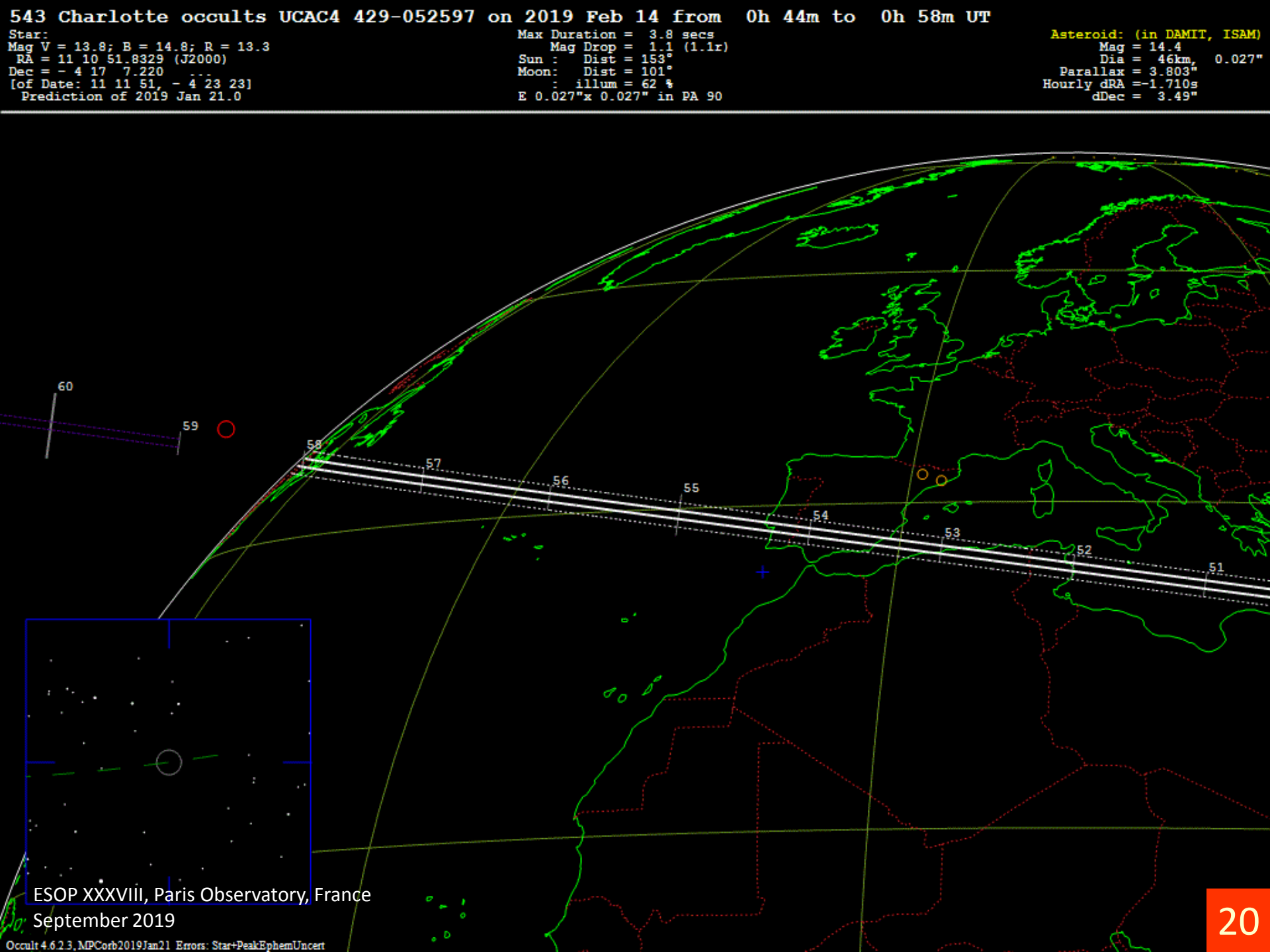


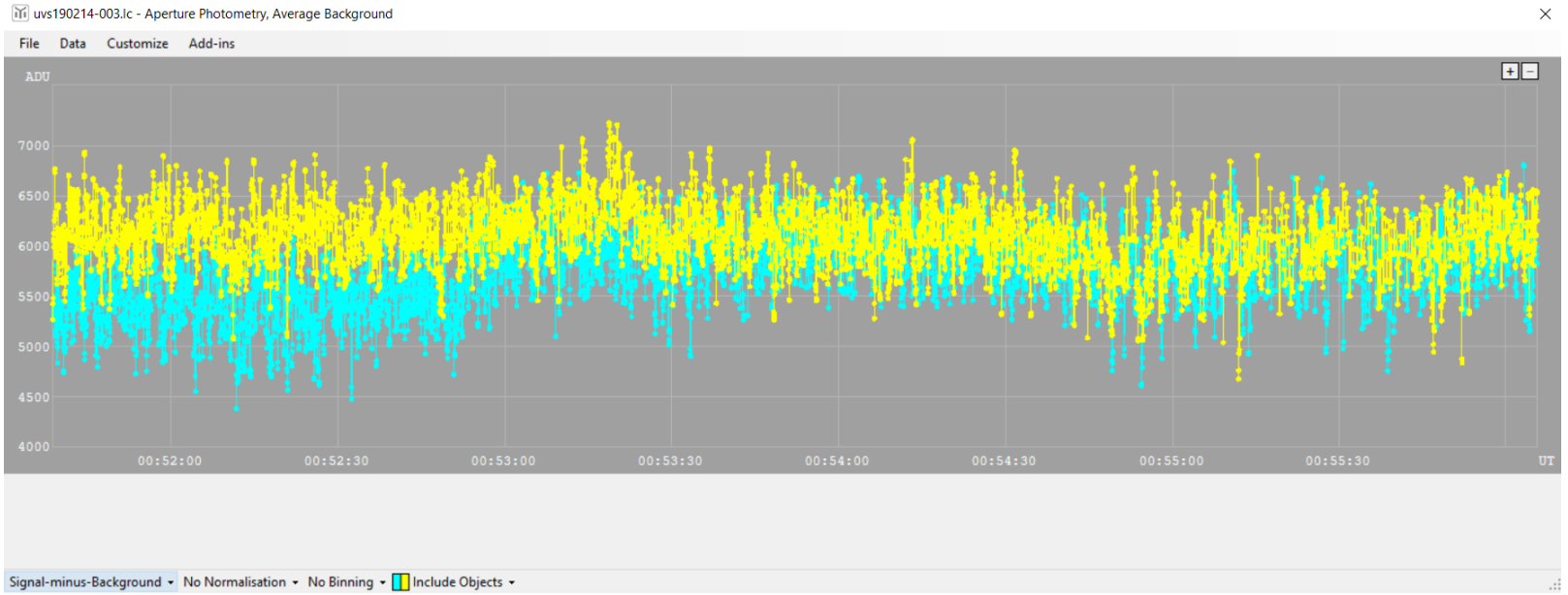
Occult 4.5.12.5, Preston2018Nov24 Errors: Known errors

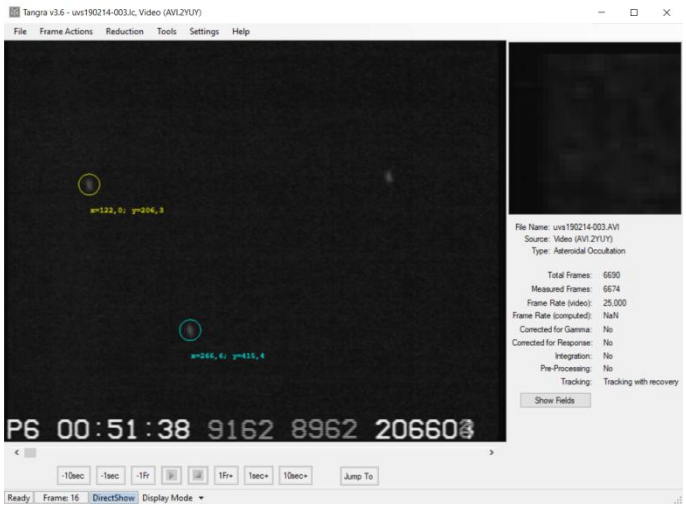

uvs190116-005.lc - Aperture Photometry, Average Background
File Data Customize Add-ins
ADU
17K
15K
12K
10K
7500
5000
2500
04:41:20 04:41:30 04:41:40 04:41:50 04:42:00 04:42:10 04:42:20 04:42:30 04:42:40 04:42:50 UT
Signal-minus-Background No Normalisation No Binning Include Objects

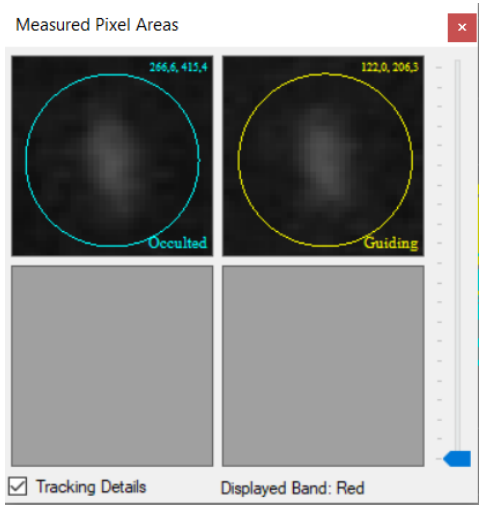

Tangra v3.6 - uvs190116-005.lc, Video (AVI.2YUY)
File Frame Actions Reduction Tools Settings Help
x=153,8; y=288,8
x=422,6; y=328,3
P9 04:41:08 4237 4437 303340
File Name: uvs190116-005.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 2836
Measured Frames: 2817
Frame Rate (video): 25.001
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: Tracking with recovery
Show Fields
-10sec -1sec -1Fr 1Fr+ 1sec+ 10sec+ Jump To
Ready Frame: 19 DirectShow Display Mode


Measured Pixel Areas
422,6, 328,3
153,8, 288,8
Occulted
Guiding
Tracking Details
Displayed Band: Red


543 Charlotte occults UCAC4 429-052597 on 2019 Feb 14 from 0h 44m to 0h 58m UT
Star:
Mag V = 13.8; B = 14.8; R = 13.3
RA = 11 10 51.8329 (J2000)
Dec = - 4 17 7.220
[of Date: 11 11 51, - 4 23 23]
Prediction of 2019 Jan 21.0
Max Duration = 3.8 secs
Mag Drop = 1.1 (1.1r)
Sun : Dist = 153°
Moon: Dist = 101°
: illum = 62 %
E 0.027"x 0.027" in PA 90
Asteroid: (in DAMIT, ISAM)
Mag = 14.4
Dia = 46km, 0.027"
Parallax = 3.803"
Hourly dRA =-1.710s
dDec = 3.49"
60
59
58
57
56
55
54
53
52
51
Occult 4.6.2.3, MPCorb2019Jan21 Errors: Star+PeakEphemUncert


uvs190214-003.lc - Aperture Photometry, Average Background
File
Data
Customize
Add-ins
ADU
7000
6500
6000
5500
5000
4500
4000
00:52:00
00:52:30
00:53:00
00:53:30
00:54:00
00:54:30
00:55:00
00:55:30
UT
Signal-minus-Background
No Normalisation
No Binning
Include Objects


Tangra v3.6 - uvs190214-003.lc, Video (AVI.2YUY)
File
Frame Actions
Reduction
Tools
Settings
Help
P6 00:51:38 9162 8962 206603
Show Fields
Ready
Frame: 16
DirectShow
Display Mode


Measured Pixel Areas
266,6, 415,4
122,0, 206,3
Occulted
Guiding
Tracking Details
Displayed Band: Red

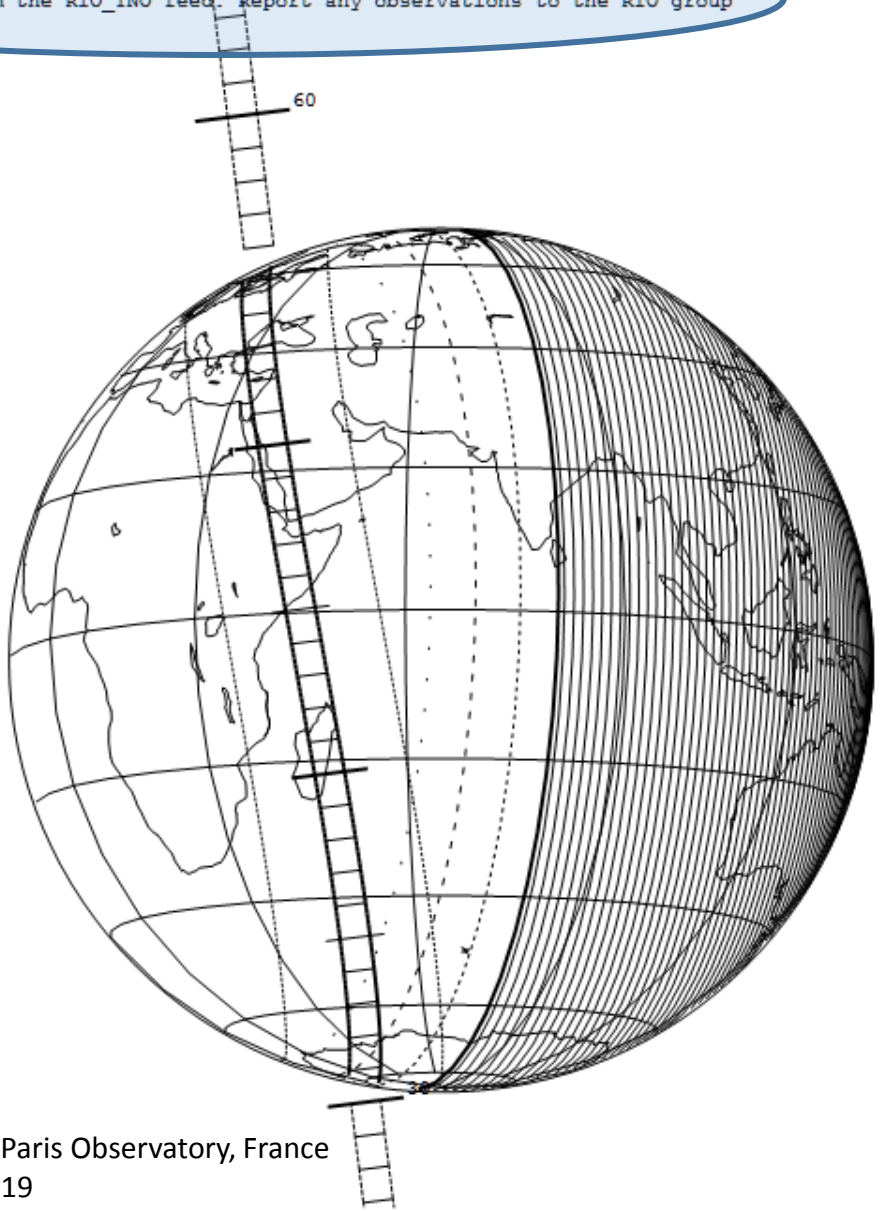
38628 Huya occults TYC 5061-00513-1 on 2019 Mar 18 from 0h 30m to 0h 56m UT

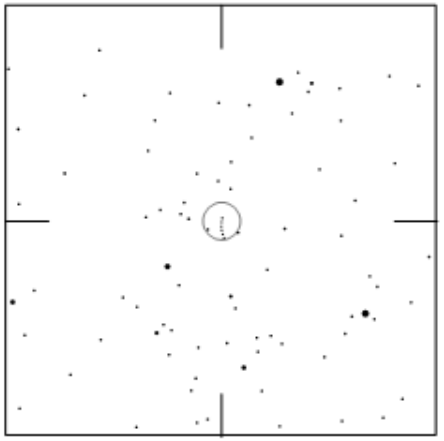
Star:
Mag V = 11.1; R = 6.3
RA = 16 41 6.4260 (J2000)
Dec = - 6 43 34.575 ...
[of Date: 16 42 8, - 6 45 45]
Prediction of 2019 Mar 15.0

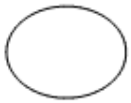
Max Duration = 53.9 secs
Mag Drop = 8.5 (12.9r)
Sun : Dist = 107°
Moon: Dist = 114°
: illum = 87 %
E 0.043"x 0.033" in PA 90

Asteroid:
Mag = 19.6
Dia = 440km, 0.021"
Parallax = 0.310"
Hourly dRA =-0.003s
dDec = 0.02"

1 moon. {?} 213km at 1740km, Period 3.200days
Prediction is from the RIO_TNO feed. Report any observations to the RIO group
TNO

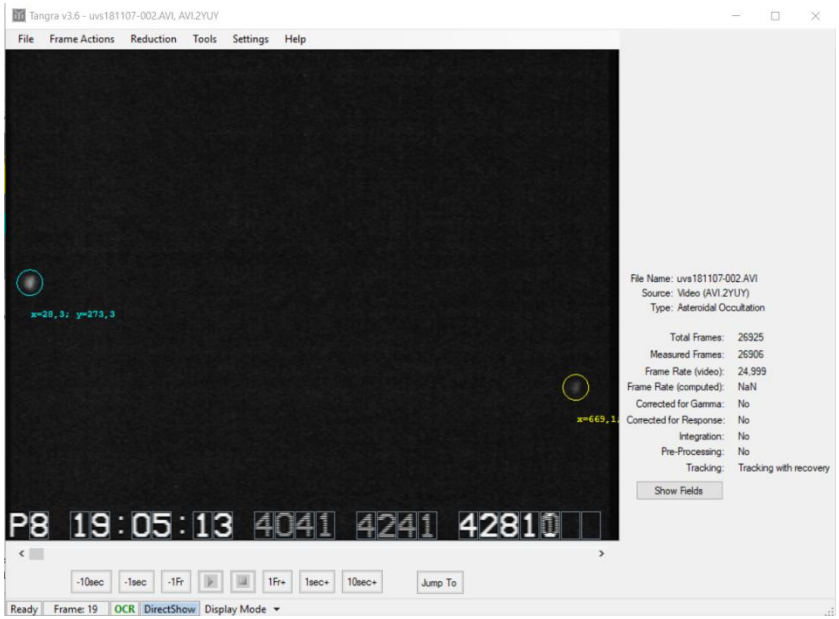


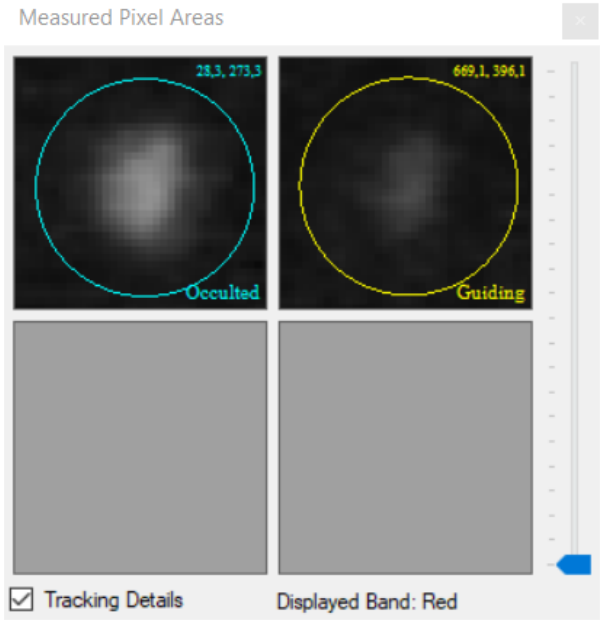


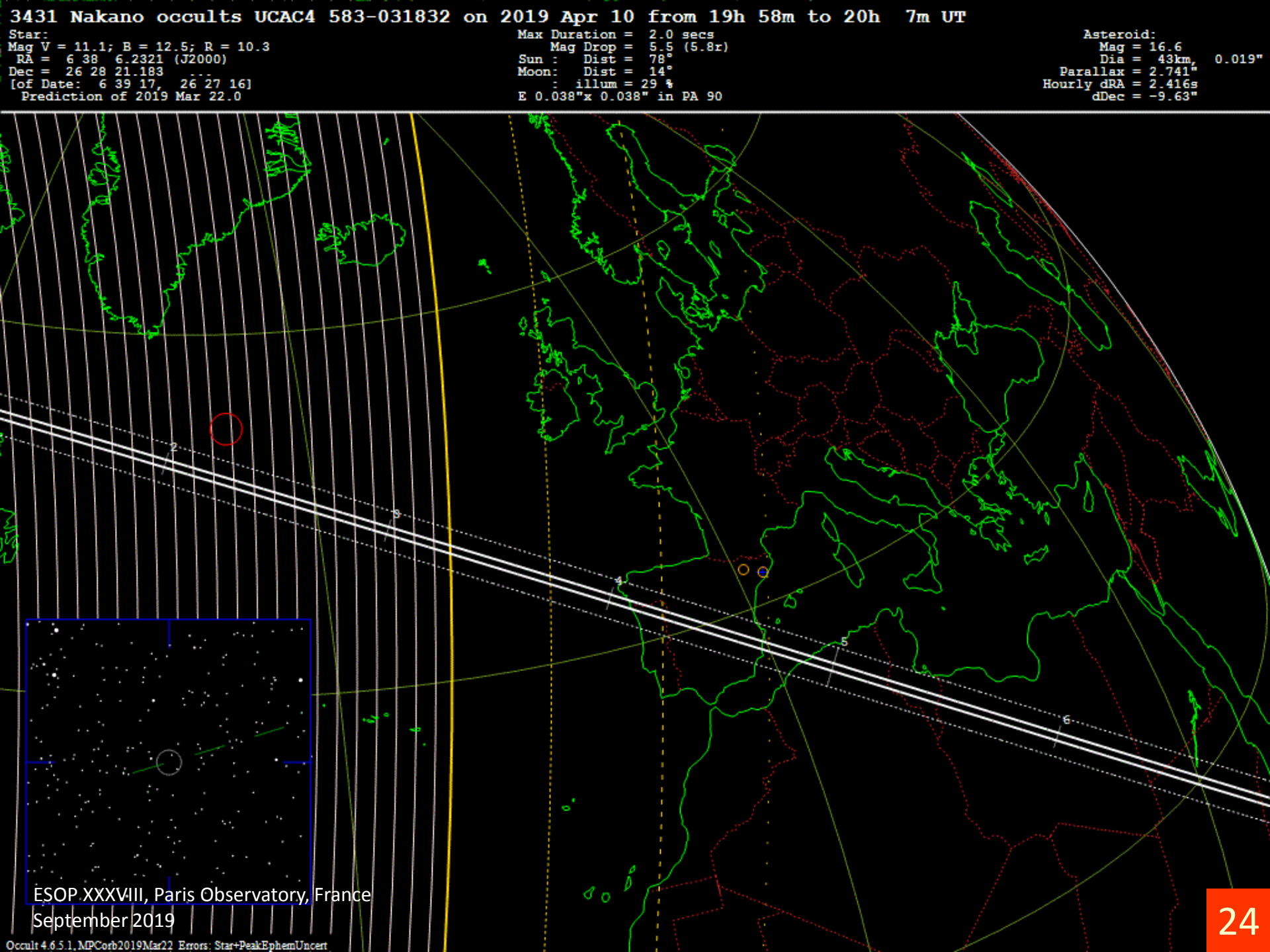


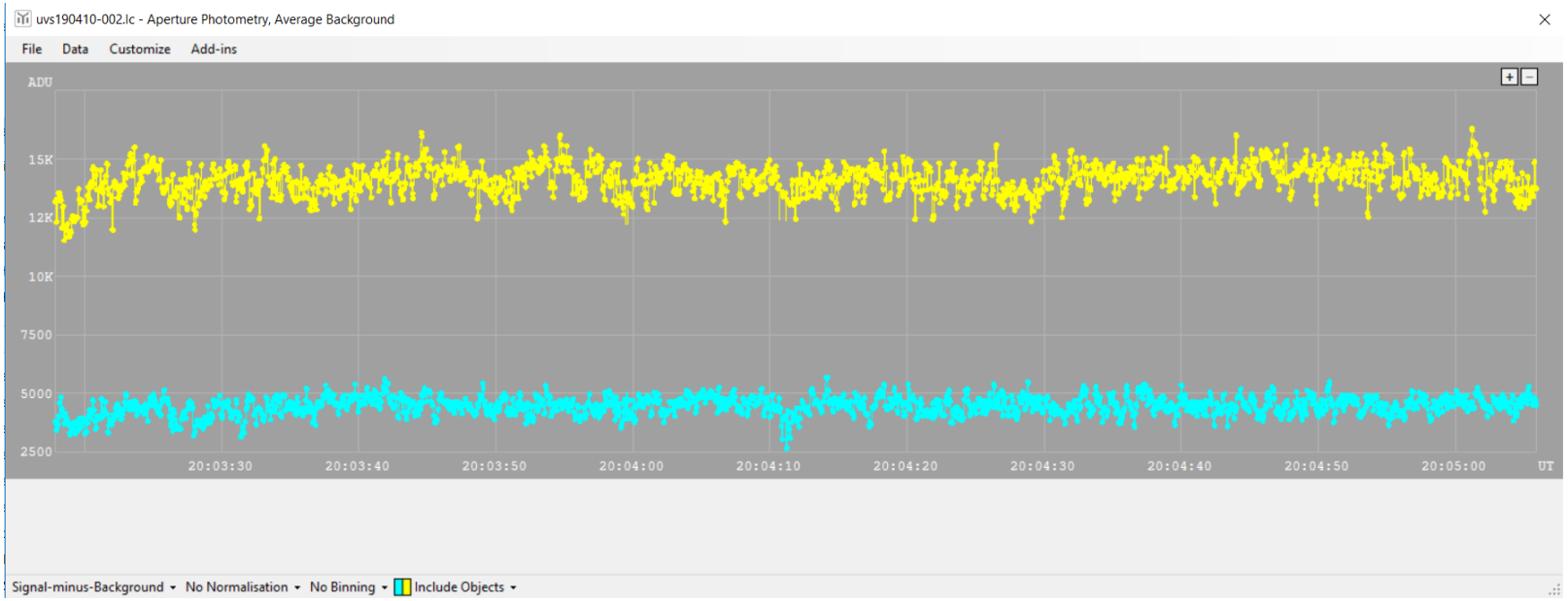
Occult 4.6.5.1, RIO_Update: GaiaDR2pm_NIMA mar2019 ephem. Errors: Asteroid only

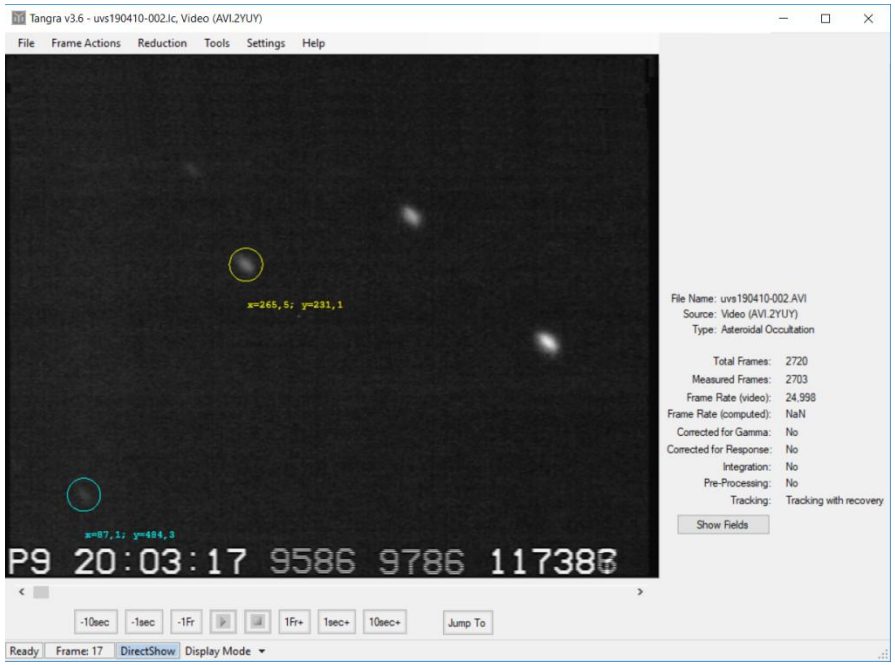

VIDEO.lc - Aperture Photometry, Average Background
File Data Customize Add-ins
ADU
6000
5000
4000
3000
2000
1000
0
-1000
00:42 00:43 00:44 00:45 00:46 00:47 00:48 00:49 00:50 00:51 00:52 00:53 00:54 00:55 00:56 00:57 00:58 00:59 01:00 01:01 UT
Signal-minus-Background
No Normalisation
No Binning
Include Objects

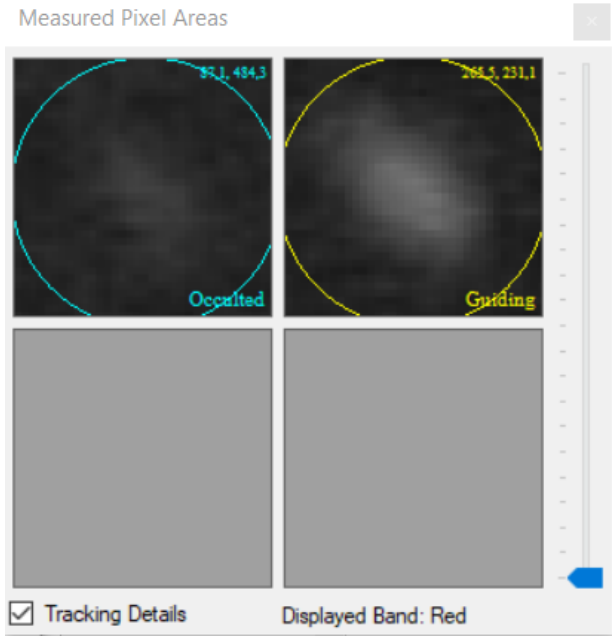

Tangra v3.6 - uvs181107-002.AVI, AVI.2YUY
File Frame Actions Reduction Tools Settings Help
x=28,3; y=273,3
File Name: uvs181107-002.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 26925
Measured Frames: 26906
Frame Rate (video): 24.999
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: Tracking with recovery
Show Fields
P8 19:05:13 4041 4241 42810
-10sec -1sec -1Fr 1Fr+ 1sec+ 10sec+ Jump To
Ready Frame: 19 OCR DirectShow Display Mode


Measured Pixel Areas
28,3, 273,3
669,1, 396,1
Occulted
Guiding
Tracking Details
Displayed Band: Red


3431 Nakano occults UCAC4 583-031832 on 2019 Apr 10 from 19h 58m to 20h 7m UT
Star:
Mag V = 11.1; B = 12.5; R = 10.3
RA = 6 38 6.2321 (J2000)
Dec = 26 28 21.183
[of Date: 6 39 17, 26 27 16]
Prediction of 2019 Mar 22.0
Max Duration = 2.0 secs
Mag Drop = 5.5 (5.8r)
Sun : Dist = 78°
Moon: Dist = 14°
: illum = 29 %
E 0.038"x 0.038" in PA 90
Asteroid:
Mag = 16.6
Dia = 43km, 0.019"
Parallax = 2.741"
Hourly dRA = 2.416s
dDec = -9.63"
2
3
4
5
6
Occult 4.6.5.1, MPCorb2019Mar22 Errors: Star+PeakEphemUncert


uvs190410-002.lc - Aperture Photometry, Average Background
File Data Customize Add-ins
ADU
15K
12K
10K
7500
5000
2500
20:03:30 20:03:40 20:03:50 20:04:00 20:04:10 20:04:20 20:04:30 20:04:40 20:04:50 20:05:00 UT
Signal-minus-Background No Normalisation No Binning Include Objects


Tangra v3.6 - uvs190410-002.lc, Video (AVI.2YUY)
File Frame Actions Reduction Tools Settings Help
x=265,5; y=231,1
x=87,1; y=484,3
P9 20:03:17 9586 9786 117383
File Name: uvs190410-002.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 2720
Measured Frames: 2703
Frame Rate (video): 24,998
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: Tracking with recovery
Show Fields
-10sec -1sec -1Fr 1Fr+ 1sec+ 10sec+ Jump To
Ready Frame: 17 DirectShow Display Mode


Measured Pixel Areas
87,1, 484,3
265,5, 231,1
Occulted
Guiding
Tracking Details
Displayed Band: Red

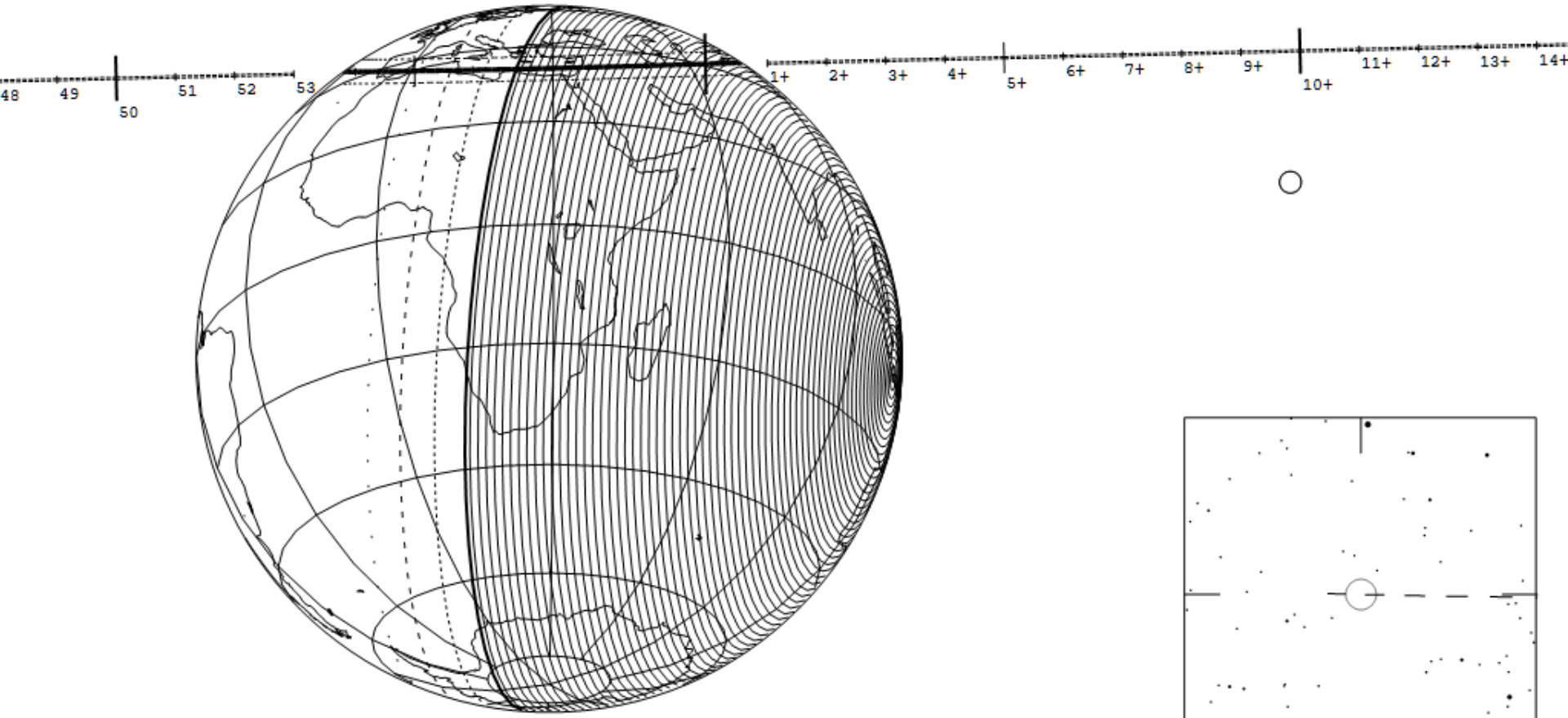
P5M10 Lysithea occults UCAC4 338-097800 on 2019 Mar 1 from 4h 54m to 5h 1m UT

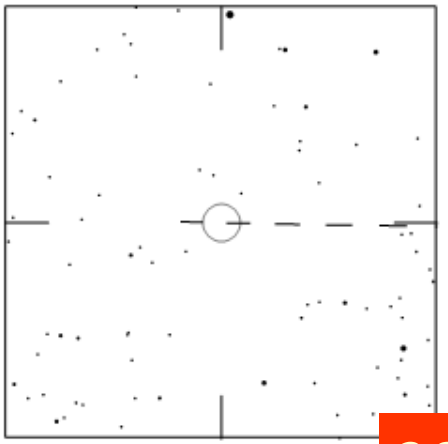
Star:
Mag V = 13.1; R = 9.4
RA = 17 26 52.5679 (J2000)
Dec = -22 25 54.699 ...
[of Date: 17 28 1, -22 26 45]
Prediction of 2019 Feb 28.8

Max Duration = 2.0 secs
Mag Drop = 5.9 (9.2r)
Sun : Dist = 78°
Moon: Dist = 19°
: illum = 24 %
E 0.050"x 0.050" in PA 90

Asteroid:
Mag = 19.0
Dia = 36km, 0.009"
Parallax = 1.623"
Hourly dRA = 0.308s
dDec = 0.01"

Prediction is from the RIO_TNO feed. Report any observations to the RIO group





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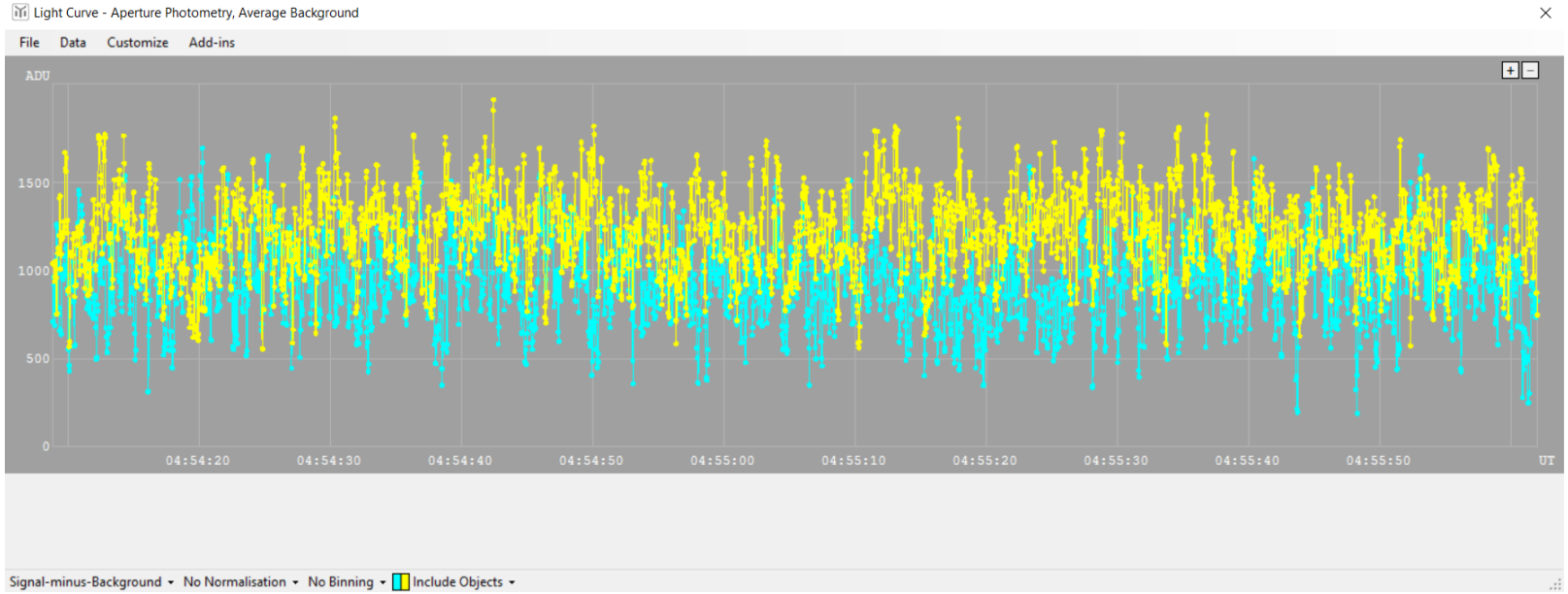
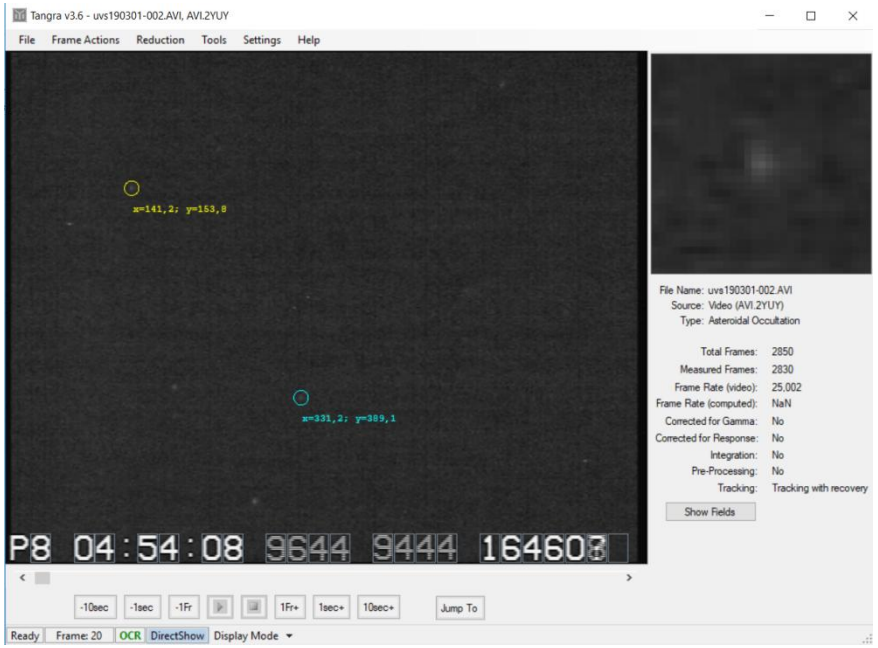
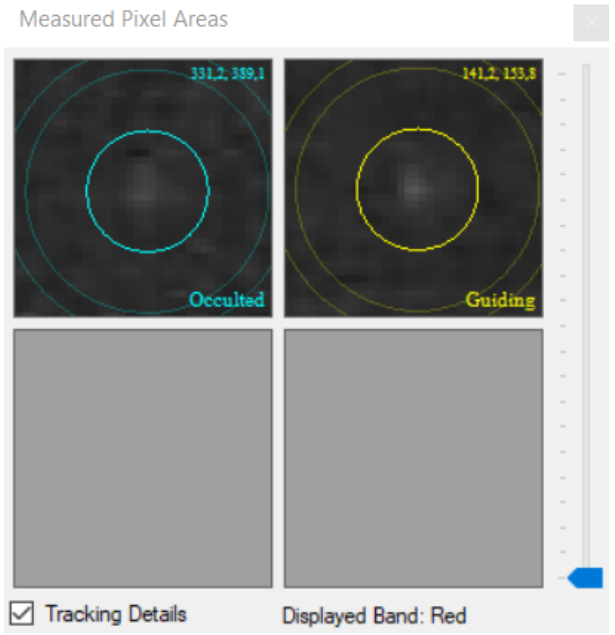
Occult 4.6.4.0, RIO_Update: Star GAIA-DR2_JUP340+DE435 (Brozovic et al._2017) Errors: Asteroid only

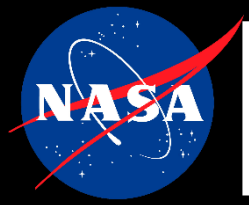

Light Curve - Aperture Photometry, Average Background
File Data Customize Add-ins
ADU
1500
1000
500
0
04:54:20 04:54:30 04:54:40 04:54:50 04:55:00 04:55:10 04:55:20 04:55:30 04:55:40 04:55:50 UT
Signal-minus-Background No Normalisation No Binning Include Objects


Tangra v3.6 - uvs190301-002.AVI, AVI.2YUY
File Frame Actions Reduction Tools Settings Help
x=141,2; y=153,8
x=331,2; y=389,1
File Name: uvs190301-002.AVI
Source: Video (AVI.2YUY)
Type: Asteroidal Occultation
Total Frames: 2850
Measured Frames: 2830
Frame Rate (video): 25,002
Frame Rate (computed): NaN
Corrected for Gamma: No
Corrected for Response: No
Integration: No
Pre-Processing: No
Tracking: Tracking with recovery
Show Fields
P8 04:54:08 9644 9444 164603
-10sec -1sec -1Fr 1Fr+ 1sec+ 10sec+ Jump To
Ready Frame: 20 OCR DirectShow Display Mode


Measured Pixel Areas
331,2; 389,1
141,2; 153,8
Occulted
Guiding
Tracking Details
Displayed Band: Red

Center of Research in Astronomy, Astrophysics and Geophysics

Expedition to Observe Stellar Occultation of Next New Horizons Spacecraft Flyby Target ULTIMA THULE 2014 MU69 at Tamanrasset (ALGERIA) on 4 August 2018



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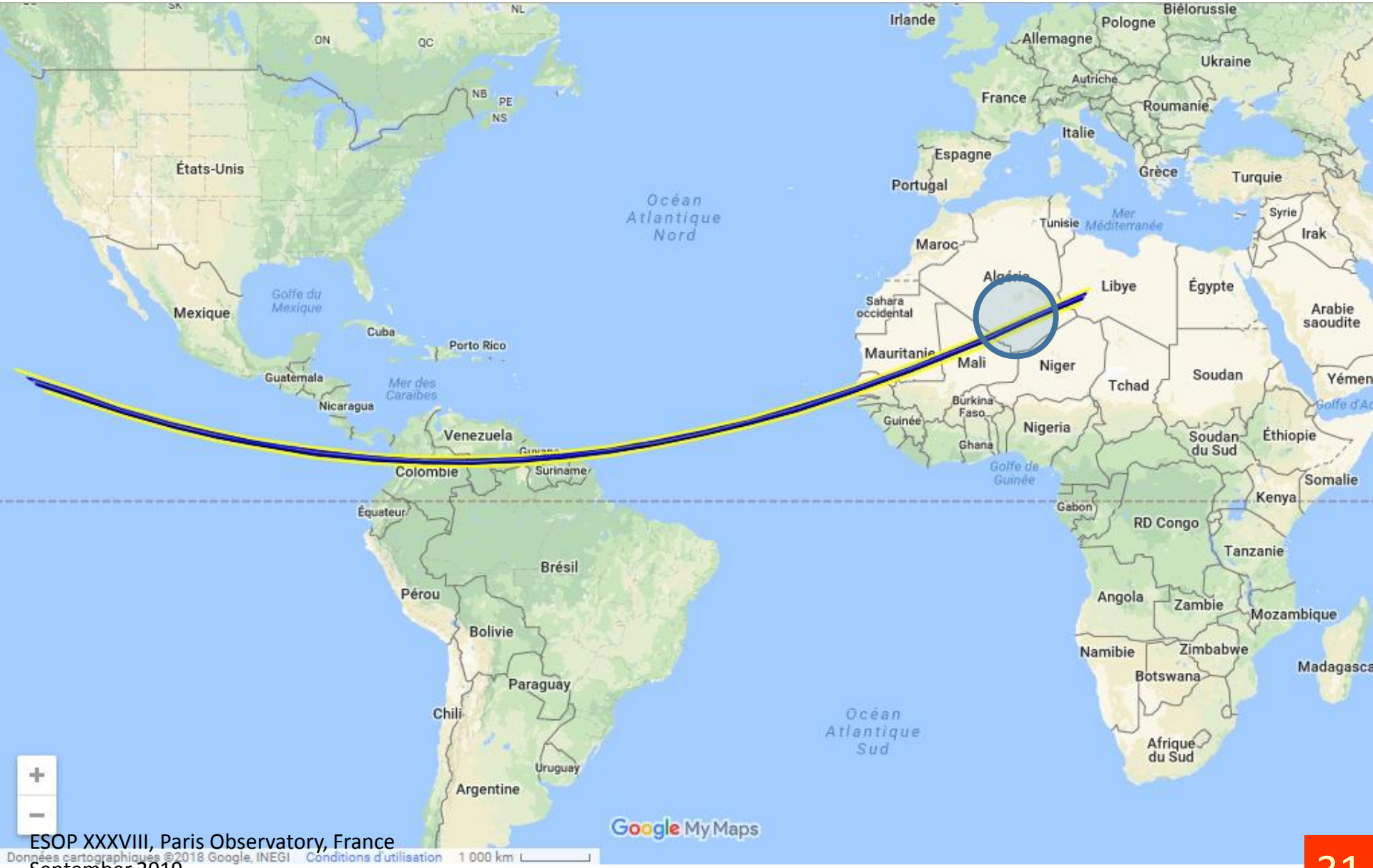
The Occultation of MU20180804 Star by the Kuiper Objet ULTIMA THULE 2014 MU 69 in August 4th 2018

The prediction is based on a Gaia DR2 pre-release position for the star and the orbit estimate for ULTIMA THULE 2014MU69. This orbit includes all data up through March 21th 2018. The event will be at 01:24 UT. The time at Senegal is 1:21:30 and Colombia is 1:26 UT. Star position is RA 19:04:21.5, Dec -20:35:37 (J2000).

TYC 6291-398-1 Star
Magnitude of the occulted Star : 13.3
Duration of the occultation : 1 to 2 seconds

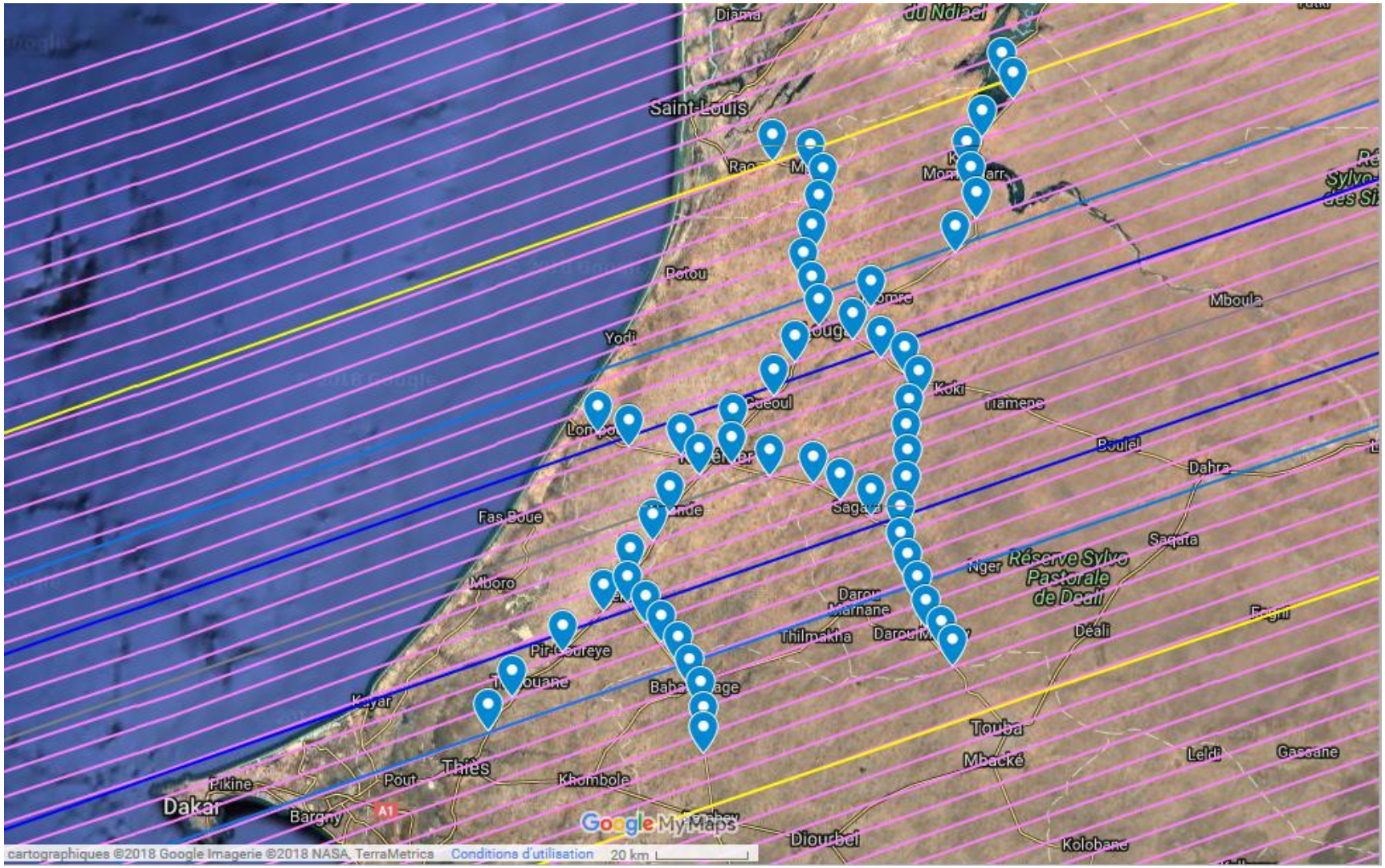
Professor Marc BUIE
NASA supervisor of the occultation campaign of MU20180804 Star by the Kuiper Objet 2014 MU 69 in August 4th 2018

The path of the occultation by Ultima Thule in the world Map

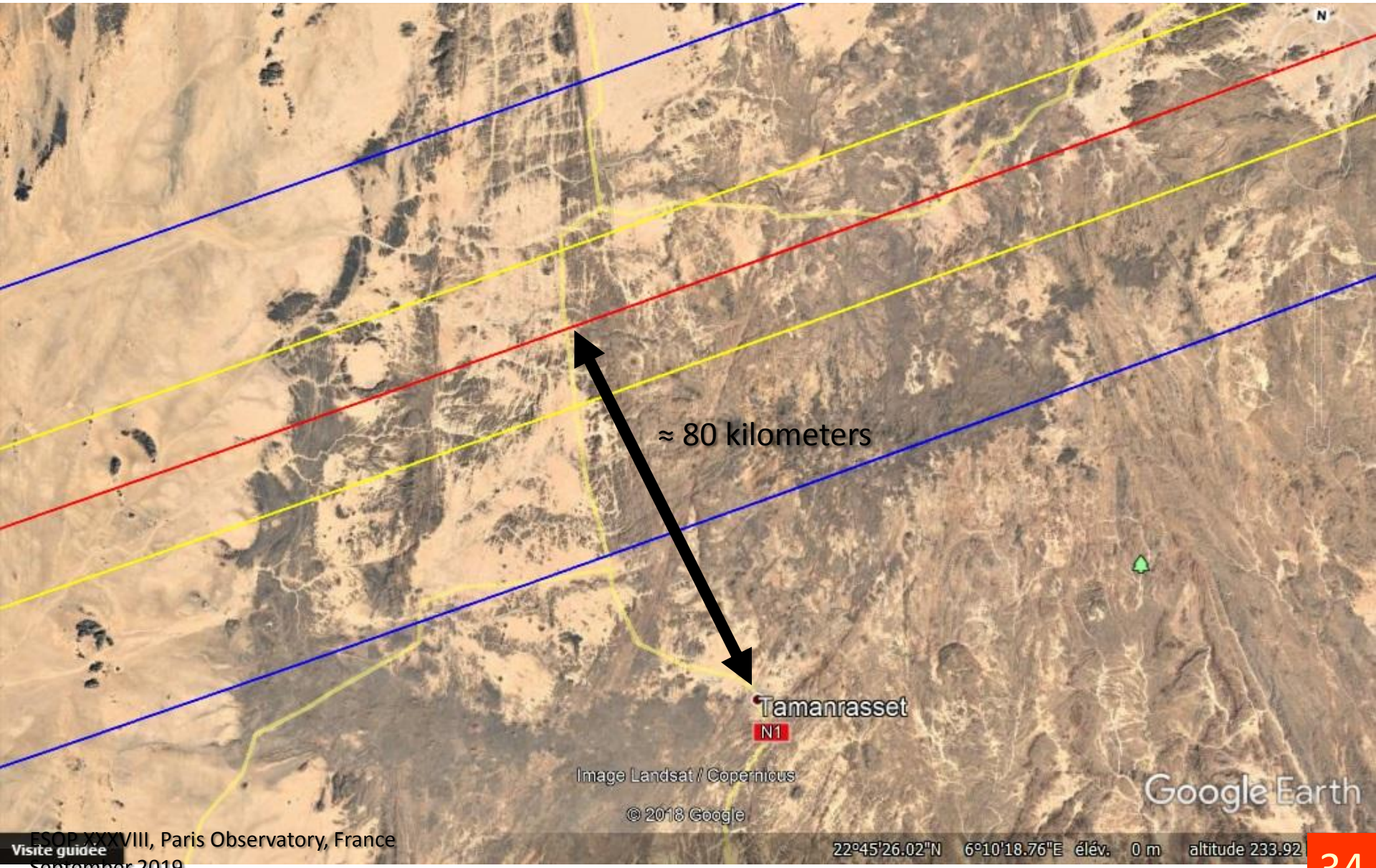


The path of the occultation in Senegal, Mauritania and Mali

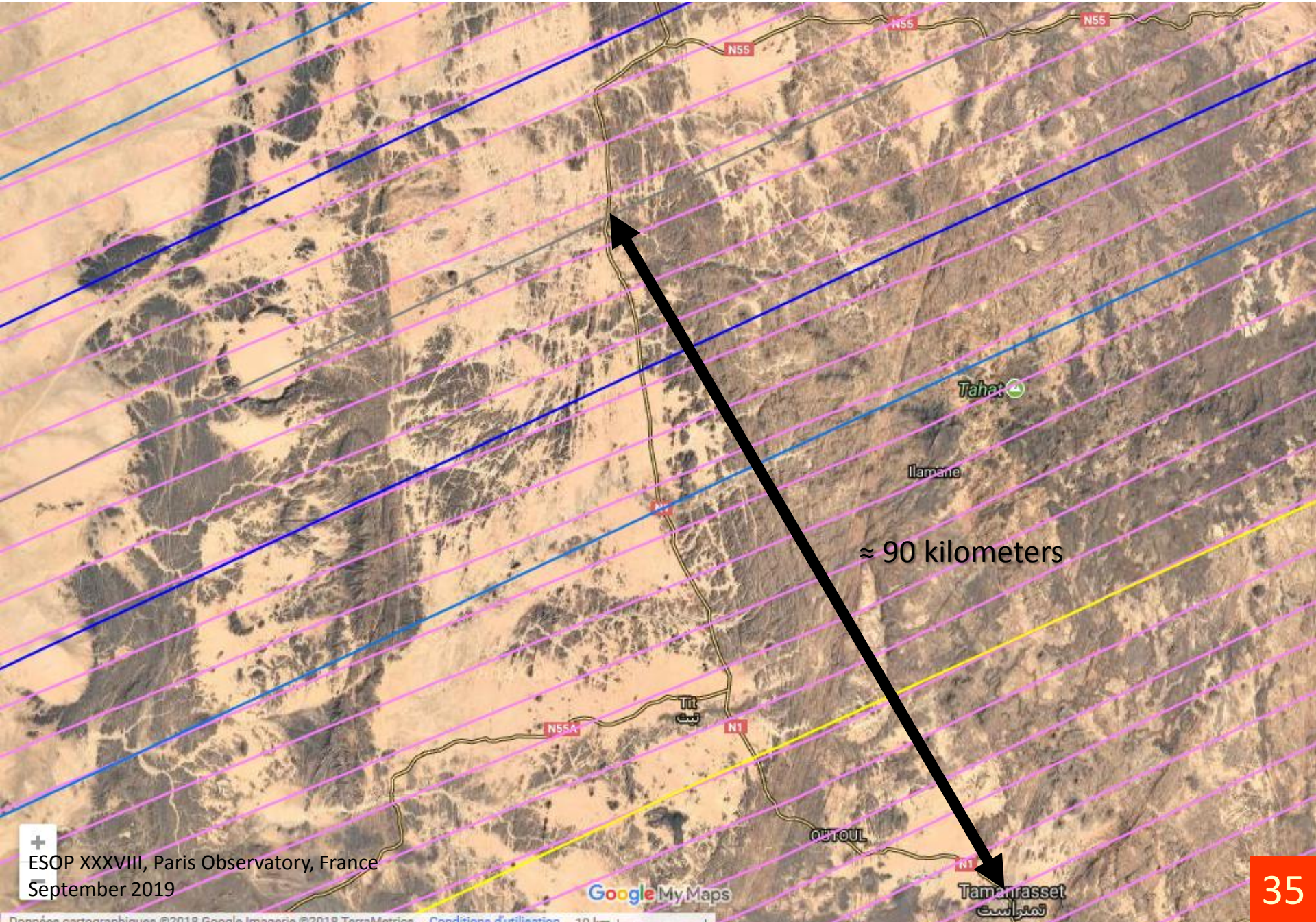
Distribution of the 23 NASA telescopes stations throughout the occultation band in Senegal



Zoom on the path prediction of the occultation in Tamanrasset



Zoom on the latest path prediction of the occultation in Tamanrasset

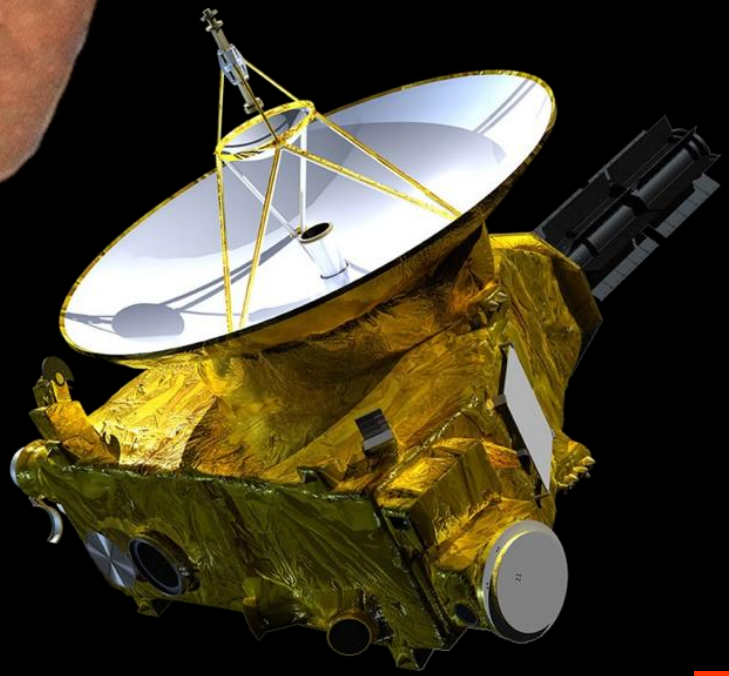



BREWER
MEXICO


FRAGILE
CELESTRON
BOX15


GPSmap 60CSx
Odom trajet
9503
Vitesse max
180
Tps déplac
Déplac. moy.
37.0
Arrêté
Moy. globale
22.5
Elévation
1018
Position
GARMIN


Generator



Participative Astronomy in the field of the stellar occultation by asteroids in Algeria

There are approximately **fifty astronomical amateur associations and clubs** in Algeria.

There are more than 2,300 youth institutions (youth centers and science centers) throughout Algeria, including more than 80 institutions in Algiers which depend on the Algerian Ministry of Youth and sport.

There are also hundreds of cultural centers which depend on the Algerian Ministry of Culture throughout Algeria.

An exhaustive census of more than 100 telescopes. Most of them have an average diameter of 115 mm. The biggest amateur telescope has a 30 centimeters.

the best method of observing occultations for amateurs in Algeria is therefore the visual method.

I am interested to popularize the phenomenon of the occultation around Algerian amateur astronomers.

I started to form a network to observe stellar occultation by asteroids since 2016 and I have already organized :

- First national meeting in Souidania (Algiers) from 08th to 10th December 2016 for to observe in network the stellar occultation by the asteroid **861 Aïda** and **444 Gyptis** in the north of Algeria (the sky was cloudy).

- Second meeting in Tichy (Bejaïa) from 05th and 06th August 2017 for the observation of the stellar occultation by the asteroid **5247 Krylov** (the sky was cloudy too).

- Third national meeting in Ghardaia from 12th to 14th November 2017 for the observation of the stellar occultation by 392 Wilhelmina (**First negative result**).

- Fourth meeting which was held in Algiers from 04th to 06th January 2018 to observe in network on the national territory of a stellar occultation produced by the asteroid **464 Megaira** in January 12, 2018 (It's the first positive result - in Bouzaréah and El-Marsa (Algiers)) .

- Fifth national meeting at Relizane April 6, 2018 for the observation of stellar occultation by the asteroid **3641 Williams Bay** (the sky was overcast).

- Sixth meeting which was regional was held in Oran in June 14, 2018 for the observation of the stellar occultation by the asteroid **785 Zwetana** (there were mists).

- **I was going to organize other meetings to obtain more positive results after these expreriences but I became seriously sick for more than 4 months.**

Refractor Brasser 90/900 mm

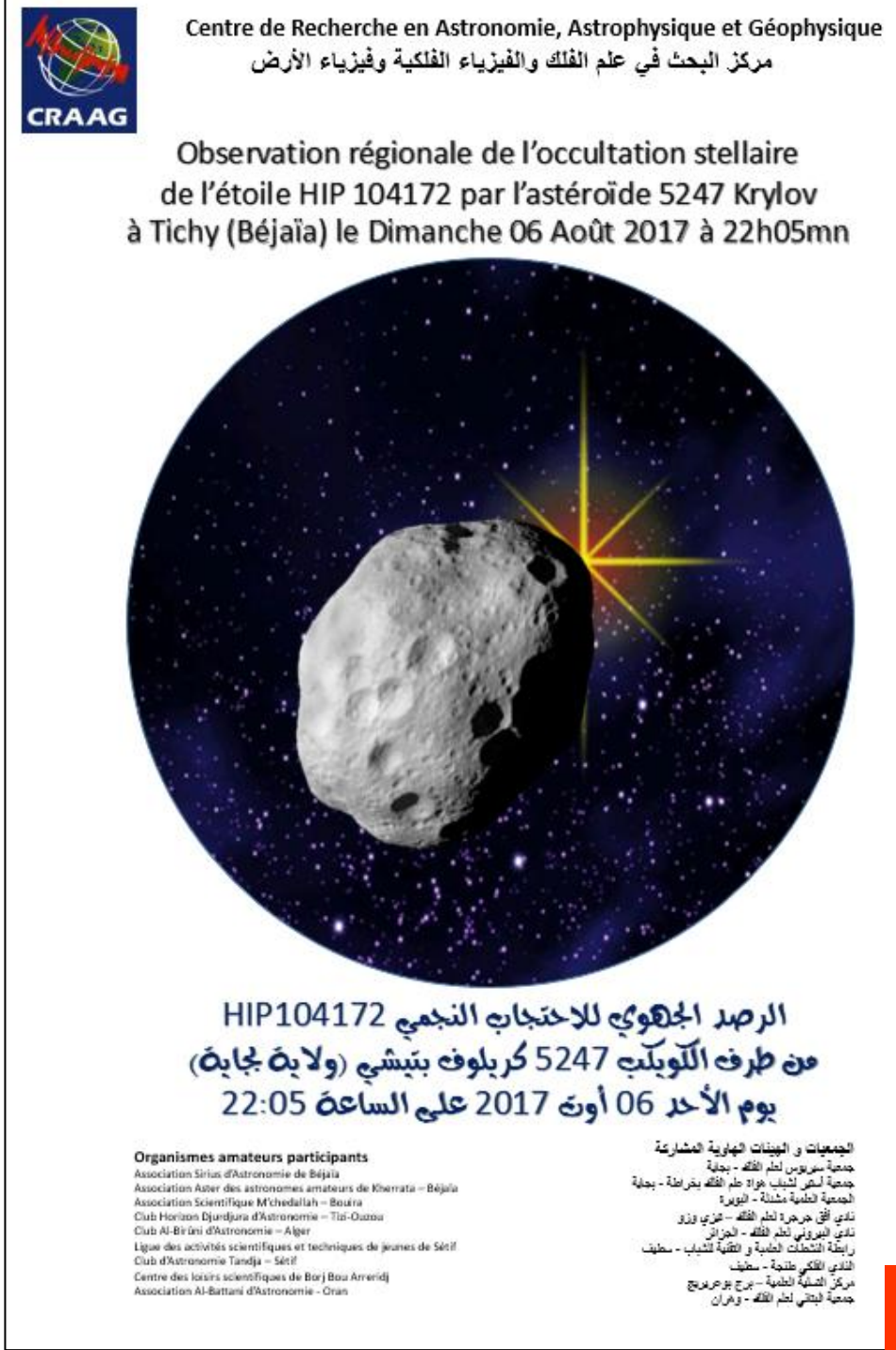
Newton Telescope 115/900 mm

Newton Telescope Brasser 130/650 mm

Newton Telescope Perl 150/750 mm

Here the instruments which be found in clubs and astronomical associations in Algeria

Regional observation of the stellar occultation HIP 104172 by 5247 Krylov in Tichy (Bejaia) – Sunday 06th August 2017 at 21h05mn UT

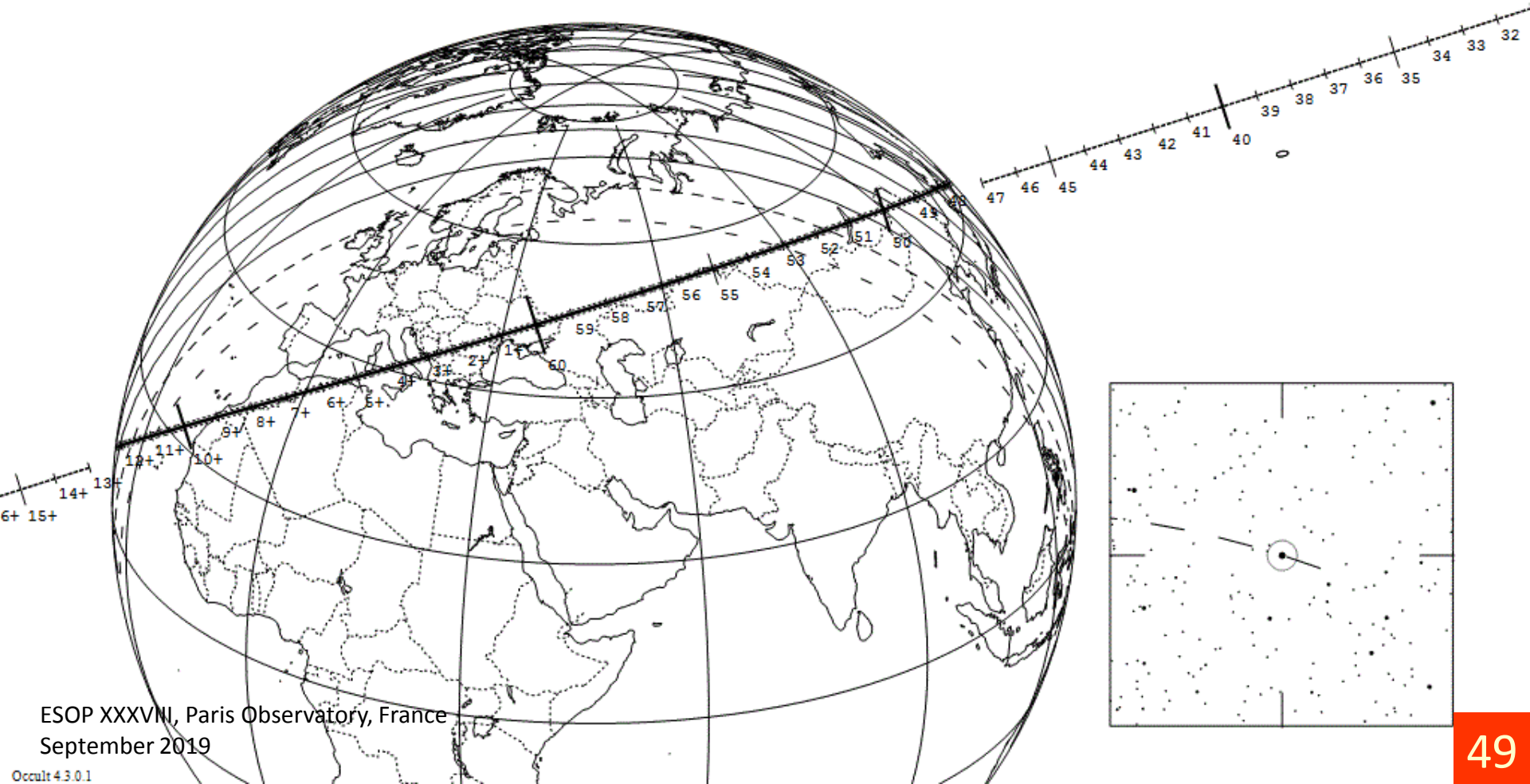


5247 Krylov occults HIP 104172 on 2017 Aug 6 from 20h 48m to 21h 12m UT

Star:
Mv = 6.1
RA = 21 6 23.5376 (J2000)
Dec = 26 55 27.364 ...
[of Date: 21 7 11, 26 59 51]
Prediction of 2017 Jun 28.0

Max Duration = 0.9 secs
Mag Drop = 9.2
Sun : Dist = 137 deg
Moon: Dist = 45 deg
: illum = 99 %
E 0.084"x 0.038" in PA 79

Asteroid:
Mag =15.3
Dia = 8km, 0.009"
Parallax = 6.946"
Hourly dRA =-2.220s
dDec = -9.49"



12 telescopes divided on 6 teams through the central center of the path occultation. Each team was composed by 2 or 3 personnes.

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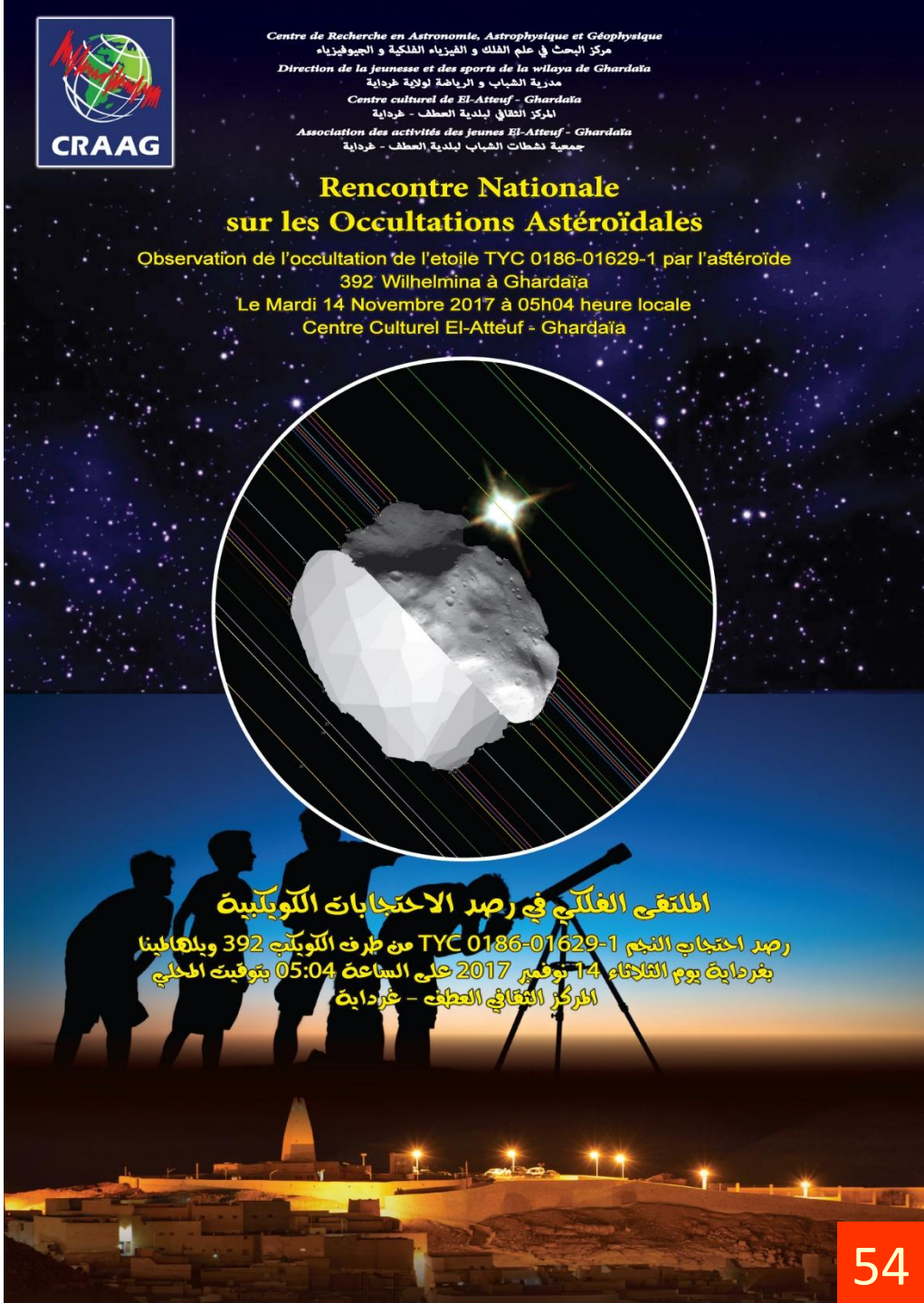
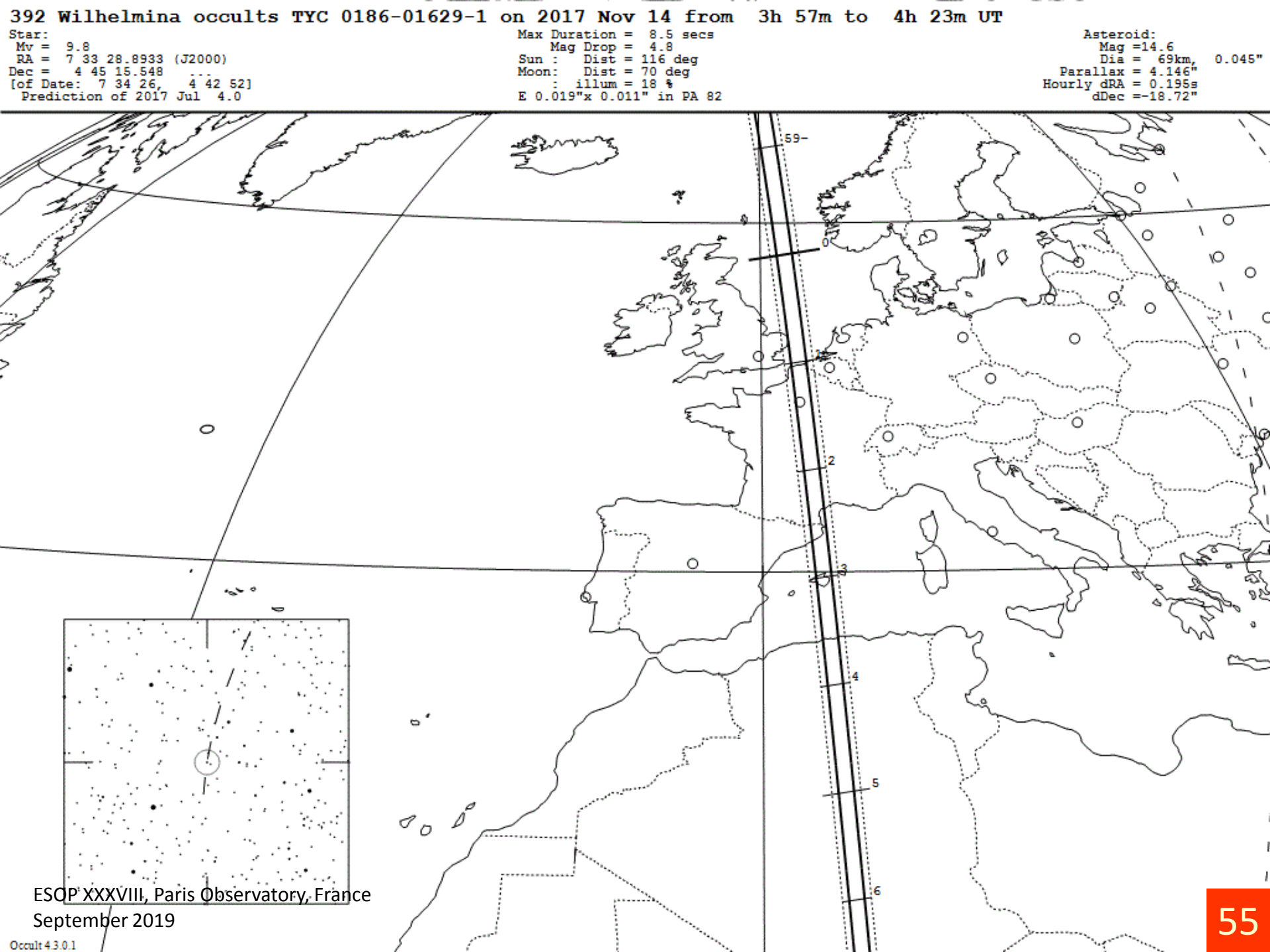
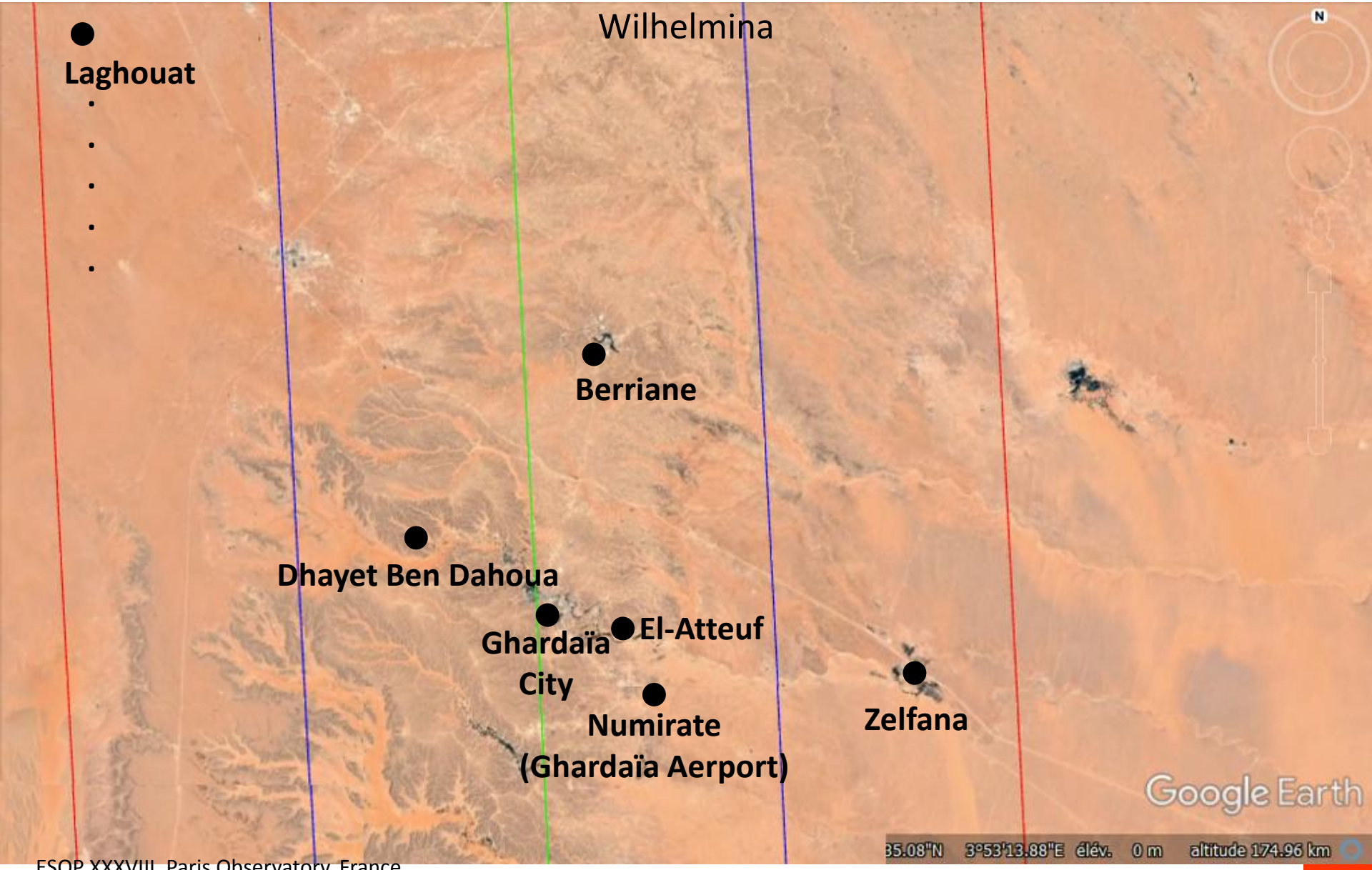
The second national meeting on stellar occultation by asteroids on November 14, 2017 in Ghardaia. More than 11 Algerian departments represented by their associations or clubs participated with more than 30 people who used 20 telescopes to observe the occultation of the star TYC 0186-01629-1 of Canis Major constellation by asteroid 392 Wilhelmina.




392 Wilhelmina occults TYC 0186-01629-1 on 2017 Nov 14 from 3h 57m to 4h 23m UT
Star:
Mv = 9.8
RA = 7 33 28.8933 (J2000)
Dec = 4 45 15.548 ...
[of Date: 7 34 26, 4 42 52]
Prediction of 2017 Jul 4.0
Max Duration = 8.5 secs
Mag Drop = 4.8
Sun : Dist = 116 deg
Moon: Dist = 70 deg
: illum = 18 %
E 0.019"x 0.011" in PA 82
Asteroid:
Mag =14.6
Dia = 69km, 0.045"
Parallax = 4.146"
Hourly dRA = 0.195s
dDec =-18.72"
59-
0
1
2
3
4
5
6
Occult 4.3.0.1

Overall distribution of the teams on the 7 observation sites of Laghouat and Ghardaia departments for the observation of the stellar occultation by the asteroid 392 Wilhelmina




CELESTRON
14/11/2017 05:34


CRAAG
Rencontre Nationale
sur les Occultations Astéroïdales
Observation de l'occultation de l'etoile TYC 0186-01629-1 par l'astéroïde
392 Wilhelmina à Ghardaïa
Le Mardi 14 Novembre 2017 à 05h04 heure locale
Centre Culturel El-Atteuf - Ghardaïa
الملتقى الفلكي في رصد الاحتجابات الكوكبية
رصد احتجاب النجم TYC 0186-01629-1 من طرف الكويكب 392 ويلهالمينا
بغرداية يوم الثلاثاء 14 نوفمبر 2017 على الساعة 05:04 بتوقيت المحلي
المركز الثقافي العطف – غرداية

According to a statistical study that I made on Steve Preston's website, we can find up to **10 occultation per year** whose stars are bright enough to be easily observed by this type of instrument in Algeria.

Global Asteroid Events

Home | Regional Events | Google Maps | Multimedia & Archive | SF Asteroid Occultations | SF Lunar Occultations
Asteroid Events | Global TNO Predictions | N America Pathmaps | Honorable Mention | Misc | SF Grazes

All times UT unless otherwise noted

Current Global Asteroid Events

Updated 2019-08-21

Previous Events are >> HERE

Future Asteroid Event Details

Double star code.
1 = WDS, 2= double in other sources (4th interferometric, or star catalogue flag),
4 = Variable star (listed in AAVSO Index file).
Values are cumulative, thus,
a 5 = a 1 (WDS) plus a 4 (AAVSO) and a 6 = a 2 (other sources) and a 4 (AAVSO).

For GoogleEarth KML files, please right click and SAVE AS, then open in GoogleEarth - This website prefers GoogleMaps

Date	U.T. Hr Mn	Minor Planet	Max Dur	Star Name	Star Mag	Star Diam	D	Delta Mag	Mapping Info	Observing Info
2019 Aug 20	01:04	8 Flora	7.4	UCAC4-380-069839	12.2			0.39	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 20	09:00	75 Eurydike	14.7	TYC 6915-00271-1	10.1			1.21	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 20	16:21	605 Juvisia	6.5	UCAC4-228-172083	12.3			2.59	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 20	19:07	605 Juvisia	6.5	UCAC4-228-172089	12.4			2.58	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 21	04:50	791 Ani	12.7	TYC 6306-02410-1	11.9			1.57	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 21	08:14	675 Ludmilla	4.4	UCAC4-587-006513	10.8			1.73	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 21	08:56	675 Ludmilla	4.4	HIP 13209	4.0		4	8.24	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements DoubleInfo
2019 Aug 21	18:42	3200 Phaethon	0.5	TYC 3348-474-1	11.9			5.06	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 21	20:57	93 Minerva	5.3	TYC 2405-01570-1	11.4			2.71	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 21	23:04	119 Althaea	3.1	TYC 1258-00334-1	11.8			1.68	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	01:15	678 Fredegundis	4.0	UCAC4-561-004269	12.2			0.99	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	02:09	759 Vinifera	4.7	UCAC4-491-150143	11.7			1.73	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	04:31	255 Oppavia	5.2	UCAC4-309-261754	9.9		1	4.84	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	13:07	472 Roma	4.1	TYC 6398-01195-1	9.8			2.62	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	14:44	1114 Lorraine	9.4	UCAC4-408-113298	12.1			3.02	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	18:22	657 Gunlod	6.7	UCAC4-346-178665	12.1			3.27	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 22	19:43	287 Nephthys	6.4	UCAC4-396-134927	11.3			0.70	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 23	03:46	1999 Hirayama	2.7	TYC 5768-561-1	9.3			6.75	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements
2019 Aug 23	04:42	4265 Kani	2.2	TYC 6351-1411-1	9.3			5.93	Global GoogleMap GoogleEarth Path Sites Chart	Stars Elements Elements

Next interesting observation in Algeria with the Occultation Algerian Amateur Astronomy network

I intend to organize the 7th national meeting on occultation for observing the stellar occultation by 332 Siri asteroid on October 27 in Laghouat.

I will try to involve a record of 60 amateurs observers using 30 telescopes.

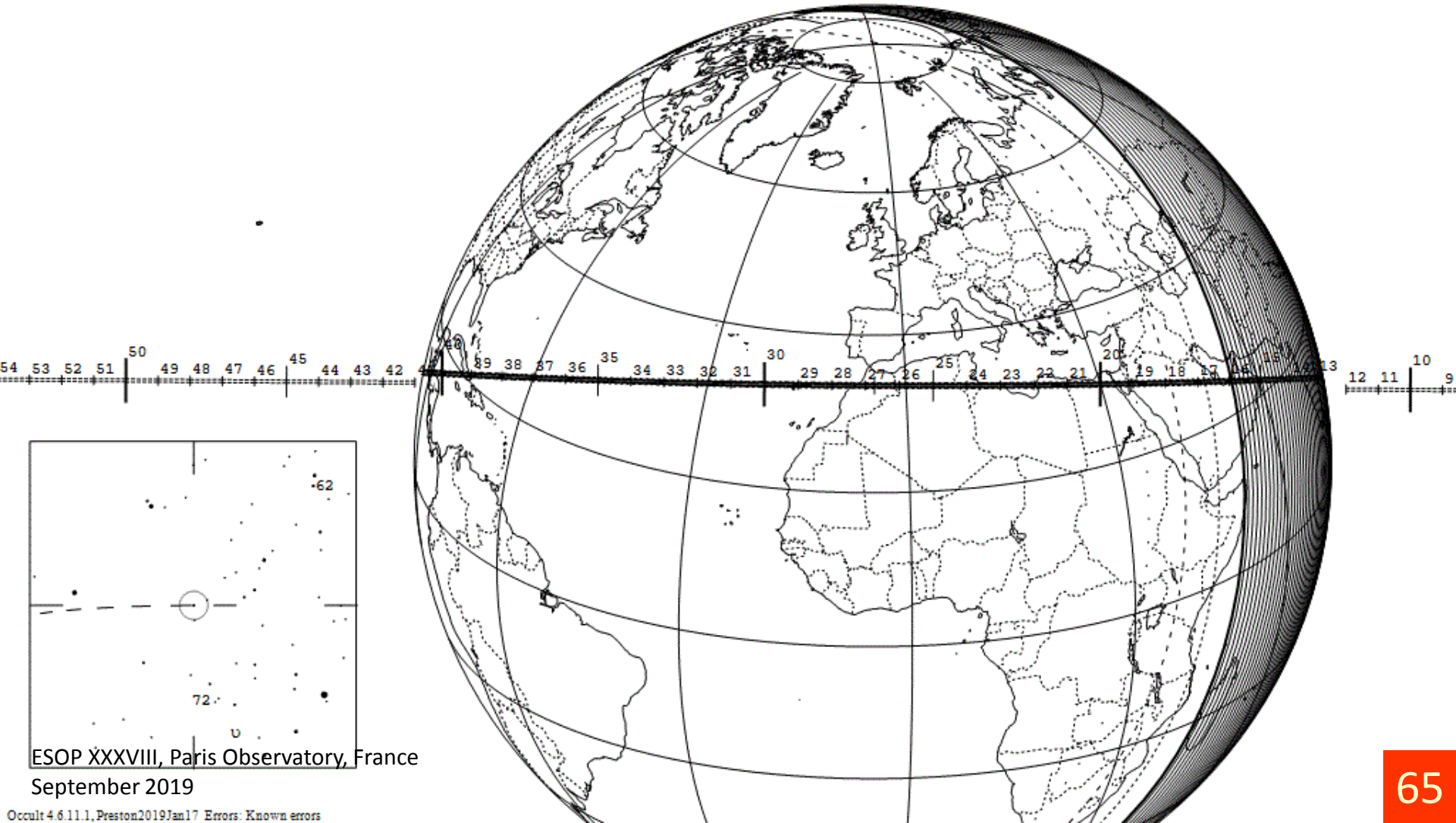
In addition, there will be the 3 telescopes of the Algiers Observatory with Three IOTA occultation kit.

332 Siri occults TYC 1816-01657-1 on 2019 Oct 27 from 2h 13m to 2h 41m UT

Star:
Mag V = 8.8
RA = 4 27 11.8720 (BCRS)
Dec = 23 30 46.699 ...
[of Date: 4 28 23, 23 33 20]
Prediction of 2019 Jul 21.0

Max Duration = 5.5 secs
Mag Drop = 5.2 (0.0r)
Sun : Dist = 145°
Moon: Dist = 129°
: illum = 2 %
E 0.026"x 0.013" in PA 79

Asteroid:
Mag = 14.0
Dia = 41km, 0.030"
Parallax = 4.695"
Hourly dRA =-1.435s
dDec = 0.14"



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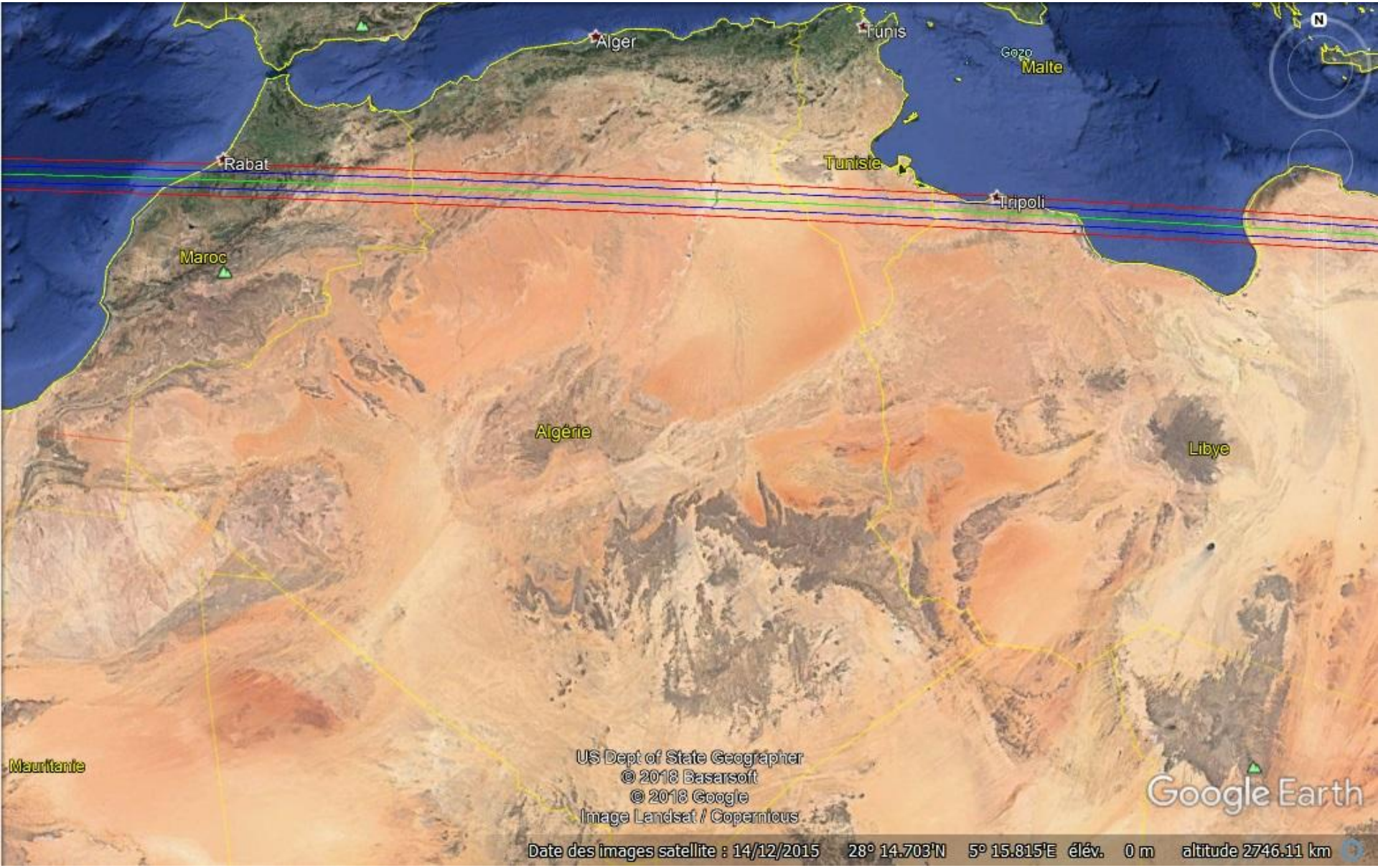
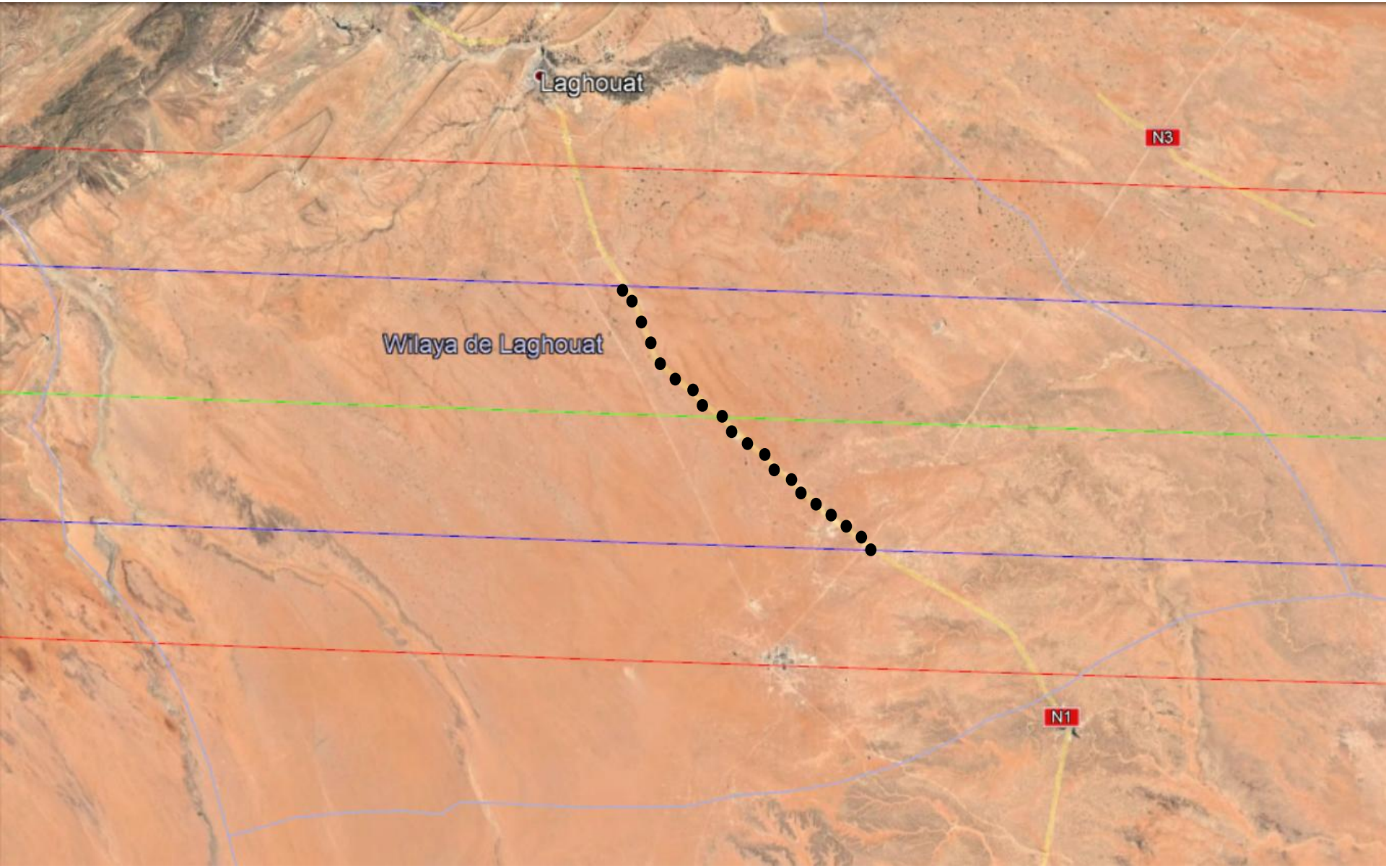
Occult 4.6.11.1, Preston2019Jan17 Errors: Known errors


Alger
Tunis
Gozo
Malte
Rabat
Tunisie
Tripoli
Maroc
Algérie
Libye
Mauritanie
US Dept of State Geographer
© 2018 Basarsoft
© 2018 Google
Image Landsat / Copernicus
Google Earth
Date des images satellite : 14/12/2015
28° 14.703'N
5° 15.815'E
élév. 0 m
altitude 2746.11 km

20 places ton observe the occultation



Tracking Motor for EQ-2 Mount

Tracking Motor for EQ-3 Mount

In the near future, it is necessary to motorize the telescopes to observe a precise occulted star having the maximum magnitude 10.

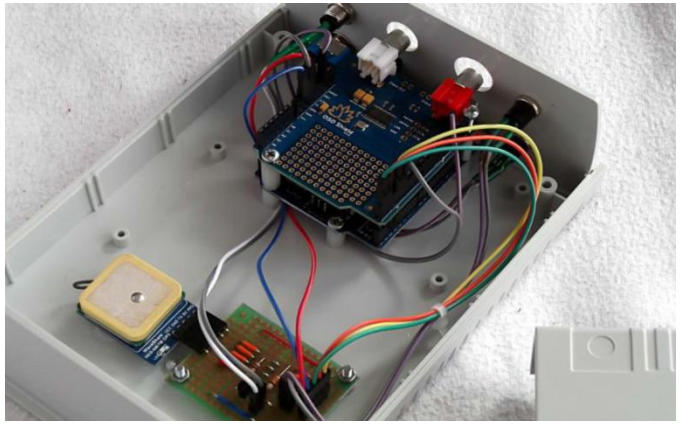
Camera RUNCAM EAGLE 2 PRO

Main Components

- **Arduino UNO R3 board** – basic and the most popular of Arduino's printed circuits boards contains microcontroller ATmega328 , 14 digital inputs/outputs which 6 of them can work as analog inputs, internal 16 MHz clock.

- **GPS U-Blox NEO-6m** – complete GPS receiver module with built-in antenna and battery back up. Please make sure to buy a model with derived PPS signal output. It is necessary to precise time synchronization.

- **Video OSD Shield** – extension of Arduino UNO board, in the form of a superimposed plate, contains the OSD MAX7456.



ARDUINO INSERTER

I develop a new easy technique for amateurs to observe visually the occultation.

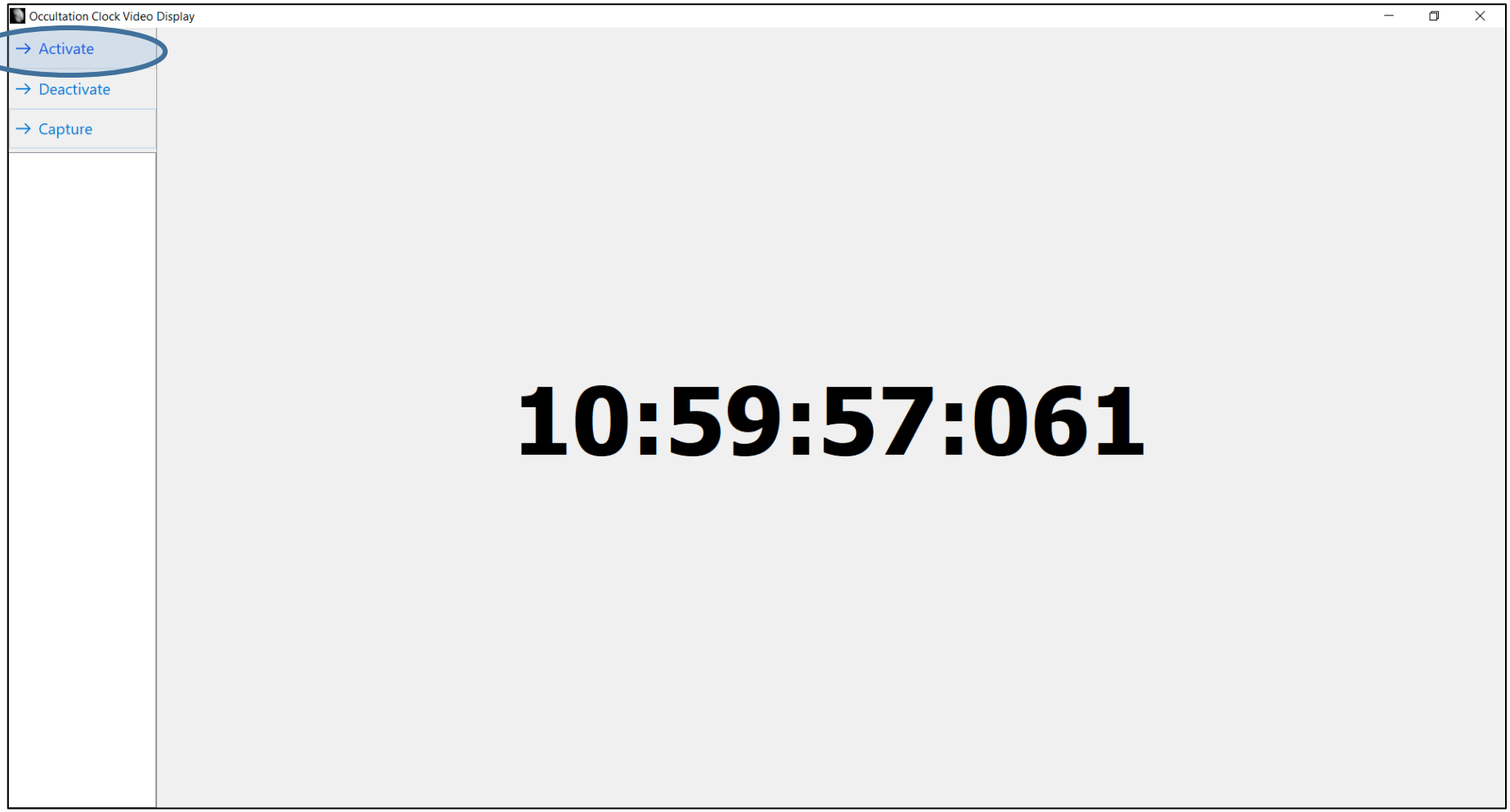
After synchronizing the computer clock via this link : ntp.obspm.fr

The amateur use this program

It’s an Application which displays the system clock in a loop.

It has been programmed to use all the computer hardware resources to minimize lags in the display.

The program displays the time to the thousandth of a second.

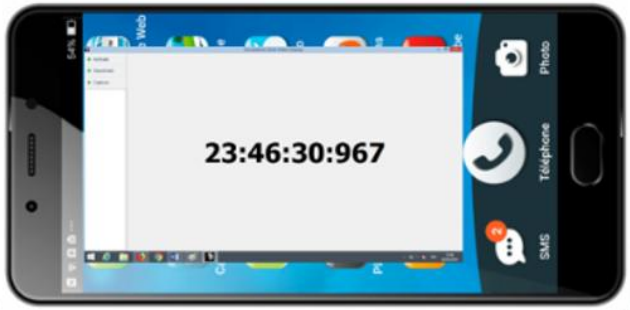


Occultation Clock Video Display

Top!!!

A TELESCOPE

Top!!!

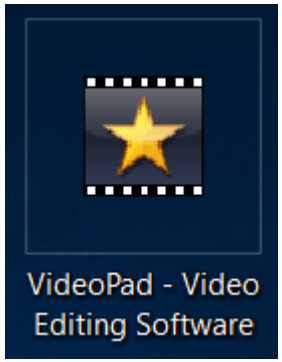


A SMARPHONE

A LAPTOP

TWO OBSERVERS

One of the amateur observers must copy the video taken by his smartphone on computer and use the following software.



Video editing software

The average error of the reaction time is about 0.4 seconds after several trainings using **the stopwatch**.

The average error of the reaction time is about 0.2 seconds after several trainings using **the voice recording method**.

Study of stellar occultation by Near Earth Asteroids

I’m preparing a PhD Thesis and this is the title :
Contribution to the characterization of near-Earth asteroids by the stellar occultation method: simulations, electronic development and observations.

There are 39 Near-Earth Asteroids which have a diameter of more than 4 kilometers.
Certainly there is a small probability to observe a stellar occultation by the NEAs because of their size.
but by having good reliable ephemeris, by using the newest GAIA data and by increasing the number of observations we will be able to observe one or two per year.

List of the 39 Near-Earth asteroids over 4 km in diameter

Number	Name	Provisory designation	H mag	a (AU)	e	i (deg)	Diameter (km)	Class	Notes	Multiple
1036	Ganymed	1924 TD	9.45	2.6627	0.5337	26.69	37.7	Amor		
3552	Don Quixote	1983 SA	12.9	4.2591	0.7089	31.09	18.4	Amor		
433	Eros	1898 DQ	11.16	1.4579	0.2226	10.83	16.8	Amor	NEAR Shoemaker Probe in 1998-2001	
4954	Eric	1990 SQ	12.6	2.0021	0.4488	17.43	9.6	Amor		
481032		2004 YZ23	15.2	3.4215	0.6776	56.15	9.4	Amor		
1627	Ivar	1929 SH	13.2	1.8628	0.3966	8.45	8.4	Amor		
52762		1998 MT24	14.8	2.4184	0.6515	33.89	6.7	Apollo		
53319		1999 JM8	15.2	2.7261	0.6411	13.83	6.4	Apollo	PHA	
7092	Cadmus	1992 LC	15.1	2.5345	0.6980	17.81	6.3	Apollo		
7358	Oze	1995 YA3	14.6	2.1992	0.5019	4.66	6.2	Amor		
88263		2001 KQ1	15.4	2.0961	0.4319	38.82	5.7	Amor		
1866	Sisyphus	1972 XA	12.4	1.8934	0.5386	41.20	5.7	Apollo		binary
25916		2001 CP44	13.6	2.5606	0.4980	15.75	5.7	Amor		
2212	Hephaistos	1978 SB	13.87	2.1598	0.8377	11.56	5.5	Apollo		
1580	Betulia	1950 KA	14.5	2.1971	0.4876	52.10	5.4	Amor		
5370	Taranis	1986 RA	15.2	3.3278	0.6359	19.13	5.3	Amor		
		2014 MQ18	15.6	2.8963	0.5993	35.08	5.3	Amor		
5731	Zeus	1988 VP4	15.7	2.2627	0.6536	11.43	5.2	Apollo		

List of the 39 Near-Earth asteroids over 4 km in diameter

Number	Name	Provisory designation	H mag	a (AU)	e	i (deg)	Diameter (km)	Class	Notes	Multiple
112985		2002 RS28	15.8	2.2199	0.4928	46.99	5.1	Amor		
89830		2002 CE	14.9	2.0774	0.5074	43.70	5.1	Amor	PHA	
192642		1999 RD32	16.3	2.6447	0.7696	6.79	5.0	Apollo	PHA	
26760		2001 KP41	15.3	2.8528	0.5573	11.01	5.0	Amor		
5587		1990 SB	13.8	2.3973	0.5444	18.10	4.9	Amor		
20086		1994 LW	16.8	3.1844	0.6227	21.78	4.8	Amor		
163693	Atira	2003 CP20	16.3	0.7411	0.3221	25.62	4.8	Aten		binary
887	Alinda	1918 DB	13.4	2.4791	0.5671	9.36	4.8	Amor		
6455		1992 HE	13.9	2.2404	0.5723	37.34	4.6	Apollo		
		2014 JH57	16.1	3.3473	0.8705	26.54	4.6	Apollo		
1980	Tezcatlipoca	1950 LA	13.9	1.7094	0.3648	26.87	4.5	Amor		
3122	Florence	1981 ET3	14.1	1.7691	0.4233	22.15	4.4	Amor	PHA	binary
137170		1999 HF1	14.6	0.8191	0.4625	25.66	4.4	Aten		binary
1917	Cuyo	1968 AA	13.9	2.1491	0.5056	23.96	4.4	Amor		
16960		1998 QS52	14.3	2.2030	0.8578	17.55	4.3	Apollo	PHA	
162566		2000 RJ34	15.7	2.6361	0.5739	13.86	4.3	Amor		
401857		2000 PG3	16.1	2.8229	0.8556	22.01	4.3	Apollo		
21088	Chelyabinsk	1992 BL2	14.3	1.7065	0.2384	38.45	4.2	Amor		
152679		1998 KU2	16.7	2.2508	0.5530	4.93	4.2	Apollo		
3200	Phaethon	1983 TB	14.6	1.2712	0.8899	22.25	4.2	Apollo	PHA	
16064	Davidharvey	1999 RH27	16.7	2.8489	0.5891	4.54	4.1	Amor		

Green : by probe
Yellow : Phometric method
Gray : by radar

Reference :

http://www.johnstonsarchive.net/astro/largestasteroids.html

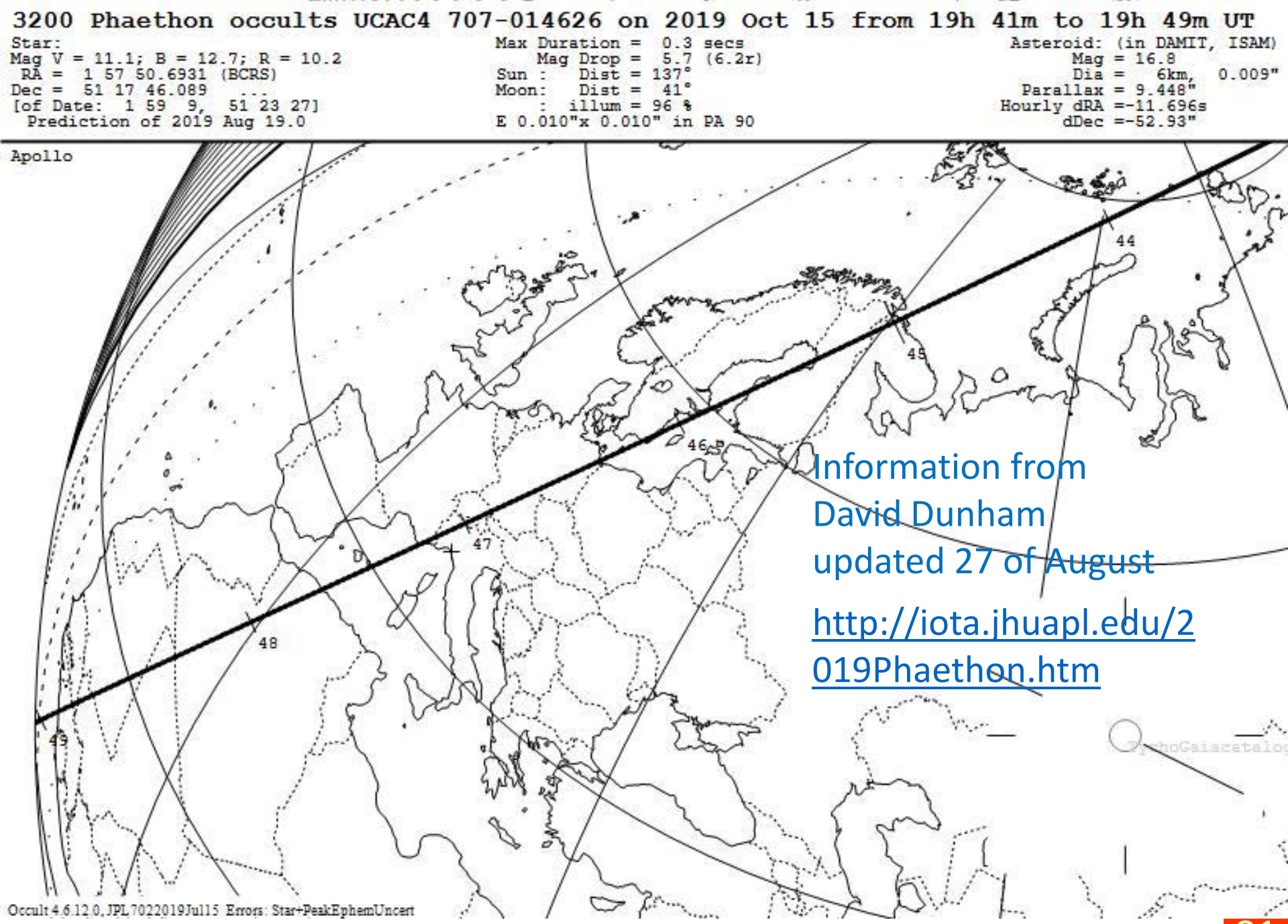
Until now only 3 NEOs have been studied using the occultation method: **1036 Ganymed** which is the largest Near-Earth Asteroid, **433 Eros** and **3200 Phaethon** lately.

Astronomers suspect that Asteroid **3200 Phaethon** is the parent body of **the Geminids**, **the annual meteor shower in mid-December**.

The Japanese agency JAXA intends to launch in 2022 the spacecraft **Destiny plus** for a flyby mission to study it in 2026.

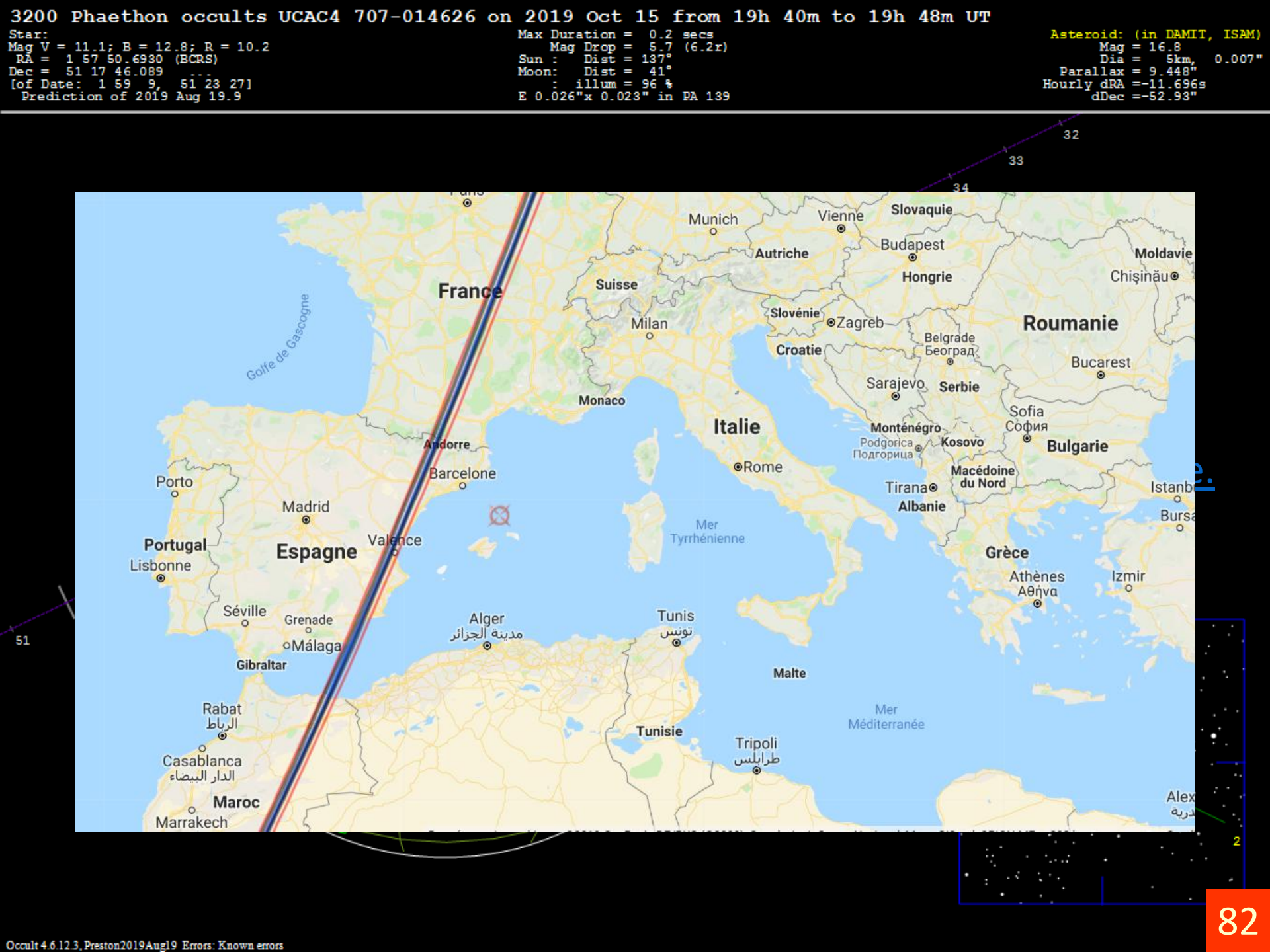
A few days ago I read through **Planoccult's e-mails from David Dunham** that there is an occultation by 3200 Phaethon asteroid on October 15th which the shadow will pass through Algeria!!!

Hurray!!!!

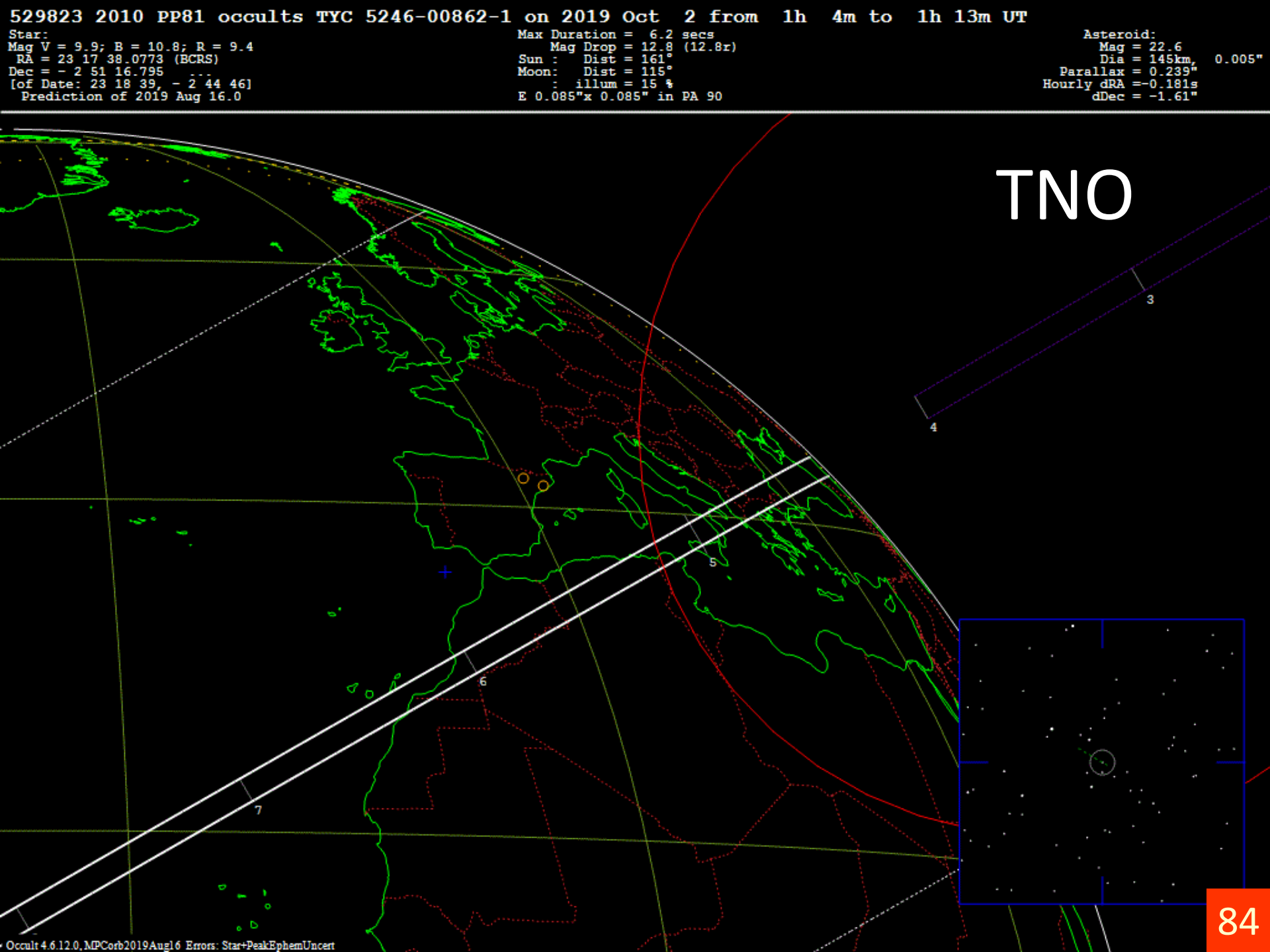


Information from
David Dunham
updated 27 of August

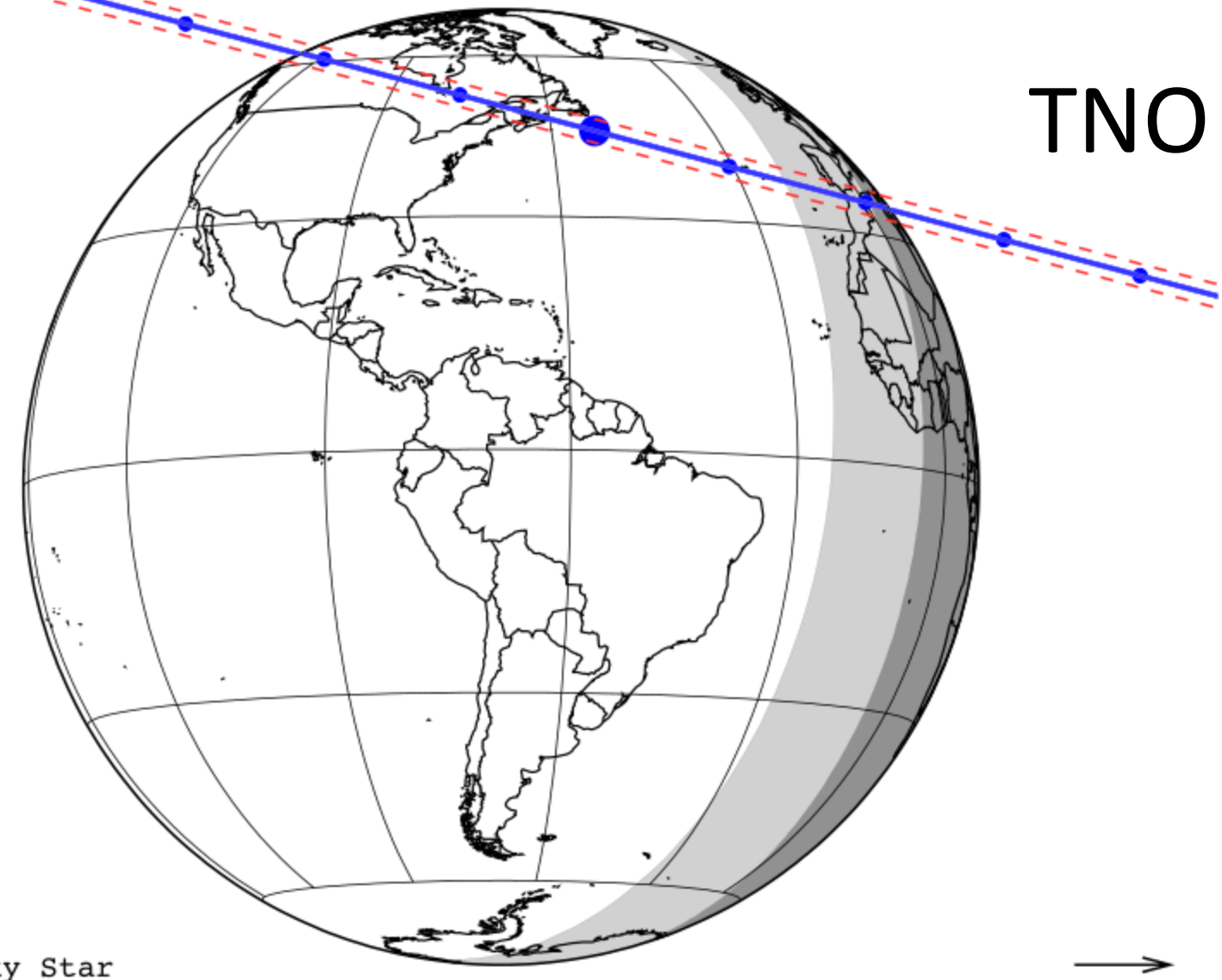
http://iota.jhuapl.edu/2019Phaethon.htm


3200 Phaethon occults UCAC4 707-014626 on 2019 Oct 15 from 19h 40m to 19h 48m UT
Star:
Mag V = 11.1; B = 12.8; R = 10.2
RA = 1 57 50.6930 (BCRS)
Dec = 51 17 46.089
[of Date: 1 59 9, 51 23 27]
Prediction of 2019 Aug 19.9
Max Duration = 0.2 secs
Mag Drop = 5.7 (6.2r)
Sun : Dist = 137°
Moon: Dist = 41°
: illum = 96 %
E 0.026"x 0.023" in PA 139
Asteroid: (in DAMIT, ISAM)
Mag = 16.8
Dia = 5km, 0.007"
Parallax = 9.448"
Hourly dRA =-11.696s
dDec =-52.93"
32
33
34
51
2
France
Suisse
Monaco
Andorre
Italie
Rome
Espagne
Portugal
Lisbonne
Porto
Madrid
Barcelone
Valence
Séville
Grenade
Málaga
Gibraltar
Rabat
الرباط
Casablanca
الدار البيضاء
Maroc
Marrakech
Alger
مدينة الجزائر
Tunis
تونس
Tunisie
Tripoli
طرابلس
Malte
Mer Tyrrhénienne
Mer Méditerranée
Golfe de Gascogne
Munich
Vienne
Slovaquie
Autriche
Budapest
Hongrie
Moldavie
Chișinău
Slovénie
Zagreb
Milan
Croatie
Belgrade
Београд
Roumanie
Bucarest
Sarajevo
Serbie
Monténégro
Podgorica
Подгорица
Kosovo
Sofia
София
Bulgarie
Macédoine du Nord
Tirana
Albanie
Istanbul
Bursa
Grèce
Athènes
Αθήνα
Izmir
Alexandrie
Occult 4.6.12.3, Preston2019Aug19 Errors: Known errors
82

Next interesting occultations in Algeria


529823 2010 PP81 occults TYC 5246-00862-1 on 2019 Oct 2 from 1h 4m to 1h 13m UT
Star:
Mag V = 9.9; B = 10.8; R = 9.4
RA = 23 17 38.0773 (BCRS)
Dec = - 2 51 16.795 ...
[of Date: 23 18 39, - 2 44 46]
Prediction of 2019 Aug 16.0
Max Duration = 6.2 secs
Mag Drop = 12.8 (12.8r)
Sun : Dist = 161°
Moon: Dist = 115°
: illum = 15 %
E 0.085"x 0.085" in PA 90
Asteroid:
Mag = 22.6
Dia = 145km, 0.005"
Parallax = 0.239"
Hourly dRA =-0.181s
dDec = -1.61"
TNO
3
4
5
6
7
Occult 4.6.12.0, MPCorb2019Aug16 Errors: Star+PeakEphemUncert

2000RW82, GAIADR2+pmGAIADR2, NIMAv1 Offset: 0.0mas 0.0mas

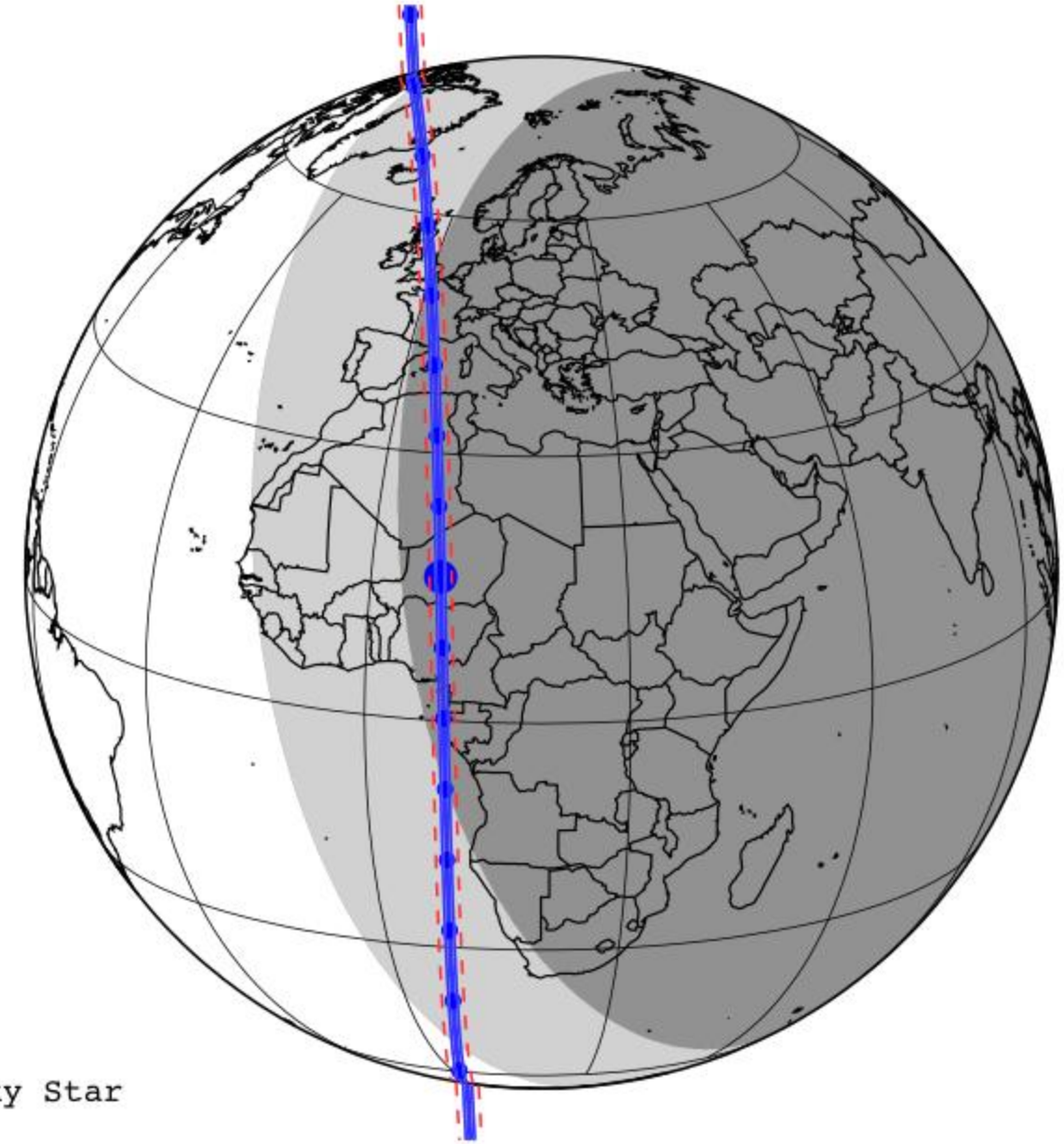


TNO

Lucky Star

yyyy mm dd hh:mm:ss.s	RA_star_J2000	DE_star_J2000	C/A	P/A	vel	Delta	G*	RP*	H*
2019-09-09 19:34:12.2	14 13 55.5215	-04 27 29.822	1.079	14.77	31.38	6.2658	12.9	12.4	11.3

Antilochus, GAIADR2+pmGAIADR2, NIMAv1 Offset: 0.0mas 0.0mas



TNO

Lucky Star

yyyy mm dd hh:mm:ss.s	RA_star_J2000	DE_star_J2000	C/A	P/A	vel	Delta	G*	RP*	H*
2019-10-30 18:28:36.2	22 22 54.8529	+16 53 49.792	0.395	266.95	14.53	4.3622	13.3	12.8	12.0

Summary

We are interesting to study more stellar occultation by asteroids and specially NEA (Near-Earth Asteroids) and TNO (TransNeptunian Objets).

In the field of my PhD thesis, I hope to characterize in the next two years 3 of the 39 Near-Earth Asteroids that have more than 4 kilometers at least using 3 telescopes coupled with IOTA occultation kit.

In parallel, we develop the Algerian Occultation Amateurs Astronomers Network to observe firstly more easy stellar occultations by asteroids visually and in the near future with the camera RUNCAM2 and Arduino Inserter which follows the works of Participative Astronomy in Algeria.

Finally, we wish to create a relationship with other partners around the world and especially from IOTA in order to develop this research in Algeria.


Thank you for
your attention!