



# The occultation by asteroid 1997 WP21 and other Czech observations

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International Occultation Timing Association / European Section

Czech Astronomical Society – Occultation and Timing Section

Discovered 1997-Nov-30 by Kobayashi, T. at Oizumi

$i = 17,958^\circ$

$e = 0,101$

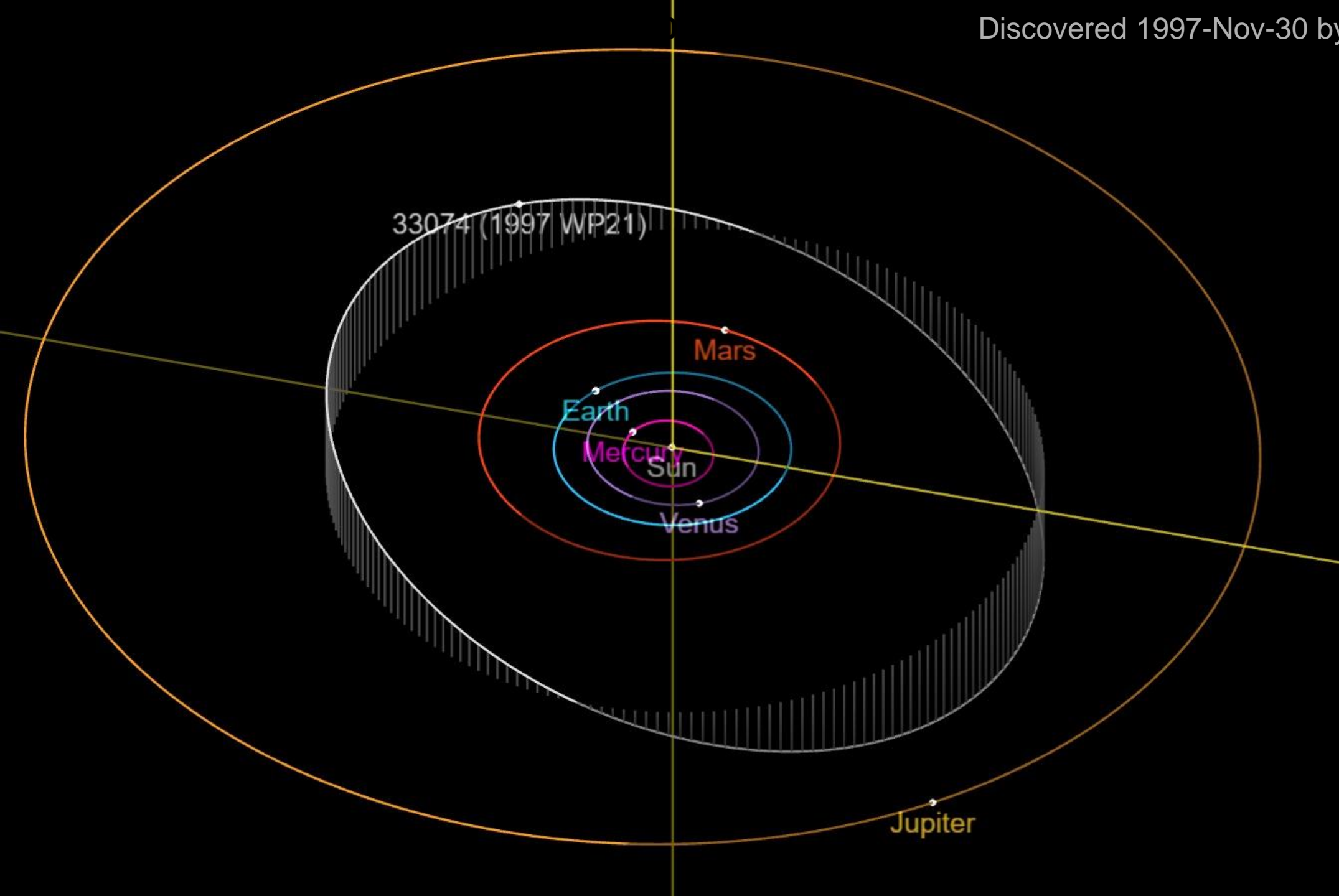
$q = 2,858 \text{ AU}$

$a = 3,180 \text{ AU}$

$Q = 3,502 \text{ AU}$

period 5,67 yr

Dia = 17,5 km



# (33074) 1997 WP21 - 14 February 2021

- ▶ Combined magnitude: 12.08 (star 12.1 mag, asteroid 16.7 mag)
- ▶ Predicted mag.drop: 4.62
- ▶ Predicted max. duration: 1.6 sec
- ▶ IBEROC feed
- ▶ Star TYC 2491\_01520\_1 (Lyn)
  
- ▶ 2 positive observations
- ▶ 5 negative observations
- ▶ Observers from CZ, PL
  
- ▶ My local circumstances:
- ▶  $h=54^\circ$  ,  $AZ=94^\circ$  , probability 10,5%



1997 WP21 - 14 February 2021

Teplice

Jerzmanowice

Tlustice

Strašice

Pízeň - Valcha  
Rokycany

Google Earth

Image Landsat / Copernicus

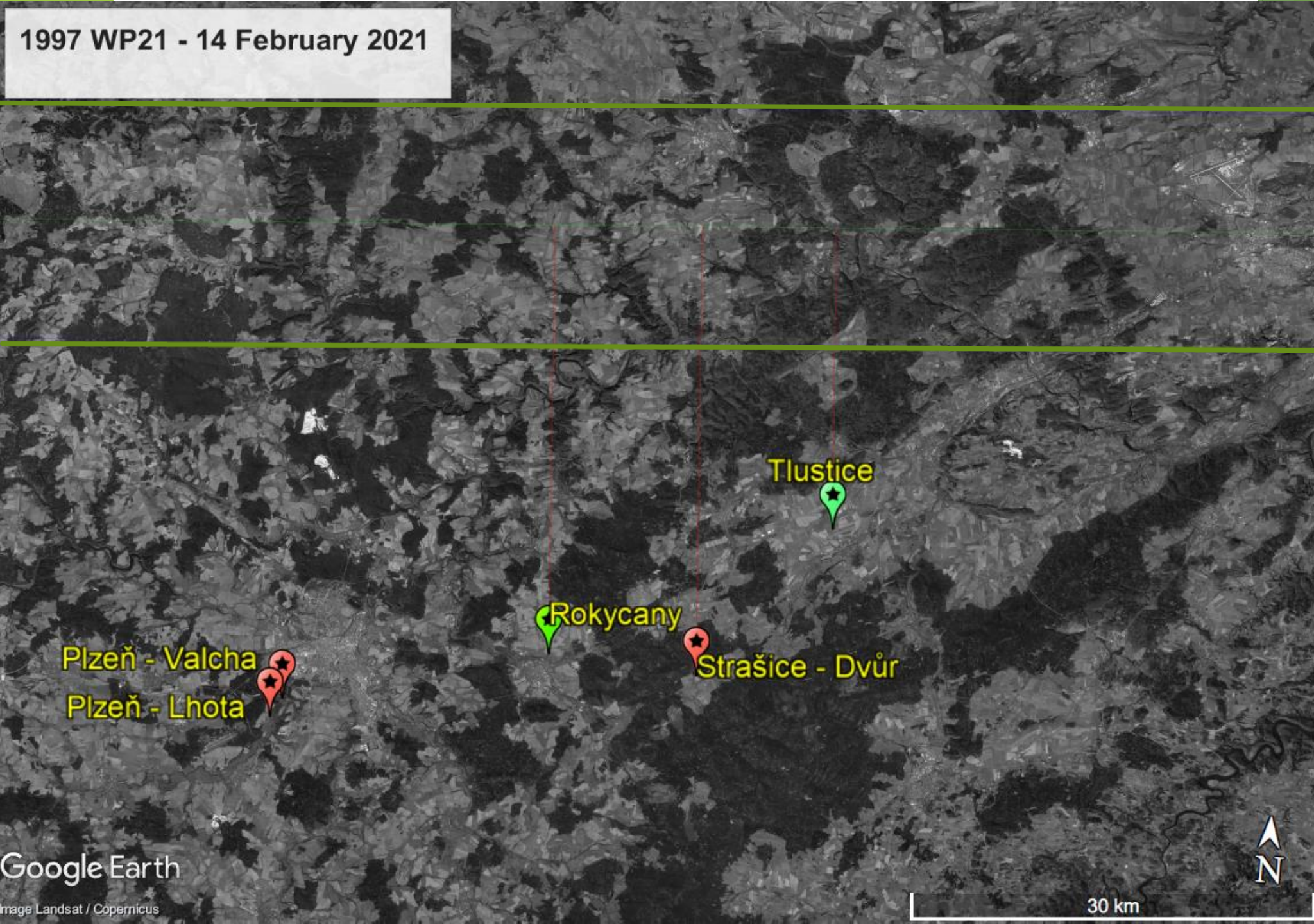


200 km





1997 WP21 - 14 February 2021



Plzeň - Valcha  
Plzeň - Lhota

Rokycany

Tlustice

Strašice - Dvůr

Google Earth

Image Landsat / Copernicus

30 km



# Predictions for Tlustice, Strašice and Rokycany and observations from these sites

Tlustice - prediction 19:16:11,2 UT - Mid-event 19:16:11.37 UT +/- 0.10 sec  
Strašice - prediction 19:16:12,0 UT - clearly negative (integration 0,18 sec)  
Rokycany - prediction 19:16:12,8 UT - Mid-event 19:16:07.04 UT +/- 0.02 sec

The difference after taking the distance between Tlustice and Rokycany is 6 seconds.

Temperatures:

Tlustice -8 deg. C

Rokycany -10 deg. C

Strašice -11 deg. C

**Hi all,**

please find attached my “triple”. I recorded 4 positive observations of 3 positive events at **night 14/15 February 2021**. Asteroids: **Hooveria** (2 pos.), **1997 WP21** (1 pos.) and **Kaye** (1 pos.). Thank you to **Jiří Polák** for processing all the events.

A small timeline:

17:10 UT searched the right field of Hooveria at station Strašice (during dusk)

17:20 UT automatic recording settings of the 1st station and departure to the 2nd station

17:40 UT arrival by car at the 2nd station and setting up the telescope

18:02 UT searched the right field of Hooveria at station Tlustice

**18:05 UT event by asteroid (932) Hooveria - recording - station Tlustice positive**

**18:05 UT event by asteroid (932) Hooveria - recording - station Strašice positive**

18:45 UT searched the right field of (33074) 1997 WP21 at station Tlustice

**19:16 UT event by asteroid (33074) 1997 WP21 - recording - station Tlustice positive**

19:40 UT put the telescope into the car and departure to the 1st station

20:00 UT arrival to Strašice

**01:10 UT event by asteroid (6546) Kaye - recording - station Strašice positive**

**Clear sky!**

**Jiří Kubánek**



2021-02-14 19:16:55:1012445



Jiří Kubánek, Tlustice

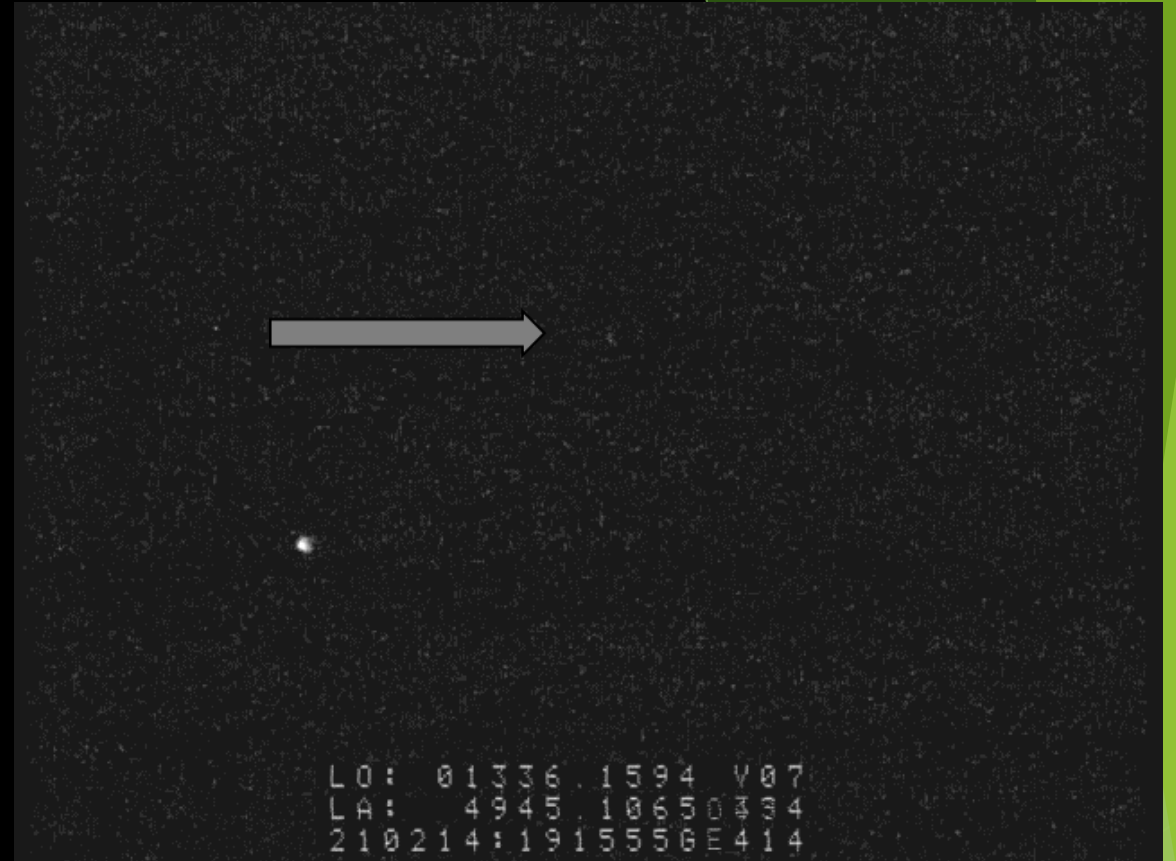
Schmidt-Cassegrain 150/1500 mm, QHY174M-GPS

D - 19:16:10.51 UT +/- 0.10

R - 19:16:12.22 UT +/- 0.10

Duration: 1.71 s +/- 0.20 sec

Integration 200 ms.



Karel Halíř, Rokycany

Dall-Kirgham 507/3454 mm, Watec 910, TIM-10

D - 19:16:06.76 UT +/- 0.02

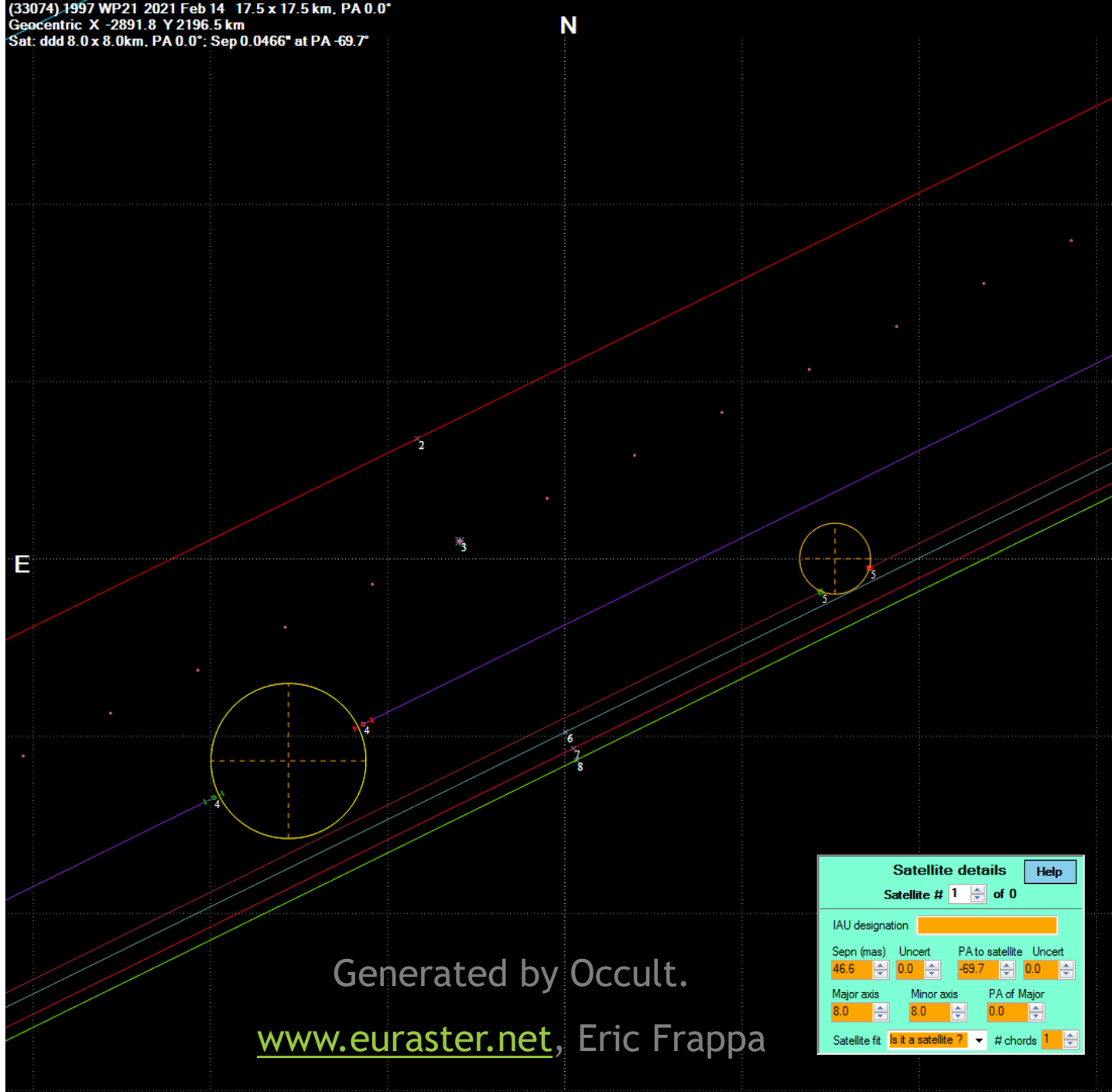
R - 19:16:07.32 UT +/- 0.02

Duration: 0,56 s +/- 0.04 sec

Integration 40 ms.



(33074) 1997 WP21 2021 Feb 14 17.5 x 17.5 km, PA 0.0°  
 Geocentric X -2891.8 Y 2196.5 km  
 Sat: ddd 8.0 x 8.0km, PA 0.0°: Sep 0.0466° at PA -69.7°



Find best fit

Center X: 0.0 Centered on Shape model  
 Center Y: 0.0

Major axis (km): 17.5 a/b=1.00  
 Minor axis (km): 17.5 dMag=0.00  
 Orientation: 0.0 Motion: 9.86km/s, X

Circular  Use assumed diameter  Include Miss events

Show:  Both  Primary  Secondary

Plot scale:  normal  x 2  x 5

Plot scale:

Quality of the fit: Limits on size, but no shape

Flag for future review

Form opacity:

RMS fit 0.6 ±0.0 km

<span style="color: cyan;">—</span>	1 (M)	Tomas Janik
<span style="color: red;">—</span>	2 (M)	Marcin Filipek
<span style="color: green;">—</span>	3 (P)	Predicted
<span style="color: purple;">—</span>	4	Jiri Kubanek
<span style="color: brown;">—</span>	5	Karel Halir
<span style="color: teal;">—</span>	6 (M)	Miroslav Polacek
<span style="color: red;">—</span>	7 (M)	Michal Rottenborn
<span style="color: green;">—</span>	8 (M)	Jiri Polak

**Satellite details** Help

Satellite #  of

IAU designation

Seprn (mas)	Uncert	PA to satellite	Uncert
46.6	0.0	-69.7	0.0

Major axis	Minor axis	PA of Major
8.0	8.0	0.0

Satellite fit  # chords

Generated by Occult.  
[www.euraster.net](http://www.euraster.net), Eric Frappa

2021 02 14 19:15:54:2930048



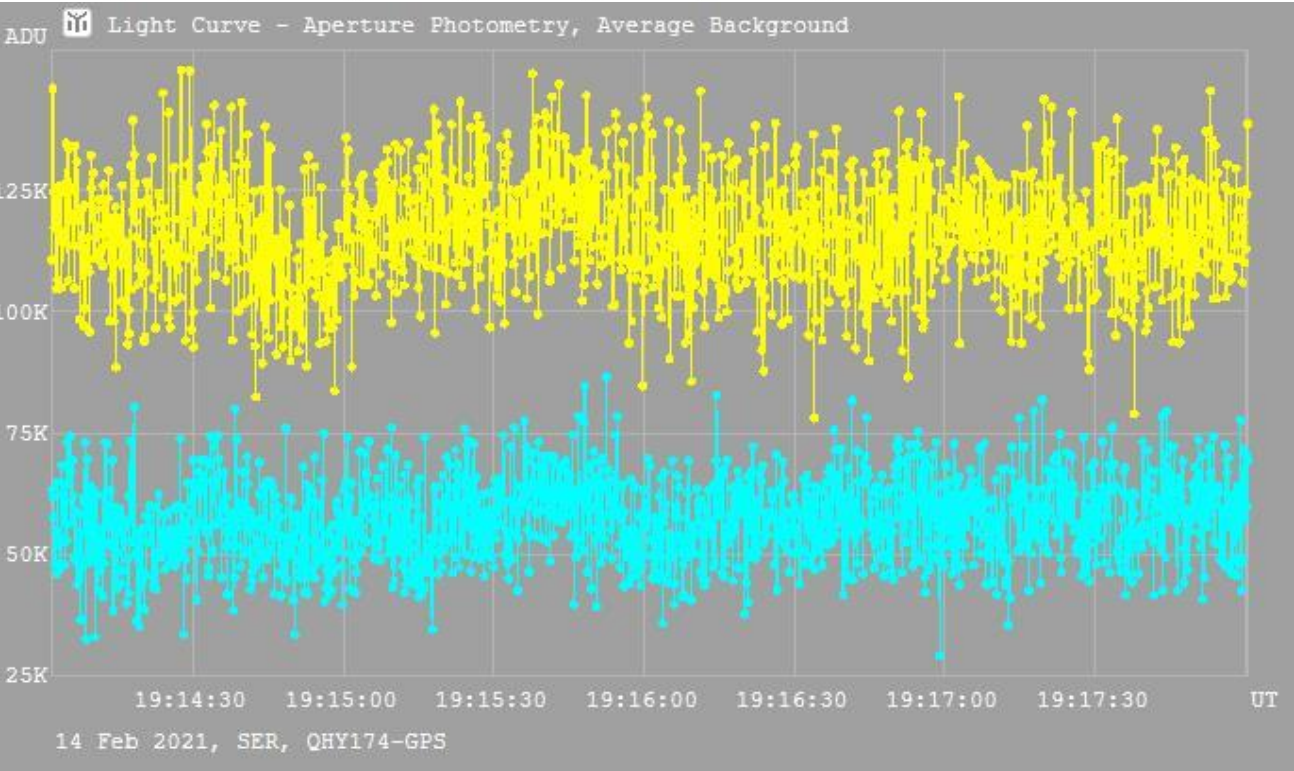
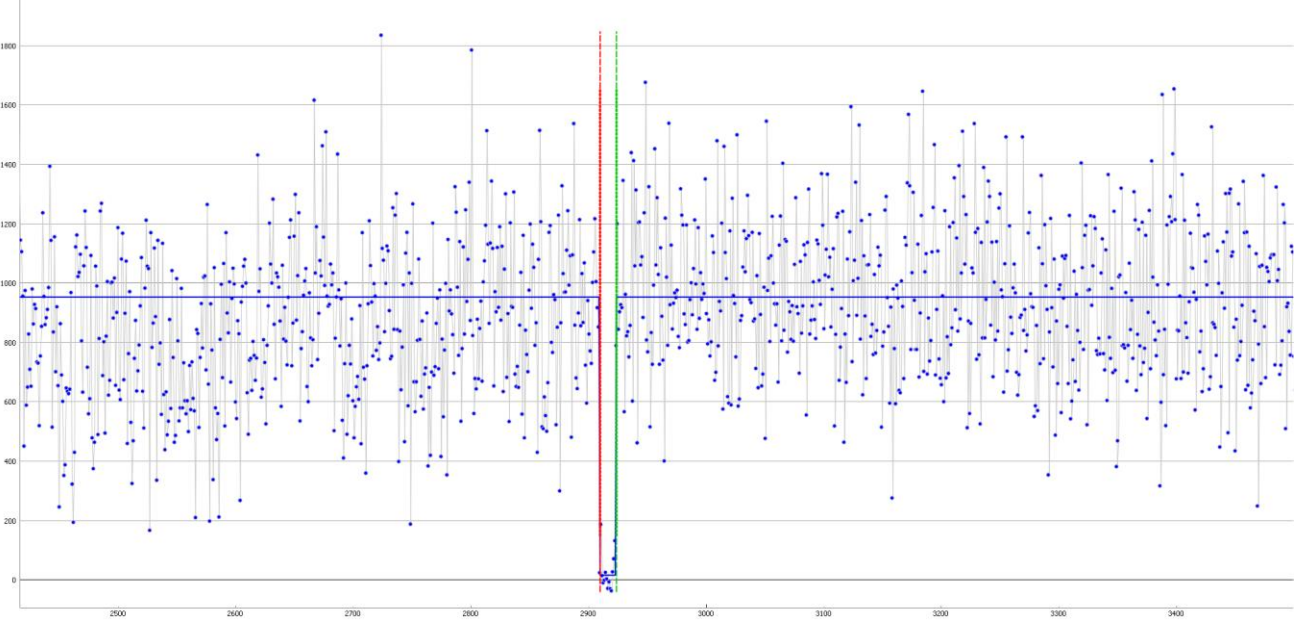
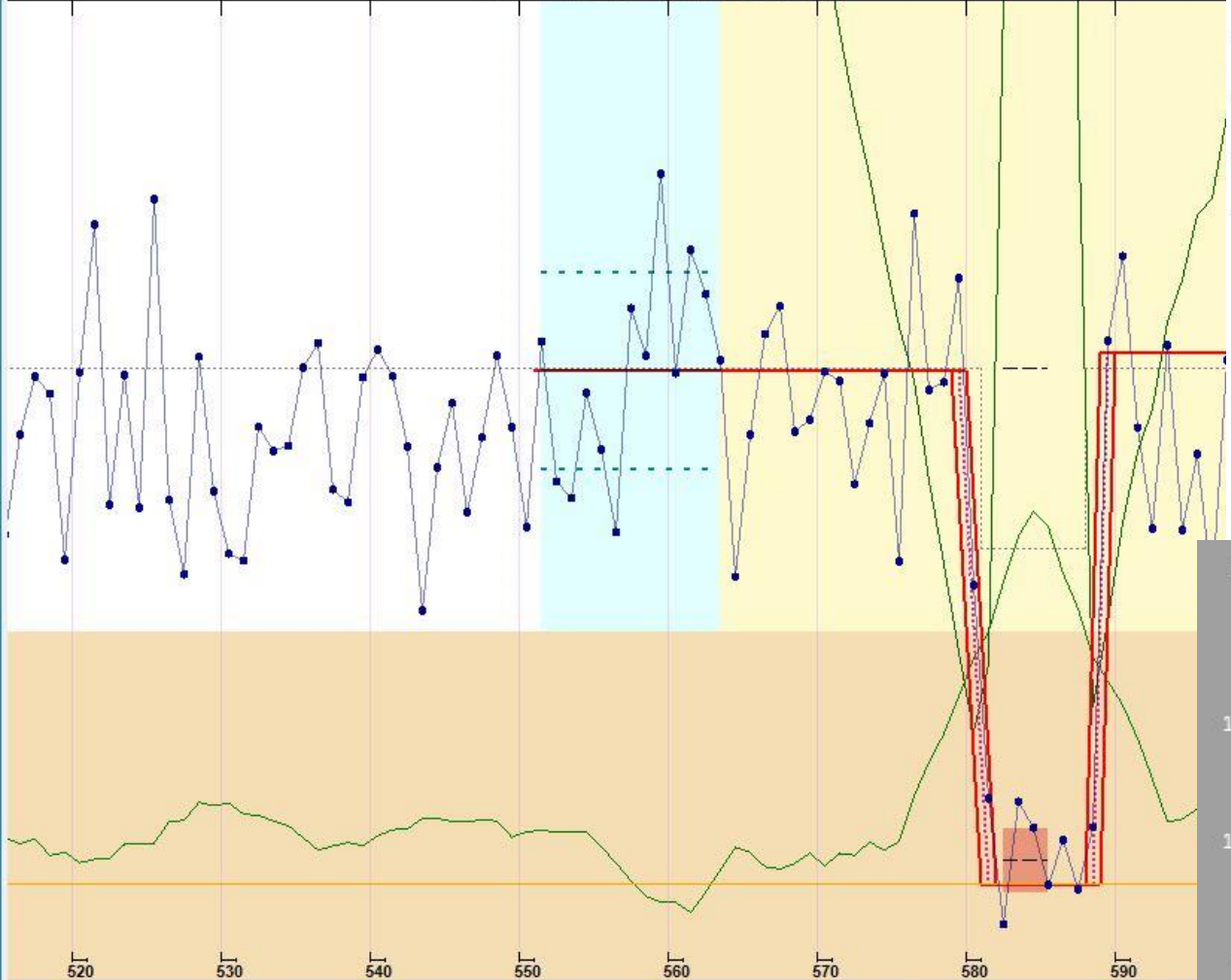
Miroslav Poláček

Strašice

Newton 152/750 mm, QHY174M-GPS

Integration 180 ms.





Scale, Objects  
 Horizontal 10.0  
 Vertical 1.00  
 0 - point average  
 its Target star   
 Comparison star 1   
 Comparison star 2   
 Comparison star 3   
 Background

1. Read, Integrity, Set time, Bin & normalise 2. (info) Fourier plot 3. Find events 4. Select event to analyse 5. Analyse event #1 6. Cal

**Adjust regions**  
 # points outside of transition: 12  
 563.0  Just before D  
 584.0  Just after D  
 584.0  Just before R  
 617.0  Just after R

**$\chi^2$  analysis**  
 # transitions: 10  
 Vary noise by:  Variance  Std Devn

**Monte Carlo parameters**  
 # Monte Carlo trials: 200  
 Noise applied to:  test signal  measured  
 Std Dev limit on noise: 3.0

**Get event locations**  
 Confidence %: D 90 R 90  
**Location of occultation**  
 D: 580.0 - 581.0; Dur. 1  
 R: 588.5 - 589.5; Dur. 0  
 Show:  meas. means  error bars  cross-corrin  
 S/N at D: 7.4 at R: 8.2

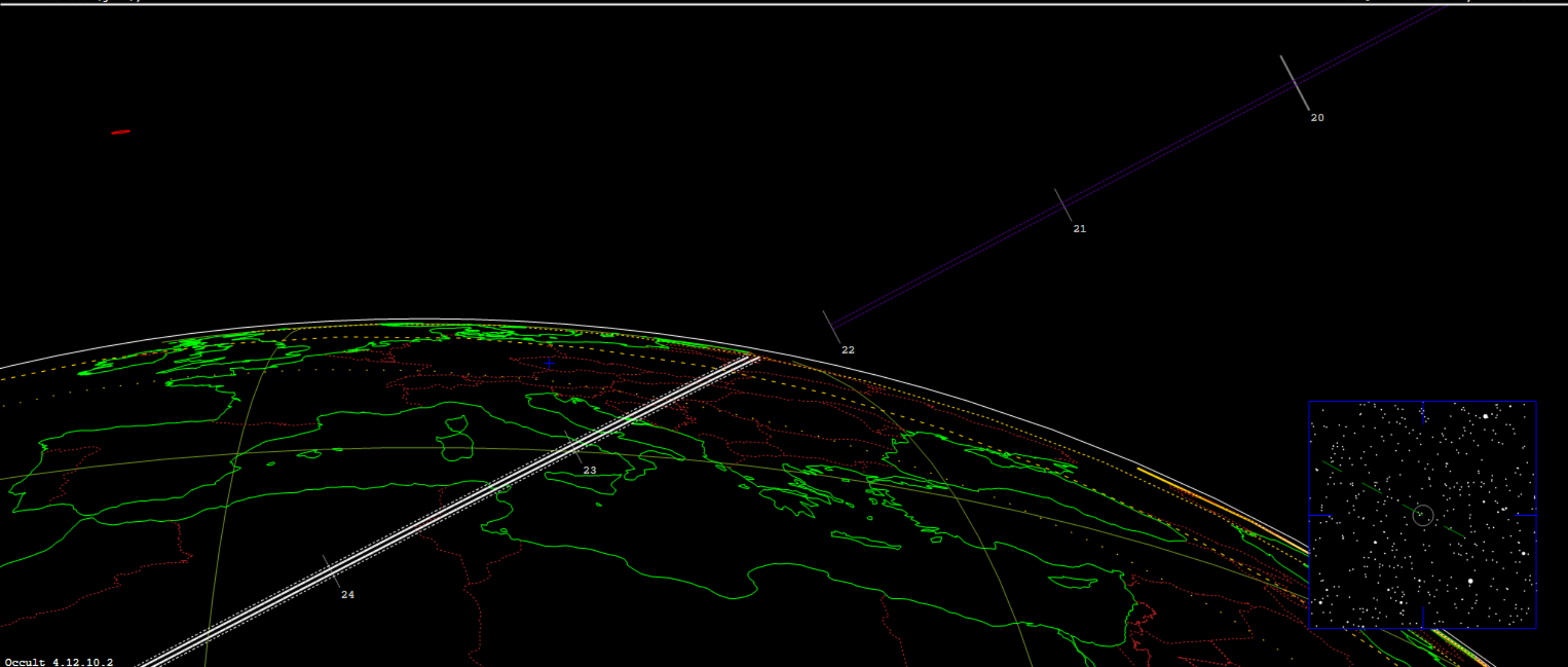
# Next events by 1997 WP21

33074 1997 WP21 occults UCAC4 307-260593 on 2023 Jul 2 from 0h 22m to 0h 31m UT

Star: (Dia < 0.1 mas)  
Mv 14.1; Mb 14.5; Mr 13.5  
RA = 19 26 58.3193 (astrometric)  
Dec = -28 44 9.099  
[of Date: 19 28 27, -28 41 18]  
Prediction of 2021 Aug 3.0  
Reliable 1.2 (good),

Max Duration = 1.15 secs  
Mag Drop = 3.5 (3.6r)  
Sun : Dist = 169"  
Moon: Dist = 30"  
: illum = 97 %  
Error 17.3x1.7 mas in PA 83°

Asteroid:  
Mag = 17.5  
Dia = 18 ±2km, 10 mas  
Parallax = 3.548"  
Hourly dRA = -2.053s  
dDec = -14.23"  
JPL#37:2021-Jul-08, Known errors





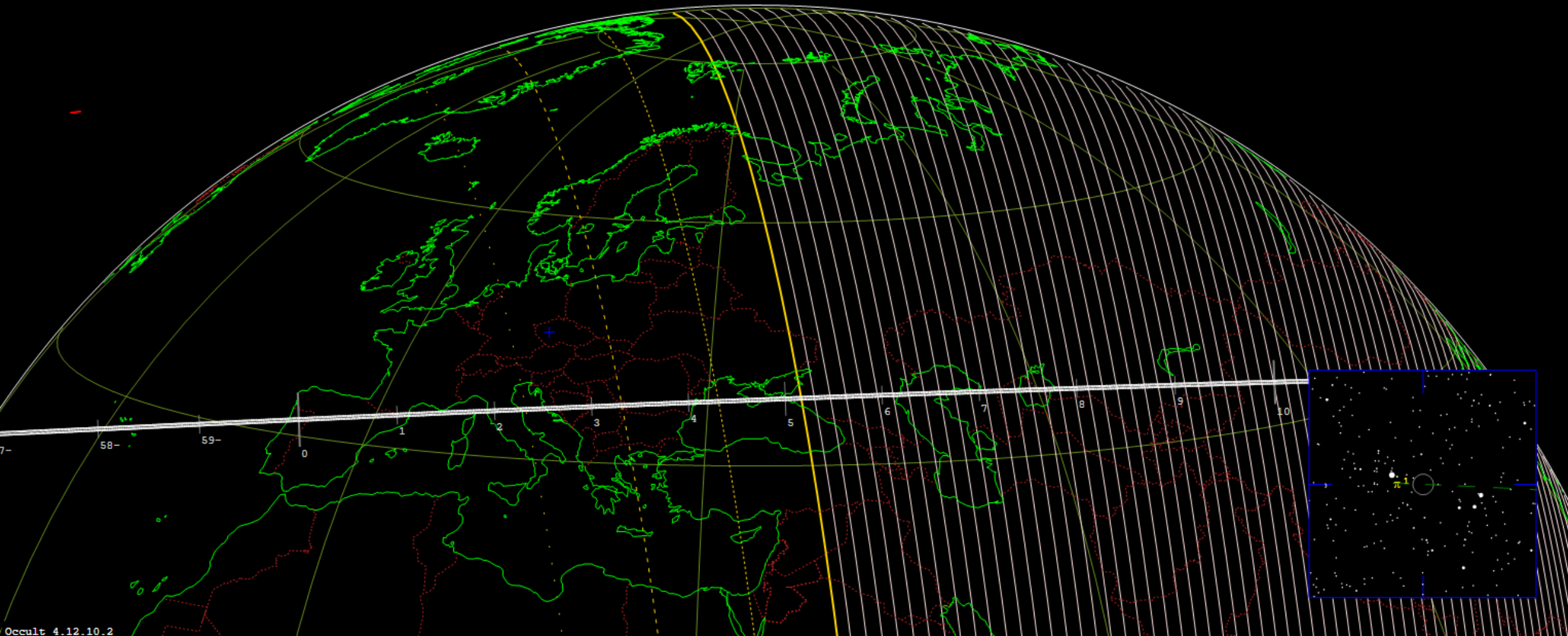
# Next events by 1997 WP21

33074 1997 WP21 occults UCAC4 501-008986 on 2025 Sep 14 from 2h 57m to 3h 12m UT

Star: (Dia < 0.1 mas)  
Mv 13.6; Mb 14.0; Mr 13.0  
RA = 4 53 46.9385 (astrometric)  
Dec = 10 4 6.847  
[of Date: 4 55 12, 10 6 46]  
Prediction of 2021 Aug 3.0  
Reliable 1.0 (good),

Max Duration = 1.51 secs  
Mag Drop = 4.5 (4.7r)  
Sun : Dist = 98°  
Moon: Dist = 18°  
: illum = 54 %  
Error 17.3x1.7 mas in PA 83°

Asteroid:  
Mag = 18.1  
Dia = 18 ±2km, 9 mas  
Parallax = 3.200"  
Hourly dRA = 1.420s  
dDec = 0.80"  
JPL#37:2021-Jul-08, Known errors





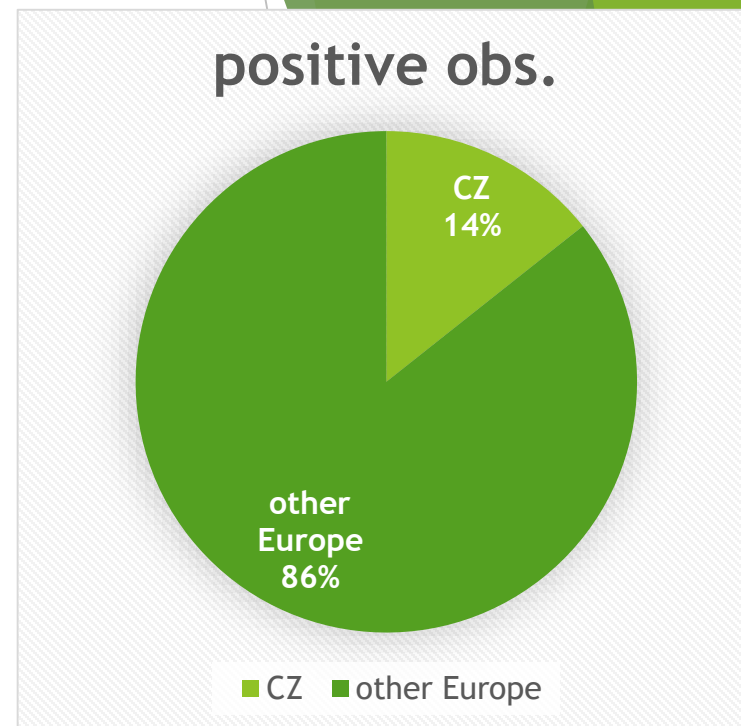
# Ondřejov – Astronomical Institute - Department of Interplanetary Matter





# Number of all observations / positive observations by Czech observers in 2020

Michal Rottenborn	335 observations	19 positive observations
Jiří Kubánek	212	26
Jiří Polák	69	13
Tomáš Janík	52	6
Karel Halíř	19	7
Petr Zelený	14	2
Miroslav Poláček	11	1
Jan Mánek	9	5
Zdeněk Moravec	7	2
Václav Přibáň	5	2
Jiří Srba	2	1
Milan Antoš	1	1
Pavel Svozil / Martin Leskovjan	1	1
Radim Neuvirt	1	1
Jan Gebel	1	0



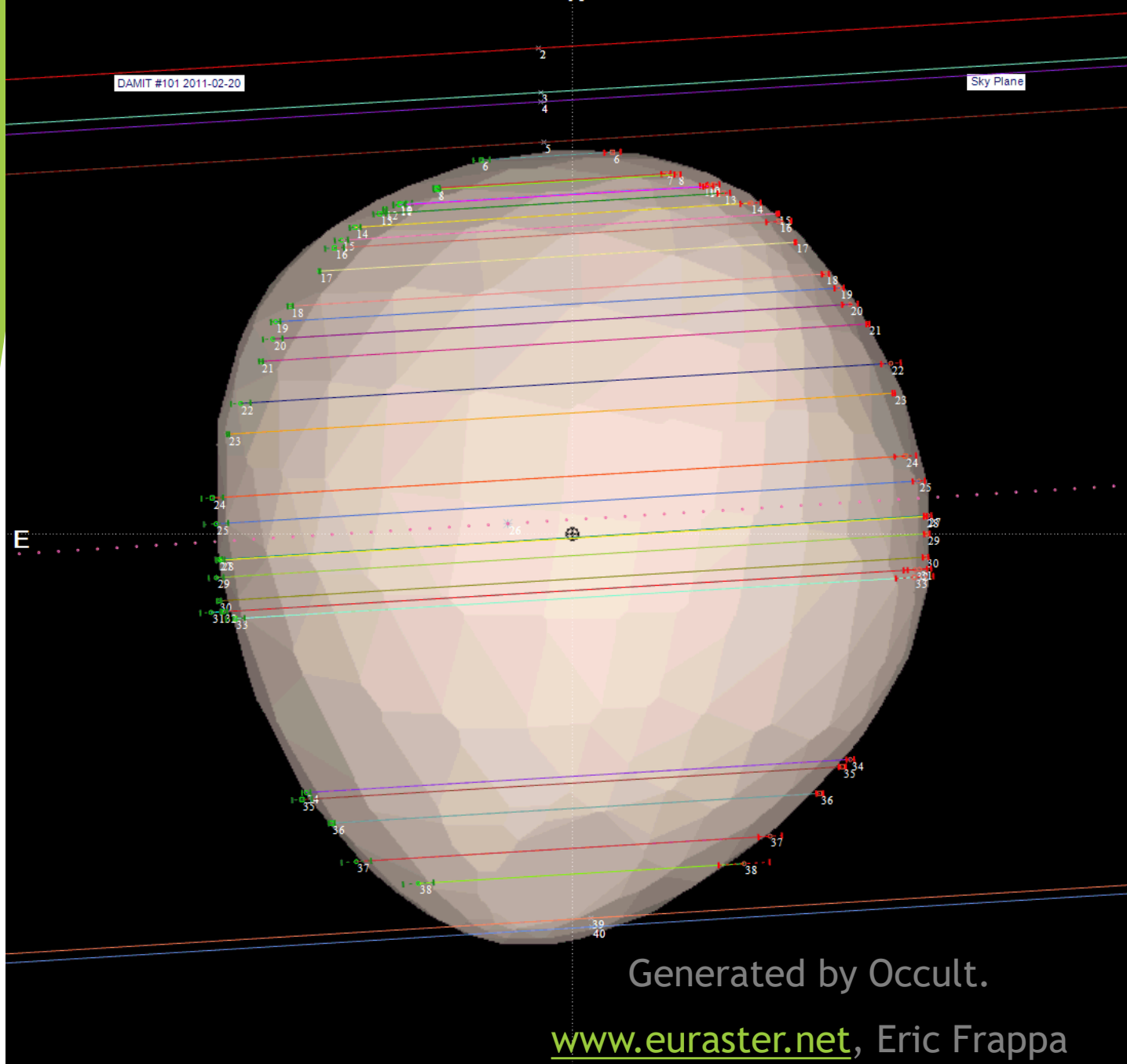




## (2) Pallas - 22 June 2020

- ▶ Combined magnitude: 9.5
- ▶ Predicted mag.drop: 0.16
- ▶ Predicted max. duration: 41.8 sec
- ▶ 32 positive observations
- ▶ 10 negative observations
- ▶ Observers from FR, CZ, DE, CH, BE, IT, PL

(2) Pallas 2020 Jun 22 545.5 ±2.1 x 502.4 ±1.4 km. PA 353.6° ±1.6°  
Geocentric X -1721.3 ±0.6 Y 2884.7 ±0.8 km



Find best fit

Center X -1.4 Centered on Shape model  
Center Y -12.8

Major axis (km) 545.5 a/b=1.09  
Minor axis (km) 502.4 dMag=-0.09  
Orientation 353.6 Motion 13.95km/s, X

Circular  Use assumed diameter  Include Miss events

Show:  Both  Primary  Secondary

Plot scale:  normal  x2  x5

Plot scale: [Slider]

Quality of the fit: Resolution better than shape model

Form opacity: [Slider]

RMS fit 0.2 ±3.3 km

1 (M)	Christian Weber
2 (M)	Marek Zawilski
3 (M)	Peter Lindner
4 (M)	Emmanuel Conseil
5 (M)	Anonymous
6	Chad Ellington
7	O. Schreurs & E Fernandez
8	Jean Lecacheux
9	Roland Boninsegna
10	Tomas Janik
11	Milan Antos
12	Jean Bourgeois
13	Vaclav Priban
14	F. Van Den Abbeel
15	Oliver Kloes
16	Ladislav Cervinka
17	Johannes Ohlert
18	Jiri Kubanek
19	Jan Manek
20	Miroslav Polacek
21	Olivier Dechambre
22	Michael Irzyk
23	A. Leroy, D Queant et al
24	Bernd Gaehrken
25	Karl-Ludwig Bath
26 (P)	Predicted
27	Maurice Audejean
28	Jean-Louis Dumont
29	Lionel Rousselot
30	Pierre Le Cam
31	Andreas Schweizer
32	Stefan Meister
33	Jonas Schenker
34	Stefano Sposetti
35	Andrea Manna
36	Alberto Ossola
37	Maurice Declerck
38	Gianni Galli
39 (M)	Daniel Verilhac
40 (M)	Eric Frappa
41 (M)	Pietro Baruffetti
42 (M)	E. Frappa & A. Klotz
43 (M)	J.M. Laugier

Generated by Occult.

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# (885) Ulrike - 12 July 2020

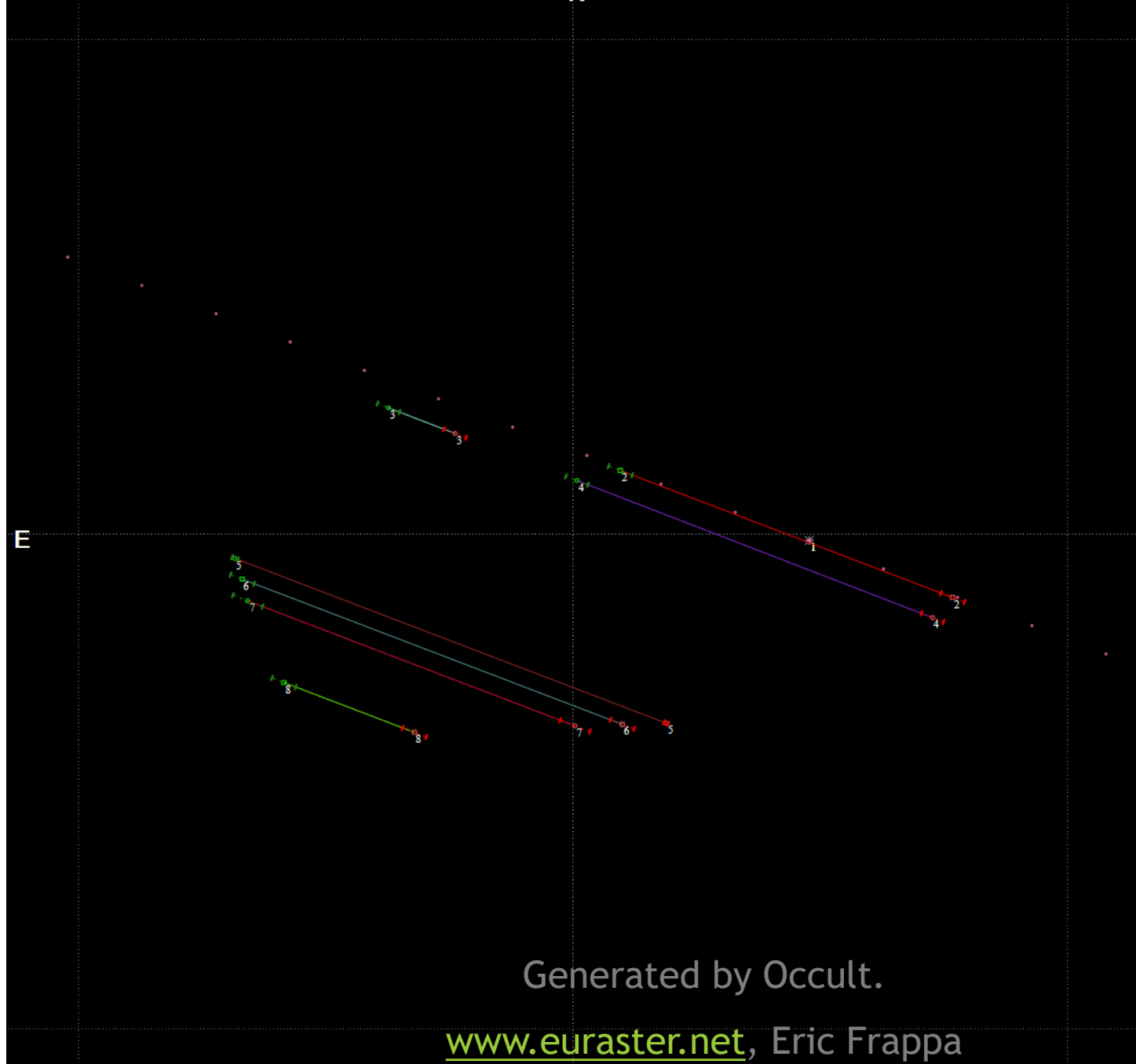
- ▶ Combined magnitude: 12.7
- ▶ Predicted mag. drop: 2.0
- ▶ Predicted max. duration: 4.4 sec
- ▶ 6 positive observations
- ▶ Observers from CZ, FR, DE



(885) Ulrike 2020 Jul 12 72.1 ± 2.4 × 30.2 ± 1.8 km, PA 89.4° ± 4.0°  
Geocentric X -2563.0 ± 1.2 Y 5473.9 ± 0.9 km

N

E



Hide best fit  Centered on Shape model

Center X -0.9  0.0  
Center Y -2.1  0.1

Major axis (km) 72.1  0.0  $a/b=2.39$   
Minor axis (km) 30.2  0.0  $dMag=-0.94$   
Orientation 89.4  0.1 Motion 7.50km/s, X

Circular  Use assumed diameter  Include Miss events

Show:  Both  Primary  Secondary

Plot scale:  normal  x 2  x 5

Plot scale:

Quality of the fit: Reliable size. Can fit to shape mode

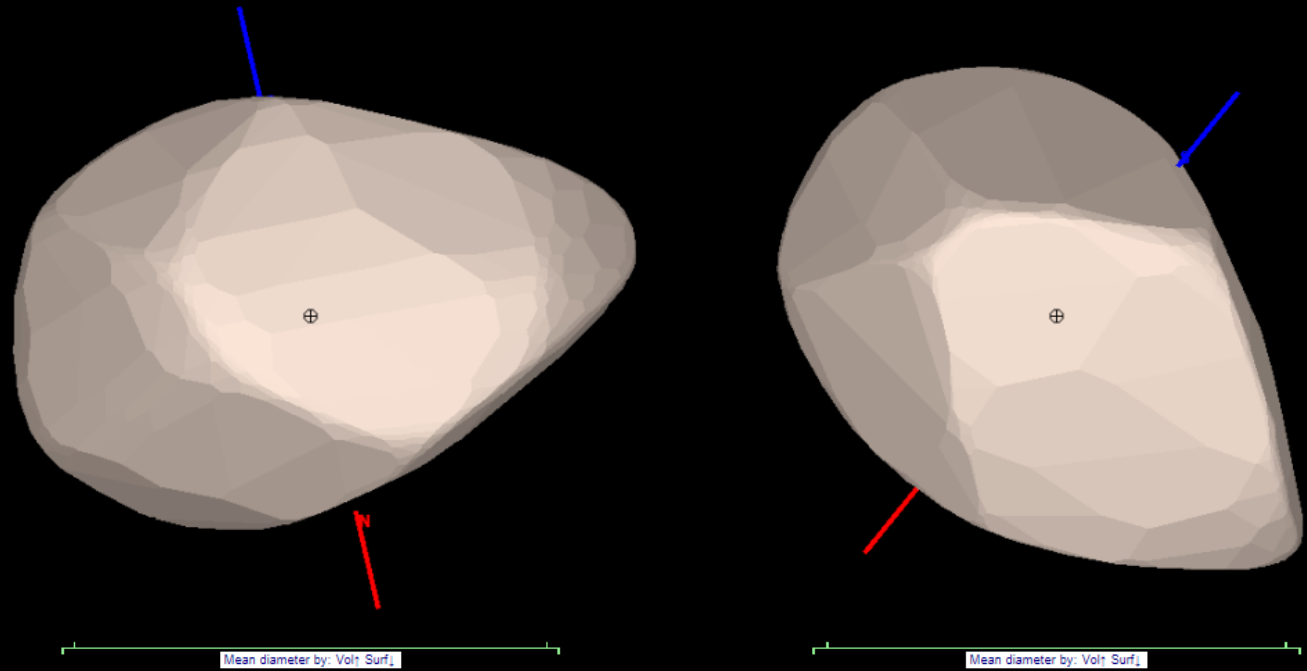
Form opacity:

RMS fit -0.1 ± 2.6 km

	1 (P)	Predicted
	2	Radim Neuvirt
	3	Pierre Le Cam
	4	Pierre Le Cam
	5	Michal Rottenborn
	6	Karel Halir
	7	Jiri Kubanek
	8	Bjoern Kattentidt

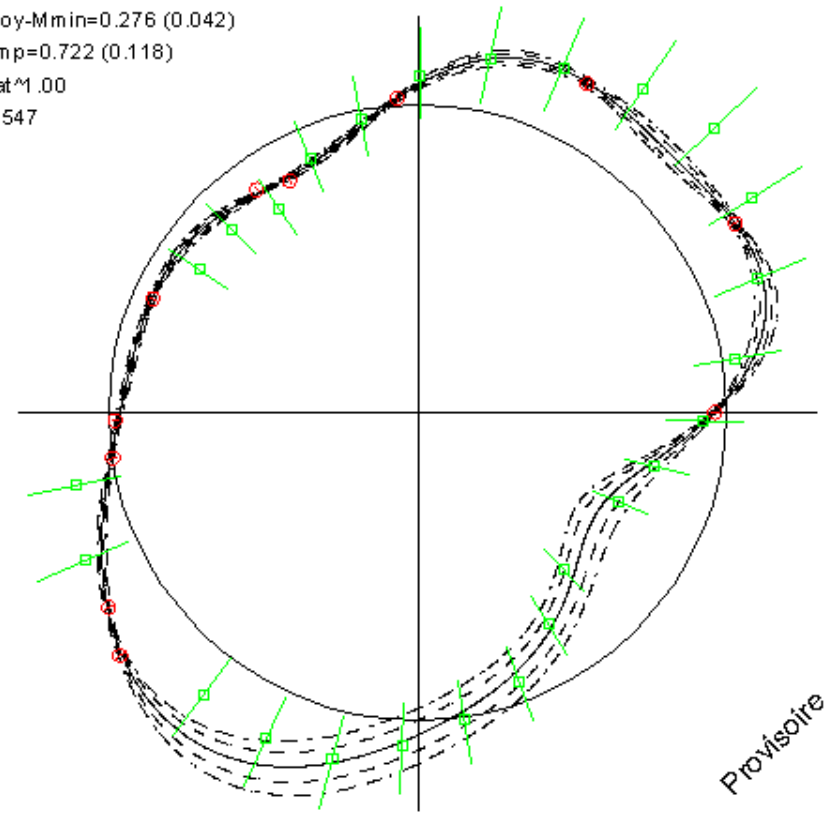
Generated by Occult.

[www.euraster.net](http://www.euraster.net), Eric Frappa



### (885) Ulrike

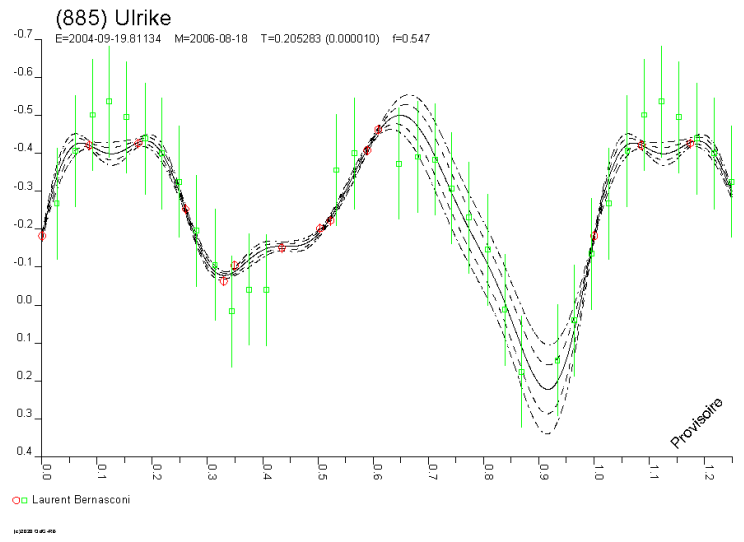
Mmax-Mmoy=0.447 (0.105)  
 Mmoy-Mmin=0.276 (0.042)  
 Mamp=0.722 (0.118)  
 Eclat~1.00  
 f=0.547



Laurent Bernasconi

14/06/2016 04:48:29

DAMIT models;  
generated by Occult



### CdR&CdL

<http://obswww.unige.ch/~behrend/page3cou.html>

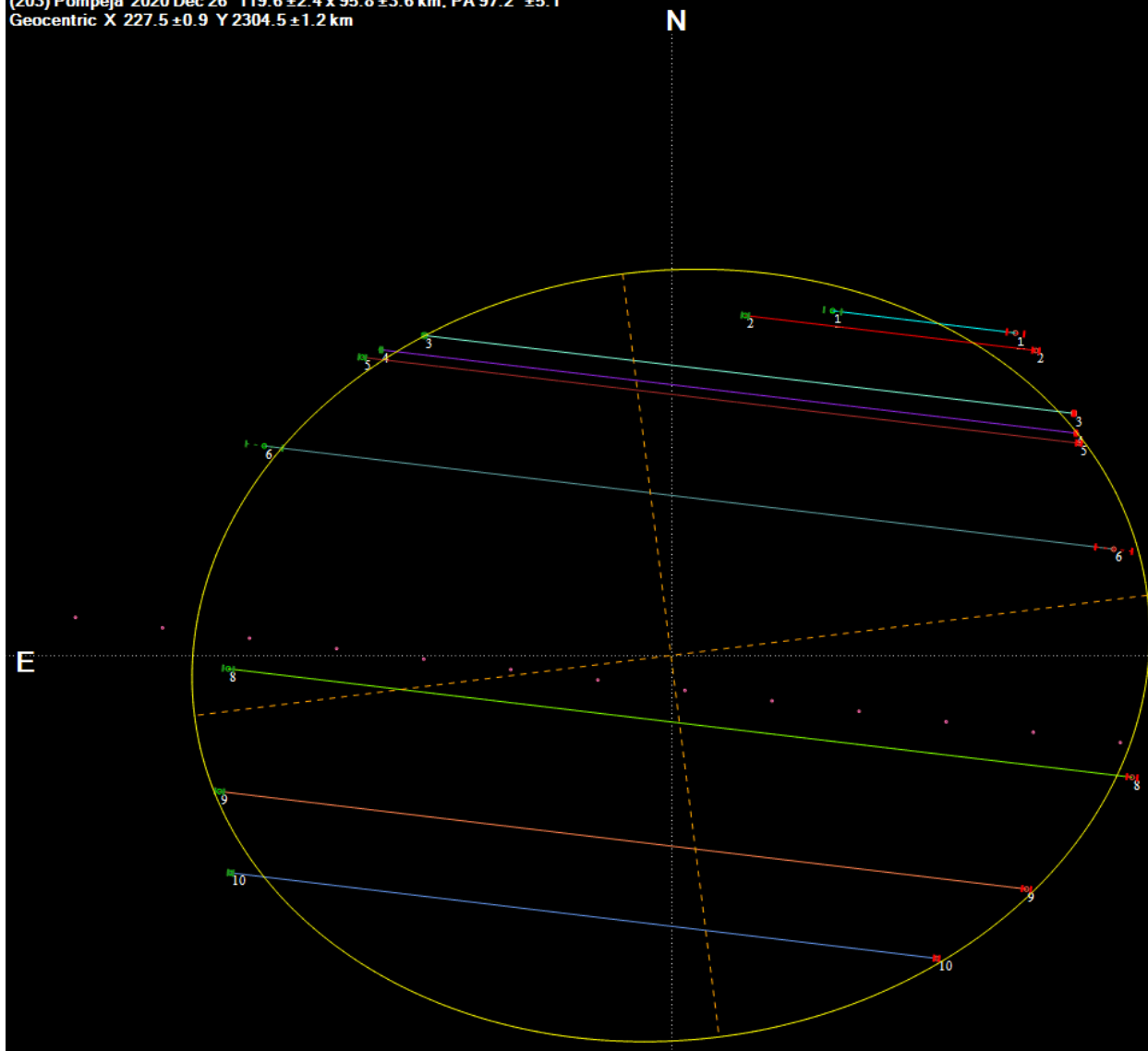
### #000885



# (203) Pompeja - 26 December 2020

- ▶ Combined magnitude: 10.7
- ▶ Predicted mag. drop: 1.7
- ▶ Predicted max. duration: 11.2 sec
- ▶ 9 positive observations
- ▶ Observers from CZ, PL, SK

(203) Pompeja 2020 Dec 26 119.6 ± 2.4 x 95.8 ± 3.6 km. PA 97.2° ± 5.1°  
Geocentric X 227.5 ± 0.9 Y 2304.5 ± 1.2 km



Generated by Occult.

[www.euraster.net](http://www.euraster.net), Eric Frappa

Find best fit

Center X -0.6  0.0 Centered on Shape model

Center Y -2.3  0.0

Major axis (km) 119.6  0.0 a/b=1.25

Minor axis (km) 95.8  0.0 dMag=0.24

Orientation 97.2  0.0 Motion 10.84km/s, X

Circular  Use assumed diameter  Include Miss events

Show:  Both  Primary  Secondary

Plot scale:  normal  x 2  x 5

Plot scale: [Slider]

Quality of the fit: Reliable size. Can fit to shape mode

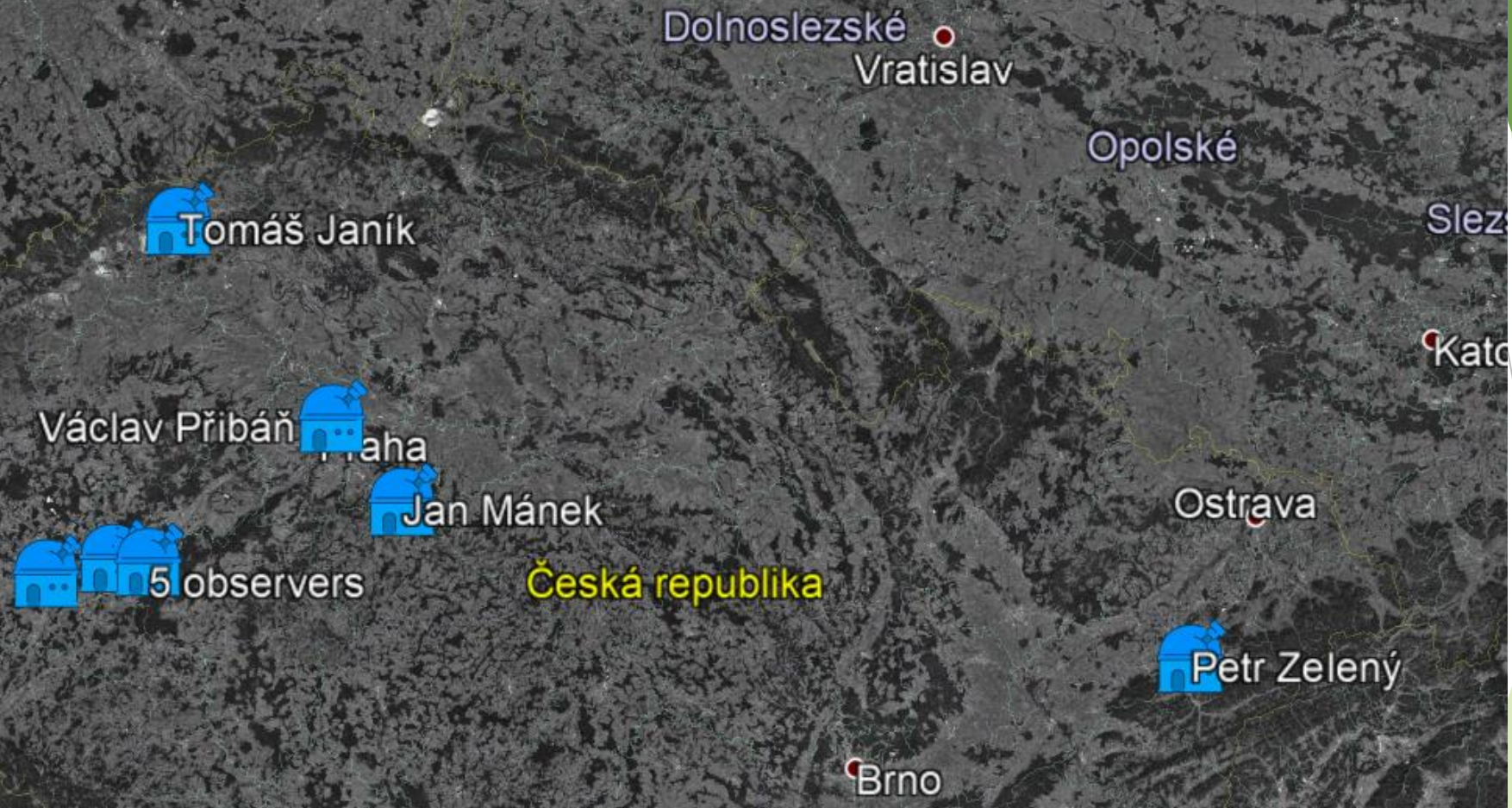
Form opacity: [Slider]

RMS fit -0.1 ± 2.5 km

1	Marcin Filipek
2	Jan Manek
3	Karel Halir
4	Michal Rottenborn
5	Jiri Polak
6	Daniel Blazewicz
7 (P)	Predicted
8	Jiri Kubanek
9	J. Srba & L. Smelcer
10	Peter Delincak



Czech positive observers in 2021



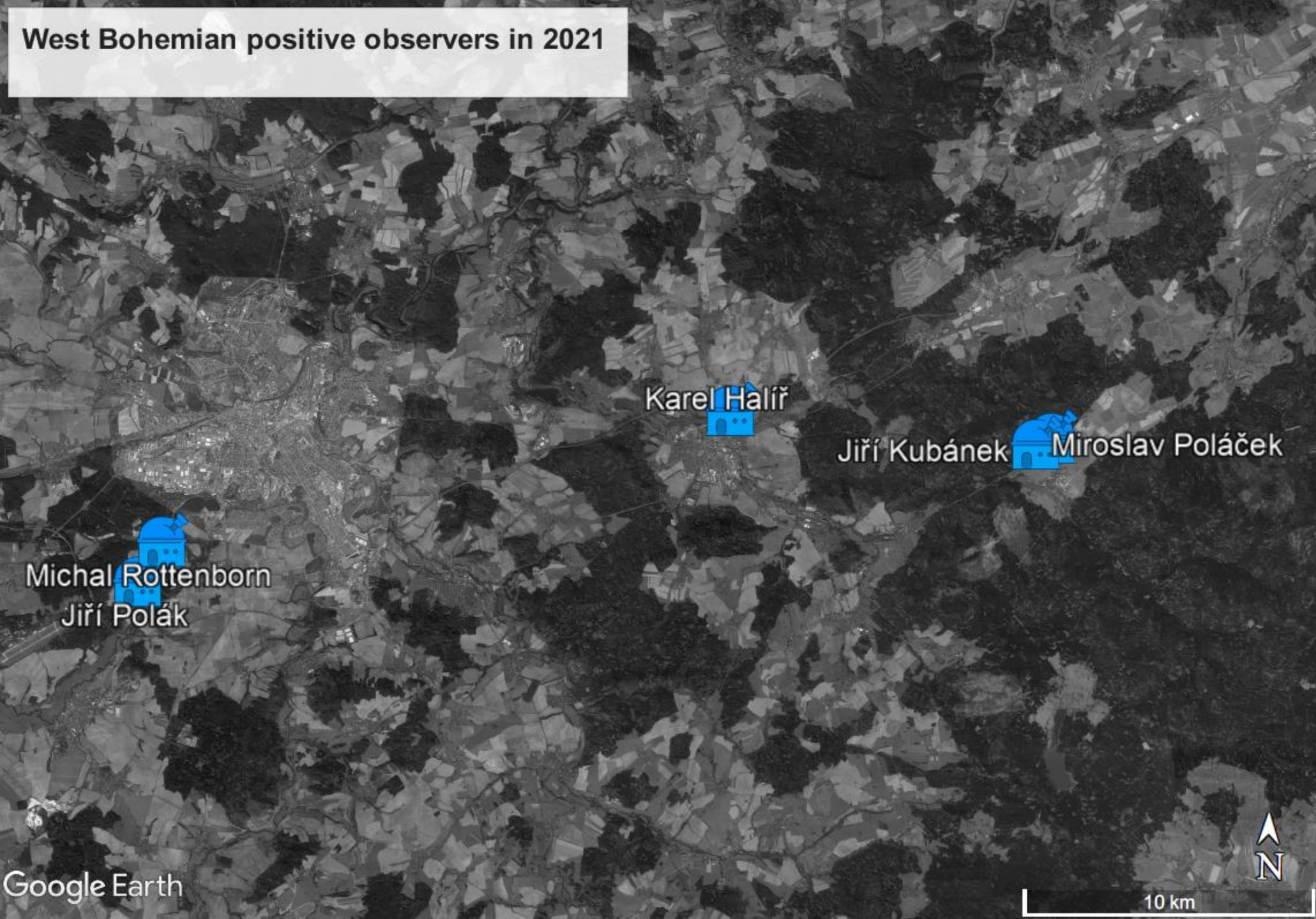
Google Earth

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Image Landsat / Copernicus  
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US Dept of State Geographer





West Bohemian positive observers in 2021



Michal Rottenborn  
Jiří Polák

Karel Halíř

Jiří Kubánek Miroslav Poláček





# Number of positive observations / events by Czech observers in 2021

current order

