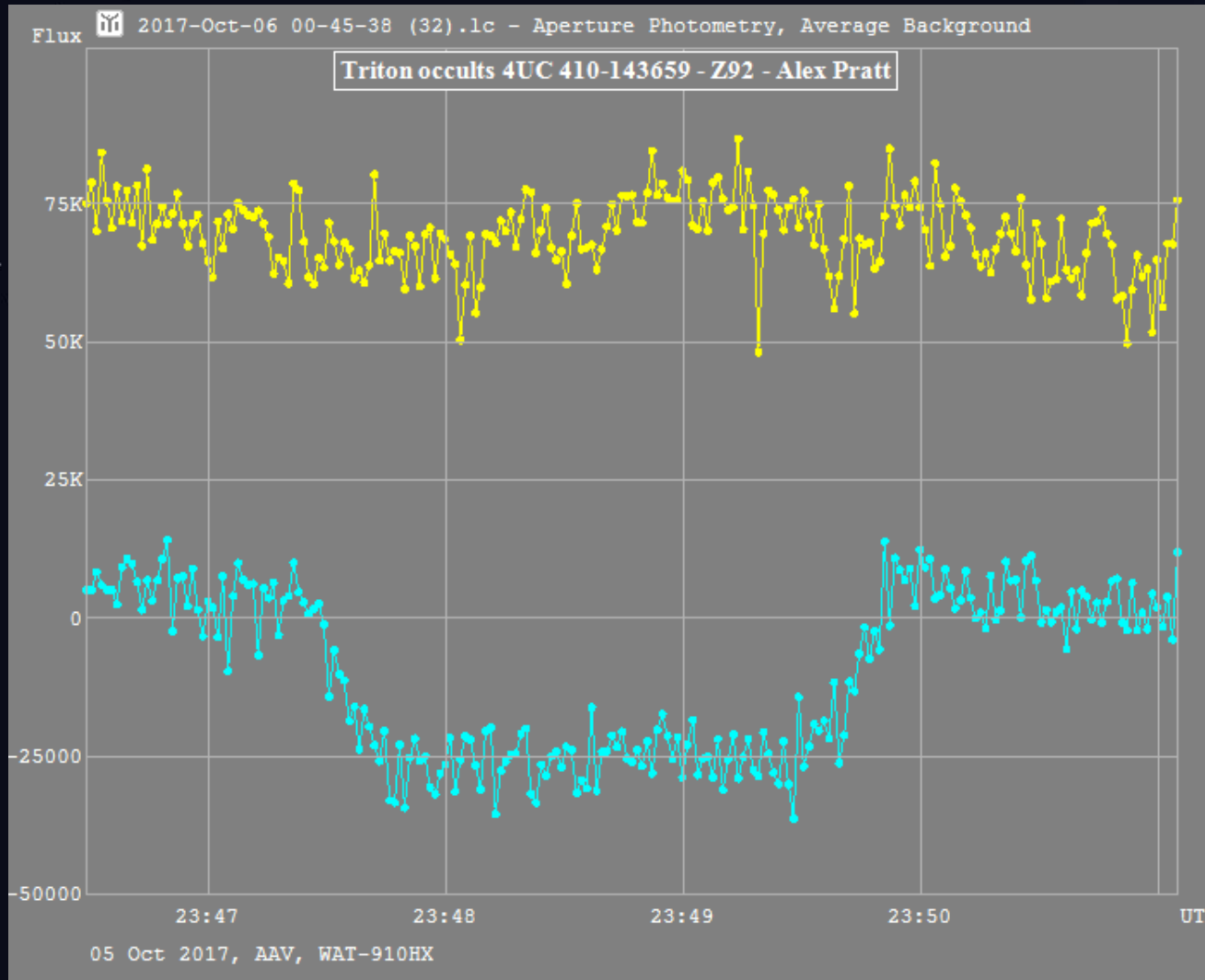


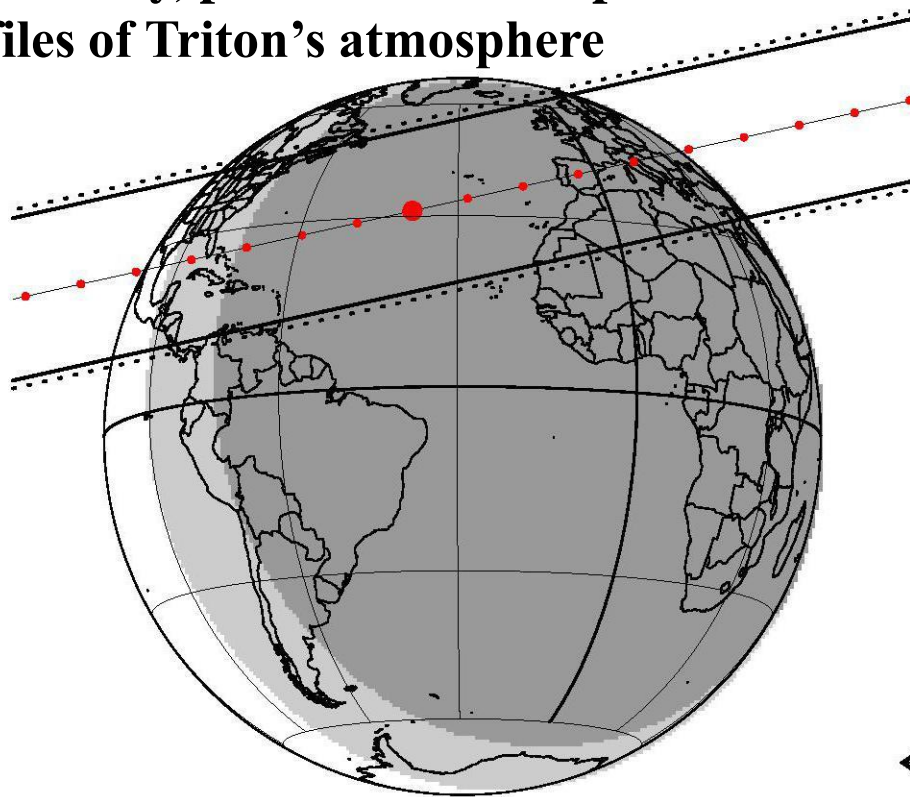
# Experiences of observing the 2017 October 5 Triton occultation



# 2017 October 5 – mag 13.5 Triton occulted mag 12.7v star for up to 161s

Triton: GaiaDR2, JPLnep081de435+offsetGaiaDR2 ephem. Offset (mas): 7.8 -17.6

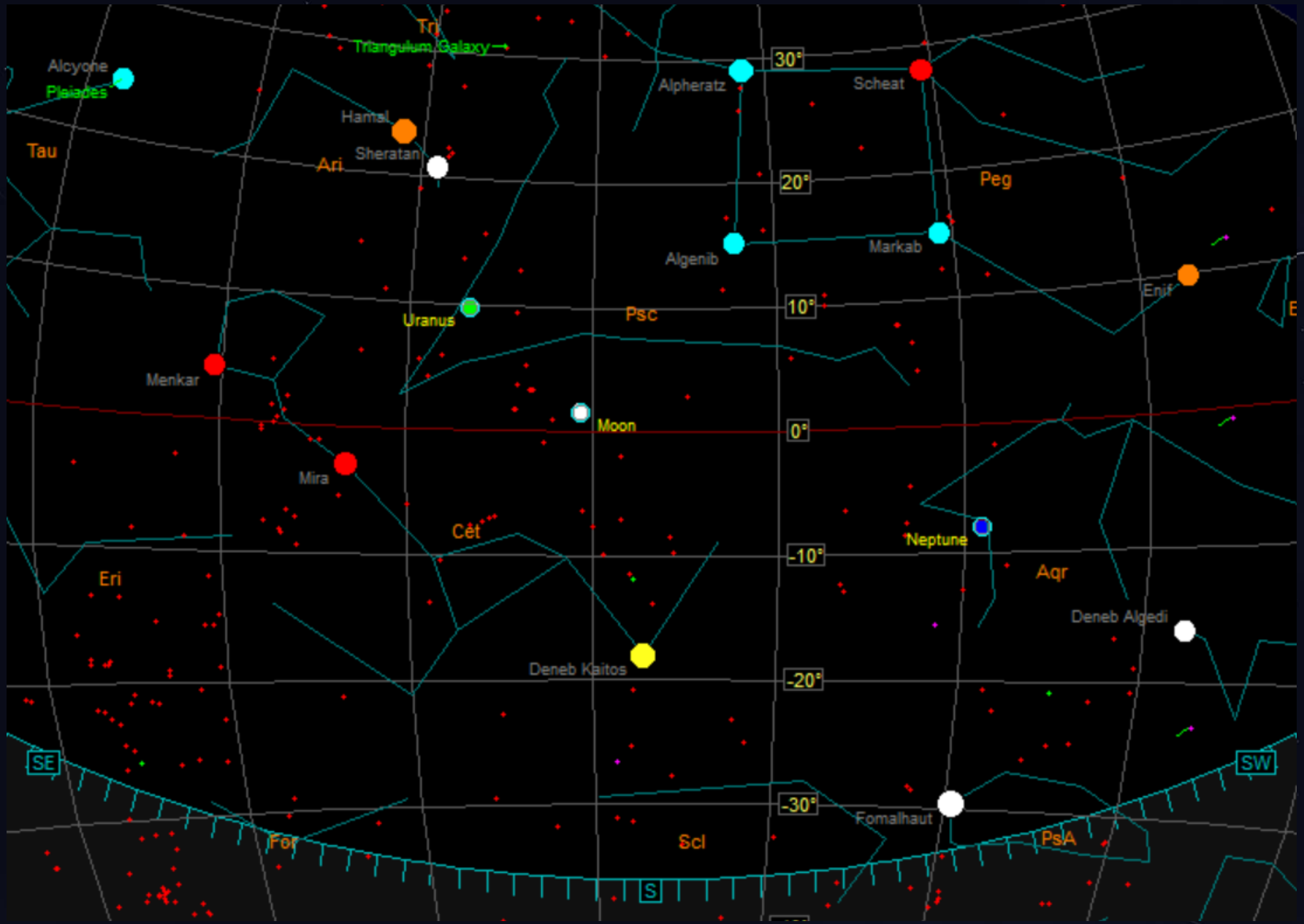
## To study the density, pressure and temperature profiles of Triton's atmosphere



by: LuckyStar

d	m	year	h:m:s UT	ra	dec	J2000_candidate	C/A	P/A	vel	Delta	G*	J*	long
05	10	2017	23 51 37.	22 54	18.4364	-08 00 08.318	0.195	347.51	-16.79	29.08	12.2	11.2	-29.

**Prediction - Lucky Star team – Pro-Am campaign**



**Leeds, England – Altitude 24 deg. Azimuth 209 deg. – Full Moon**



**Leeds Z92**





**C11 f/10 @f/3.3 - Watec 910 – IOTA-VTI – Losmandy G11 mount and Gemini Go To**

# Preparation and recording

**Plan A – Observatory**

**But - Neptune obstructed by tree ☹**

**Plan B – Portable setup 5 metres away**

**C8 20 cm f/10 – Watec 910 – IOTA-VTI - Losmandy GM-8 mount**

**Field – 10' x 6.5'**

**Problems –**

**Meridian flip**

**Dew on corrector plate...**

**Recordings – 1.28s integrations**

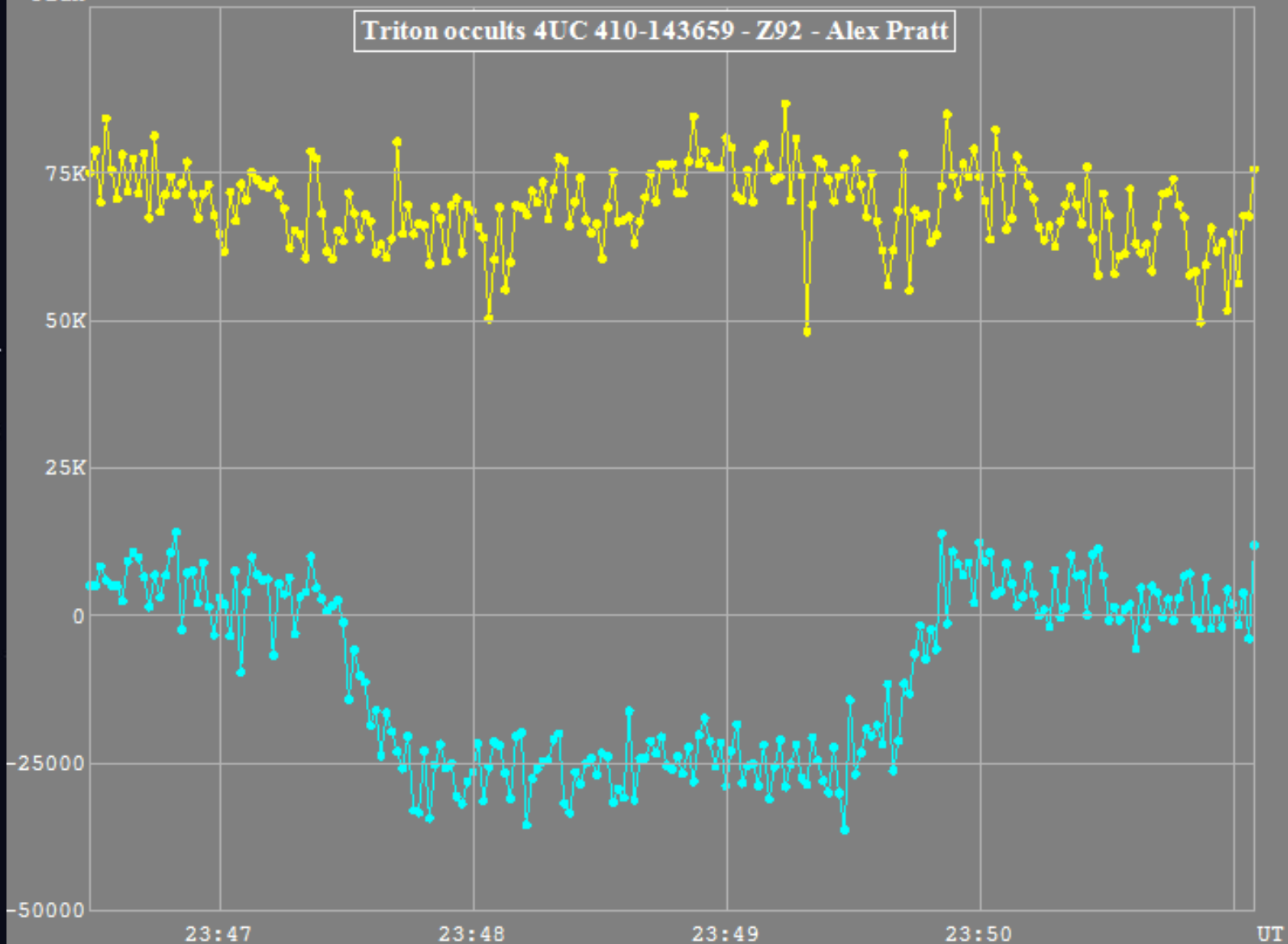
**2x calibration – occultation – darks (no flats)**

**Sky transparency – clear, occasional thin cloud**

**Image stability – fair to poor**

**Wind – Beaufort 3 to 1**

Triton occults 4UC 410-143659 - Z92 - Alex Pratt



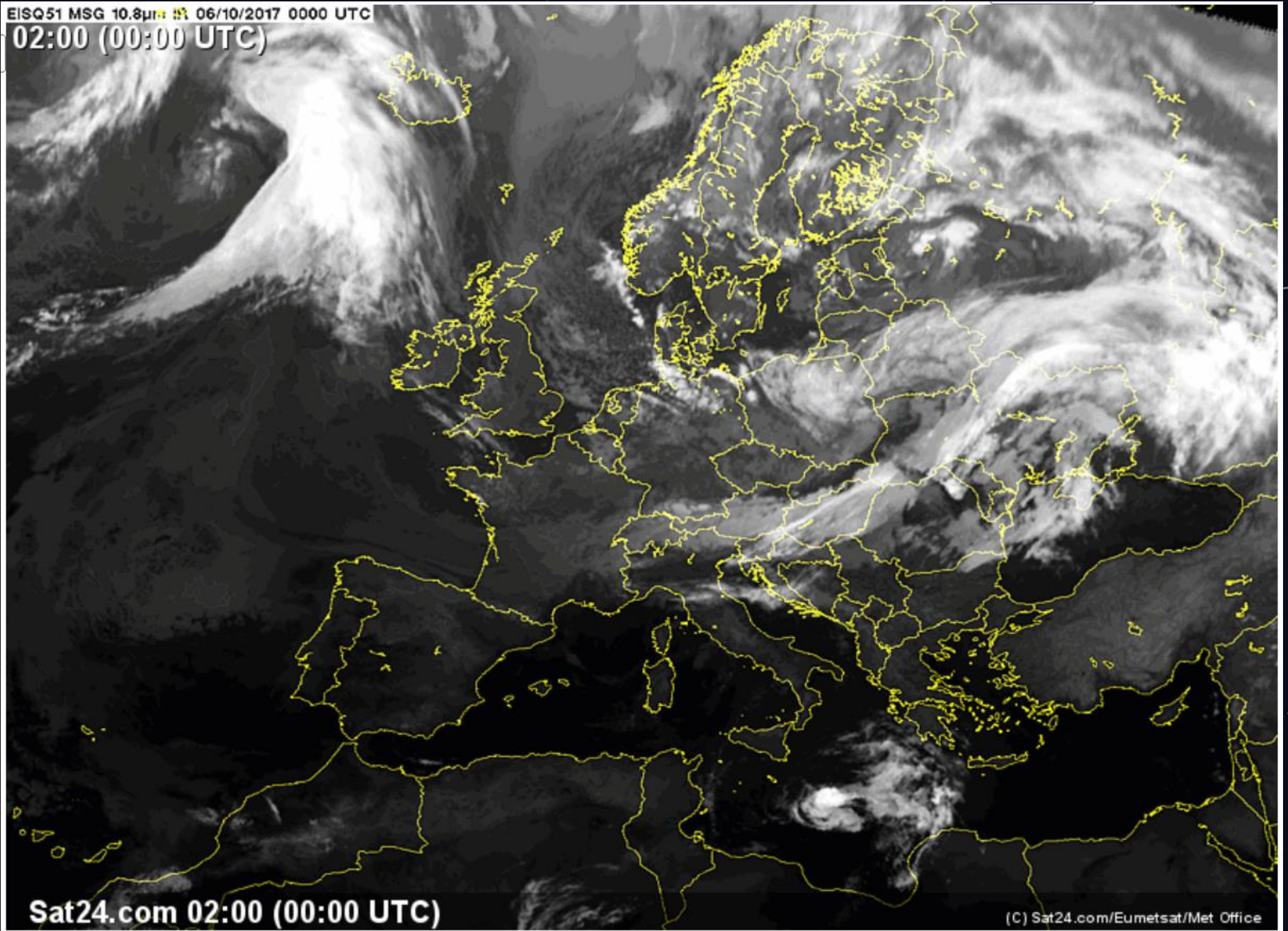
05 Oct 2017, AAV, WAT-910HX

**Light curve from Tangra 131.5s (at 50% level)**



EISQ51 MSG 10.8µm 06/10/2017 0000 UTC

02:00 (00:00 UTC)

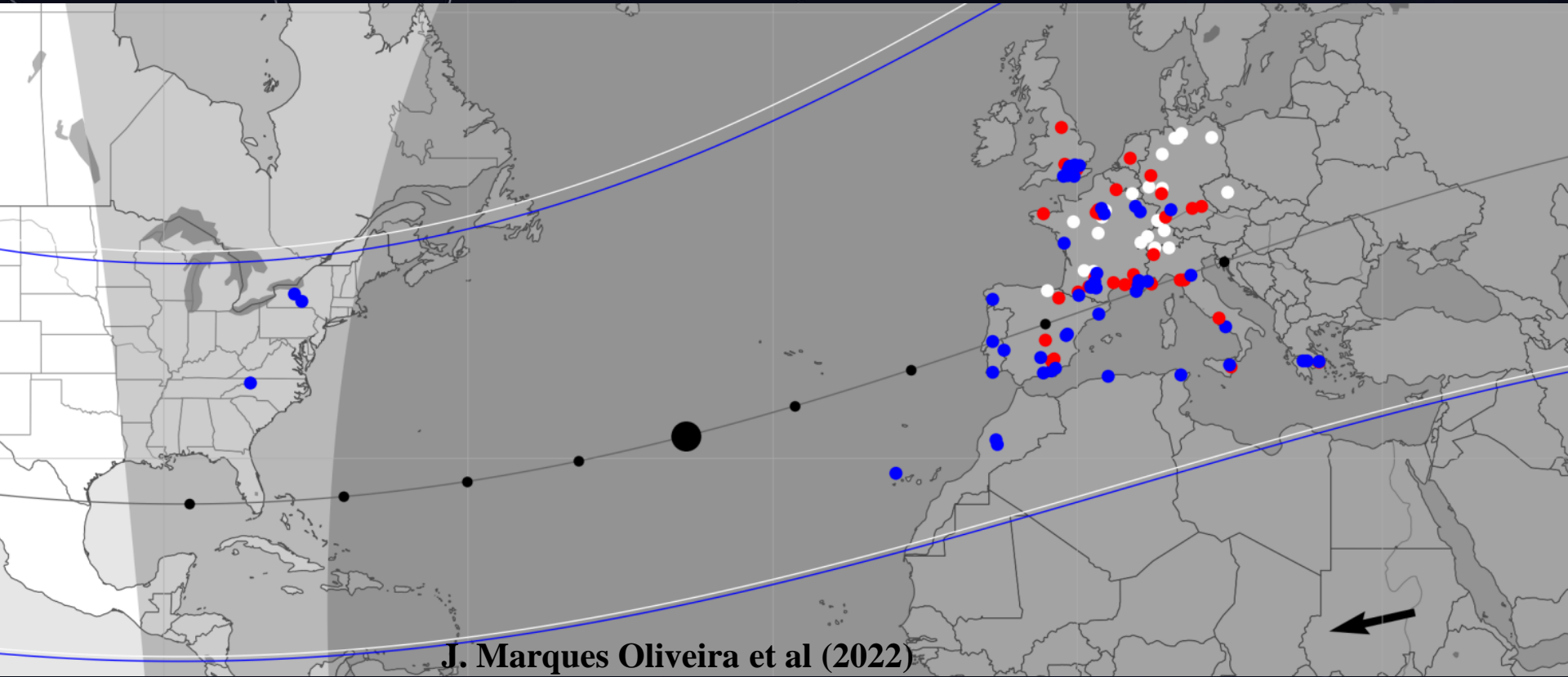


Sat24.com 02:00 (00:00 UTC)

(C) Sat24.com/Eumetsat/Met Office

**Cloud cover – 2017 October 6 00:00 UT**

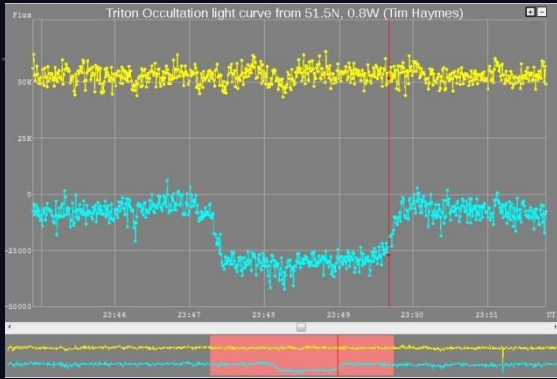




J. Marques Oliveira et al (2022)

**Stations map**

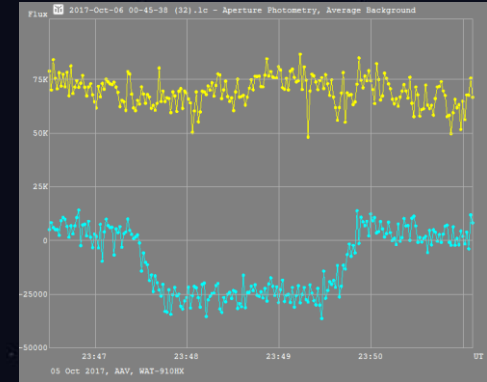
# Triton occultation – UK light curves



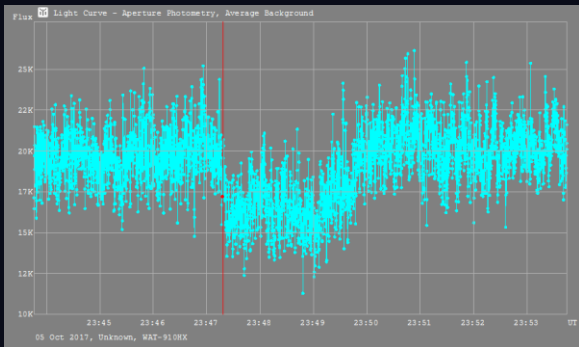
**Tim Haymes**



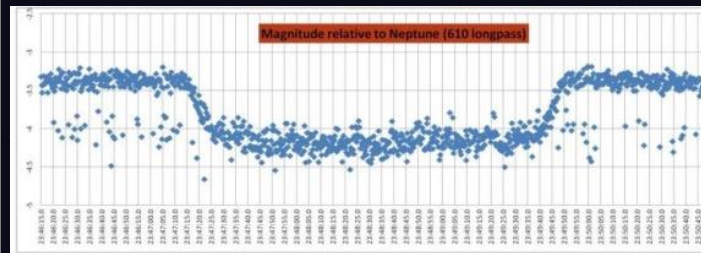
**David Briggs**



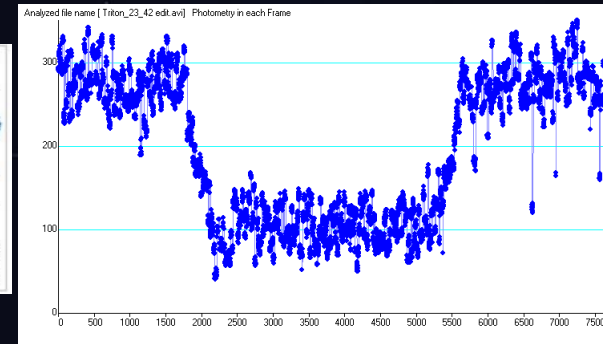
**Alex Pratt**



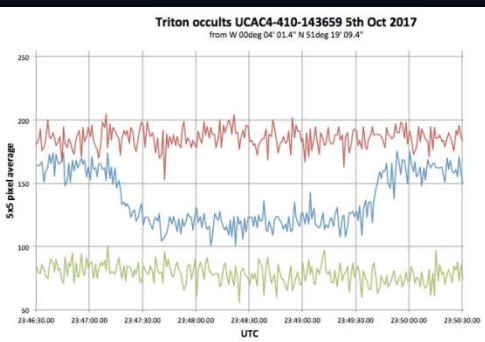
**John Talbot**



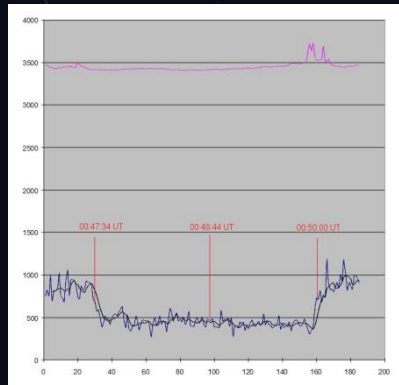
**Nick Haigh**



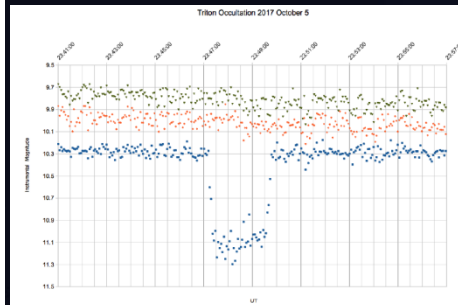
**Phil Denyer**



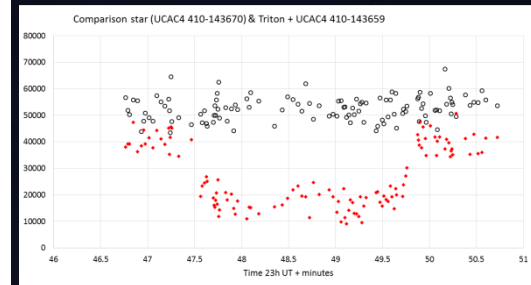
**Malcolm Jennings**



**Terry Platt**

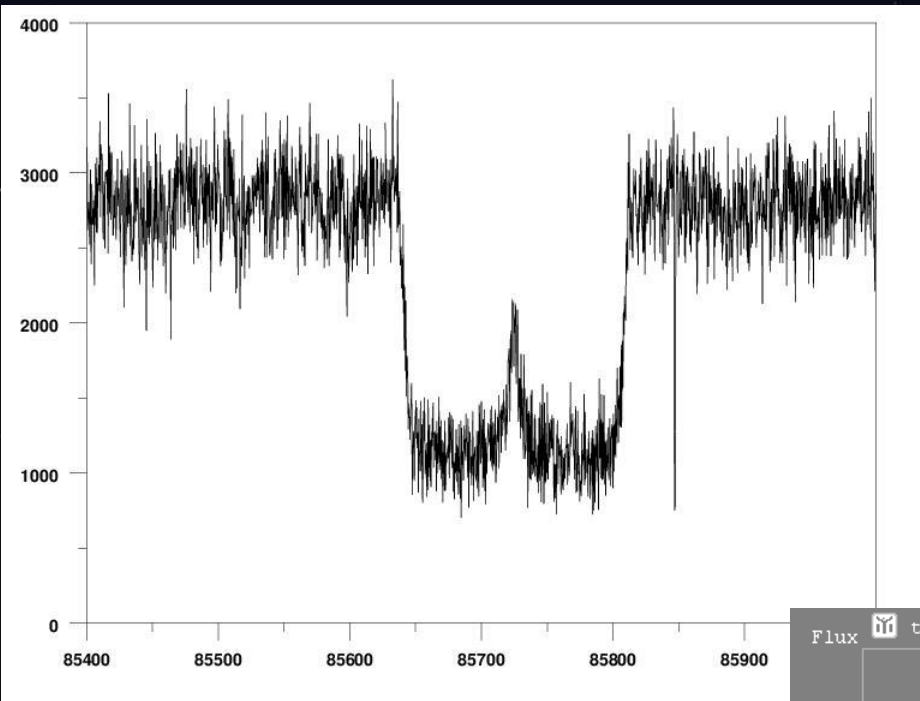


**Nick Quinn**

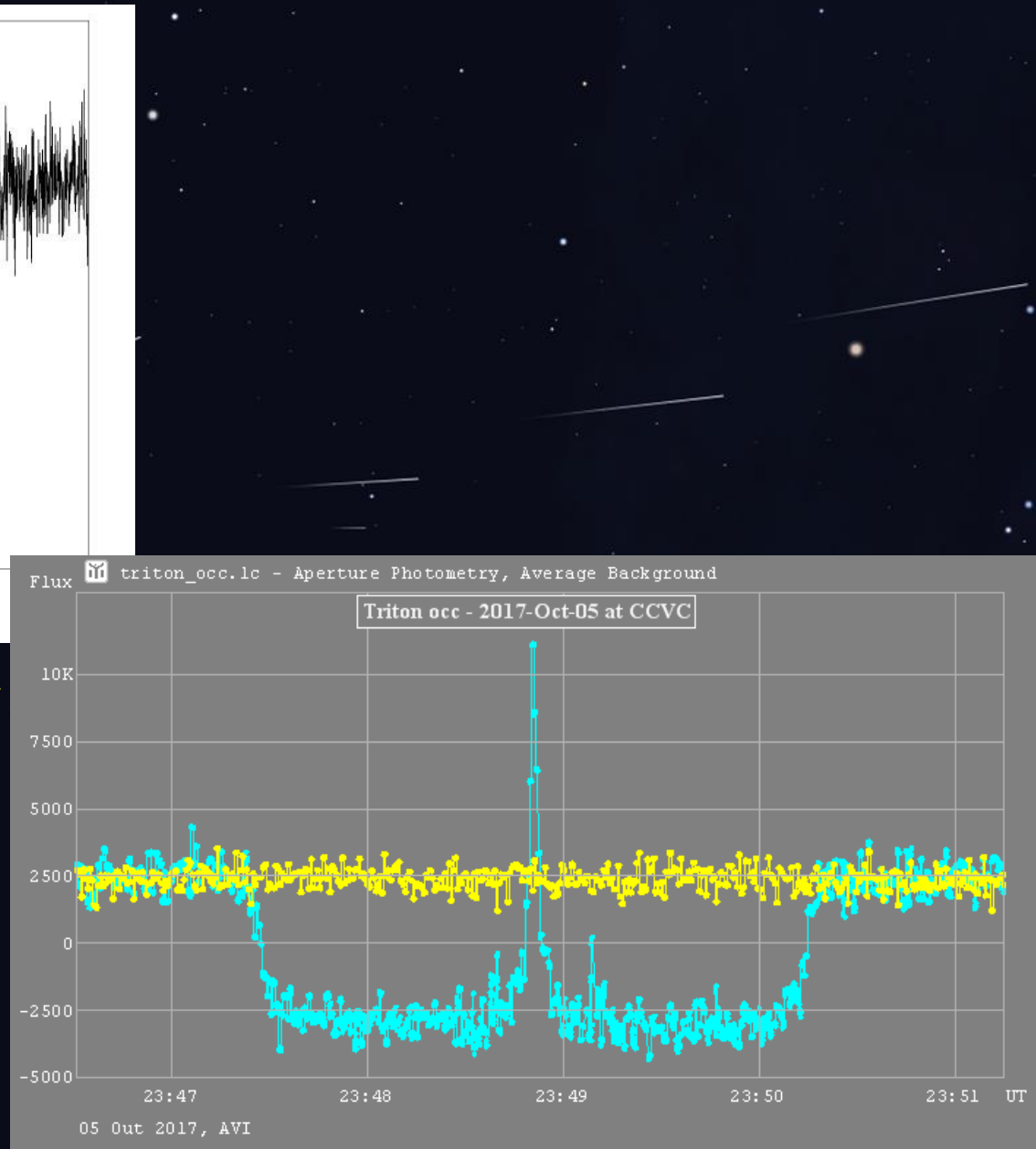


**Chris Hooker**

# Triton occultation – central flash light curves



Wolfgang Beisker, Elvas, Portugal



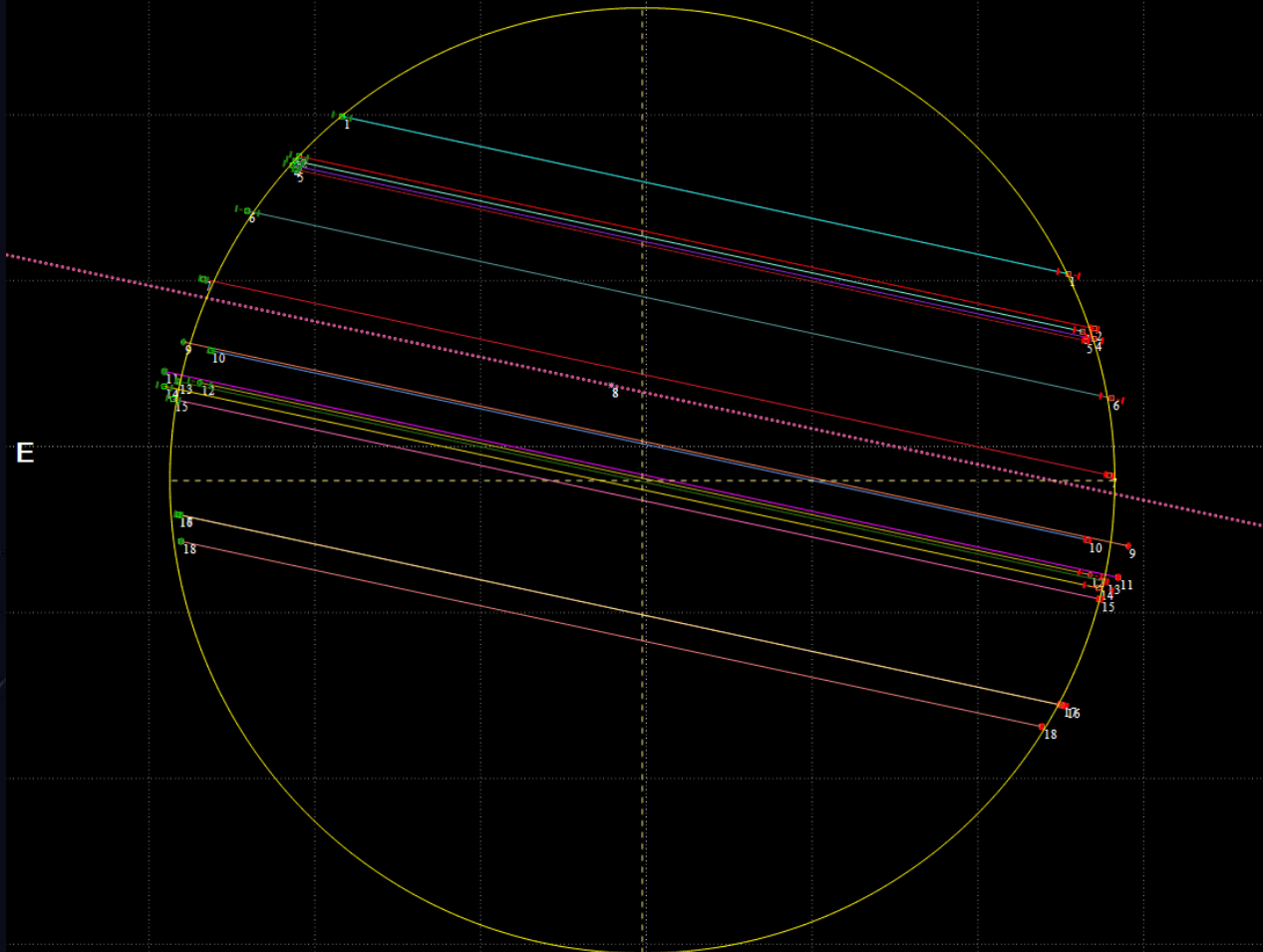
Rui Goncalves and Maximo Ferreira, Portugal



# Chords across Triton – Euraster (Eric Frappa)

Triton 2017 Oct 5 2849.7 ± 63.2 x 2849.7 km, PA 0.0°  
 Geocentric X 2954.2 ± 6.3 Y 4919.9 ± 20.0 km

**D and R at ~50% light level**



**Radius of Triton 1425 km ~72 km altitude**

Find best fit

Center X: -12.3  -0.4  
 Center Y: -178.3  0.1

Major axis (km): 2849.7  -6.2 a/b=1.00  
 Minor axis (km): 2849.7  0.0 dM=0.00  
 Orientation: 0.0  0.0 Motion: 16.70km/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 of the fit: Not fitted  
 Opacity: \_\_\_\_\_

RMS fit -2.2 ± 29.7 km



1	Alex Pratt, UK
2	John Talbot, UK
3	Tim Haymes, UK
4	Philip Denyer, UK
5	Malcolm Jennings, UK
6	Bernd Klemt, DE
7	Bjoern Kattentidt, DE
8 (P)	Prediction
9	Marc Delcroix, FR
10	Gerard Vaudeschal, FR
11	J Ferreira/P Machado/P I
12	Matthieu Conjat, FR
13	R Goncalves/M Ferreira,
14	Pietro Baruffetti, IT
15	C Perello/A Selva/V Cabe
16	Luigi Morrone, IT
17	A Noschese/A Vecchione,
18	D Baba Aissa/Z Grigahcen

500 km Grid

Occultation Observation Campaign Form				
Object Name:	Triton	Occultation Date:	2017-10-05 ~23:51:46 UT	
Star RA:	22 54 18.4364	Star DEC:	-08 00 08.318	
Site Information	Observer(s): -Full name -Full affiliations: -Email:	Mr Alex Pratt IOTA-ES BAA alexander.pratt@btinternet.com		
	Observatory name:	Z92 - West Park Observatory (*)		
	City/Country:	Leeds, England		
	Latitude:	53d 50' 15".6 N		
	Longitude:	1d 36' 27".8 W		
	Altitude:	113m above sea level WGS84 - confirmed with Google Earth		
Equipment Information	Telescope (aperture, focal):	20cm f/10 Schmidt-Cassegrain		
	Camera + Filter:	Watec 910HX video camera and IR/UV blocking filter		
	Time (method): GPS+PPS, NTP, TimeBox, Time Inserter, etc	IOTA-VTI Basic, internal GPS/1PPS time signal receiver and video time inserter Used OccuRec to record AAV video files to laptop computer		
Acquisition Information	Exposure Time:	1.28 s		
	Cycle Time (Exp + Dead time):	1.28 s		
	Start time of sequence (1 <sup>st</sup> frame):	2017 10 05 23:45:38.153 (**)		
	End time of sequence (end of last frame):	2017 10 05 23:55:03.890 (**)		
Choose which time is in images header:	START of exposure ( Y ) (**)	END of exposure ( )	MID of exposure ( )	Raptor Merlin ( )
Checklist: 1) Take darks with same Exp time : <u>Yes</u> 2) Take flats : <u>No</u> 3) Calibration images (see instructions): <u>Will be sent separately</u> 4) Send the data, if video send converted FITS images also (zip or rar) : --- Zipped in a Dropbox area 5) Send the form ( <a href="mailto:bruno.sicardy@obspm.fr">bruno.sicardy@obspm.fr</a> , <a href="mailto:erick.meza@obspm.fr">erick.meza@obspm.fr</a> ): __				
<b>Other relevant information (weather conditions, technical problems, telescope/camera peculiarities, etc):</b> (*) Observing location was 5 metres NE of IAU station Z92 Variable sky transparency. Wind calming down, Beaufort 1. Temperature 8 C. Telescope corrector plate was starting to collect dew. (**) a camera delay of -0.66 s (after Gerhard Dangl) should be applied to these times.				

**Report forms and FITS files sent to Lucky Star team**

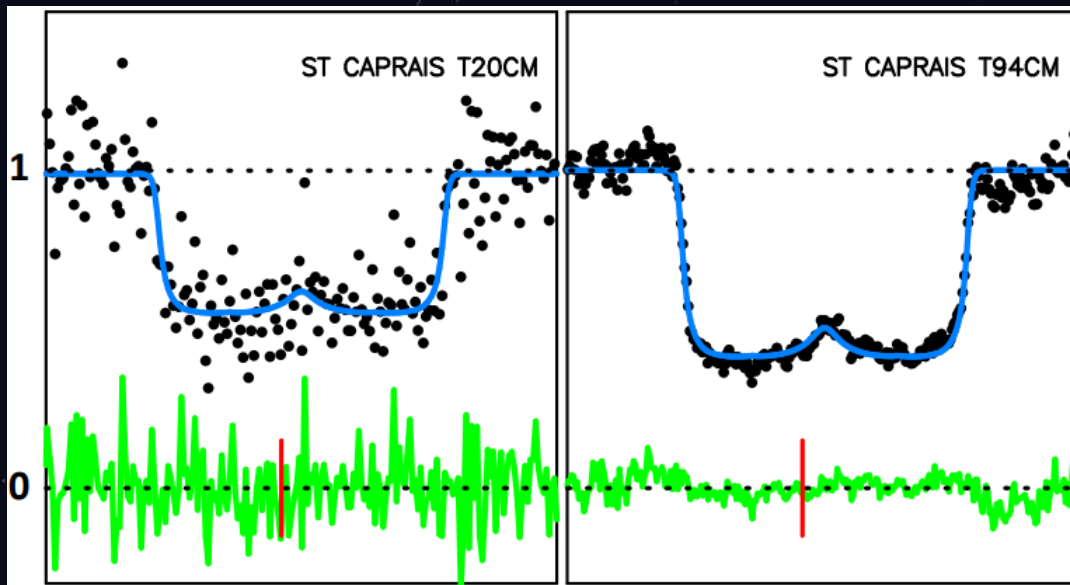
## **Constraints on the structure and seasonal variations of Triton's atmosphere from the 5 October 2017 stellar occultation and previous observations★**

J. Marques Oliveira<sup>1</sup> , B. Sicardy<sup>1</sup> , A. R. Gomes-Júnior<sup>2,3</sup> , J. L. Ortiz<sup>4</sup> , D. F. Strobel<sup>5</sup> , T. Bertrand<sup>1,6</sup> ,  
F. Forget<sup>7</sup>, E. Lellouch<sup>1</sup>, J. Desmars<sup>8,9</sup> , D. Bérard<sup>1</sup>, A. Doressoundiram<sup>1</sup>, J. Lecacheux<sup>1</sup>, R. Leiva<sup>10,11</sup> ,  
E. Meza<sup>12,13</sup> , F. Roques<sup>1</sup>, D. Souami<sup>1,14</sup> , T. Widemann<sup>1</sup>, P. Santos-Sanz<sup>4</sup> , N. Morales<sup>4</sup>, R. Duffard<sup>4</sup> ,  
E. Fernández-Valenzuela<sup>15,4</sup> , A. J. Castro-Tirado<sup>4</sup>, F. Braga-Ribas<sup>16,1,17,3</sup> , B. E. Morgado<sup>17,1,3</sup> , M. Assafin<sup>18,3</sup> ,  
J. I. B. Camargo<sup>17,3</sup> , R. Vieira-Martins<sup>17,3,9</sup> , G. Benedetti-Rossi<sup>1,3,2</sup> , S. Santos-Filho<sup>18,3</sup>, M. V. Banda-Huarca<sup>17,3</sup>,

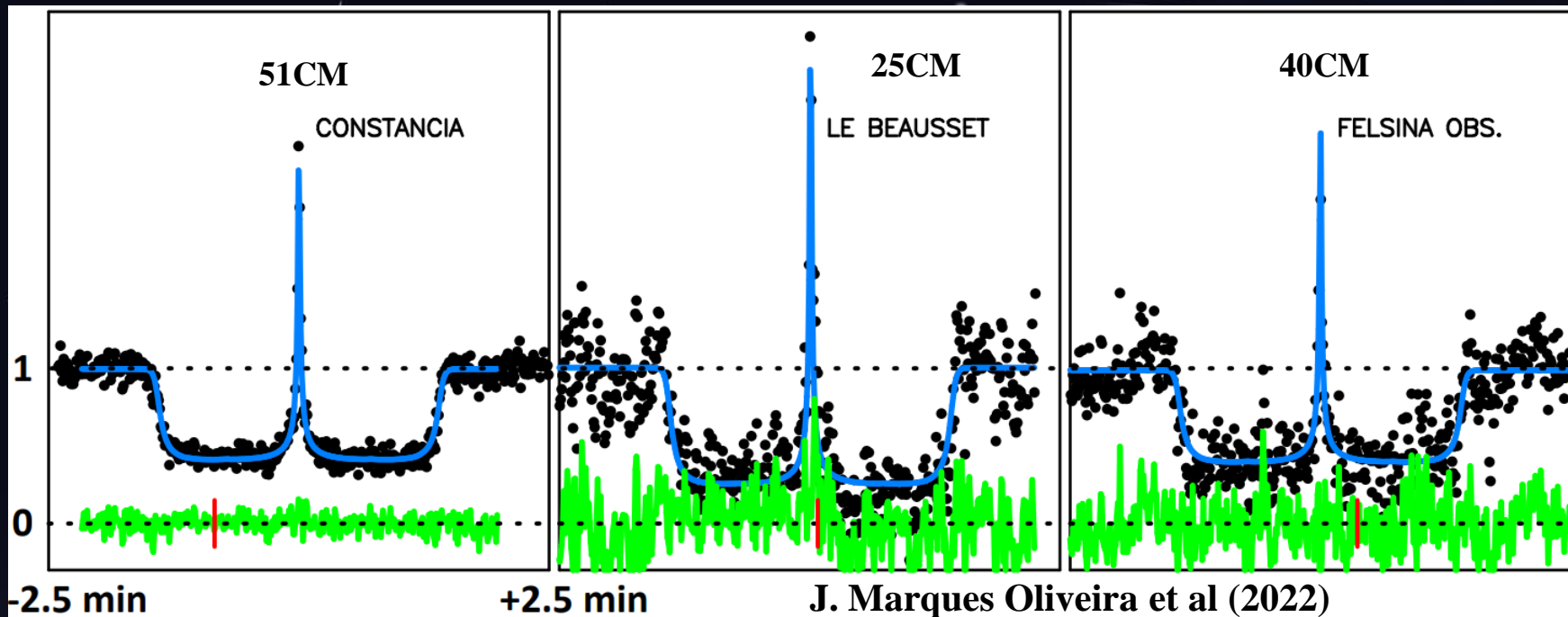
<https://doi.org/10.1051/0004-6361/202141443>

[https://www.youtube.com/watch?v=Klonle3jU\\_k](https://www.youtube.com/watch?v=Klonle3jU_k)





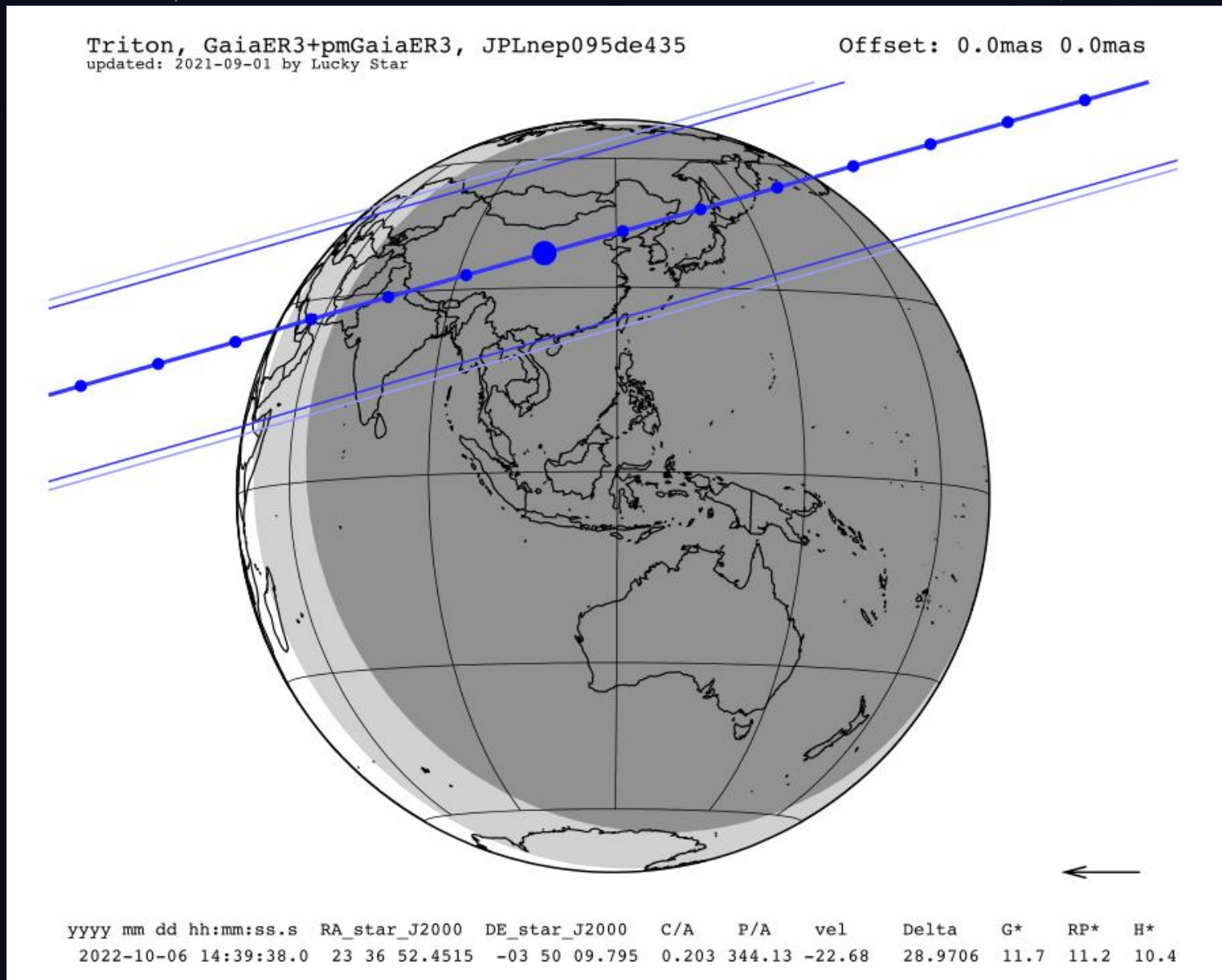
Large bit depth camera = more detail  
**J. Marques Oliveira et al (2022)**  
 Larger bit depth camera = more detail



# What can we do better next time? (Triton, Pluto,...)

- **Predictions – Gaia DR3, Horizons, Lucky Star, last-minute astrometry, occultations**
- **Cameras – 8-bit analogue – 10/12-bit (or more) digital**
- **Sensor linearity, gamma 1, Region of Interest**
- **Recording – IOTA\_VideoCapture, OccuRec, SharpCap**
- **Accurate timestamps – GPS, NTP (synchronised) , flash timers?**
- **Cadence – exposure time - signal/noise >10**
- **Calibration – reference star(s) – target - dark frames and flat fields**
- **Analysis – Tangra, AOTA, PyOTE**
- **Submit observations – Euraster2 – Occultation Portal**

# 2022 October 6 – mag 14 Triton occults mag 11.7G star for up to 124s



**Prediction - Lucky Star team – High RUWE star - Moon 23 deg. distant, 87% Full**