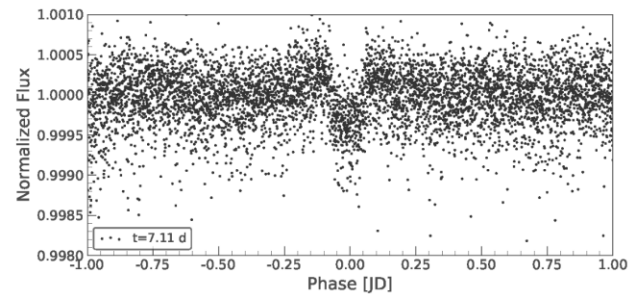
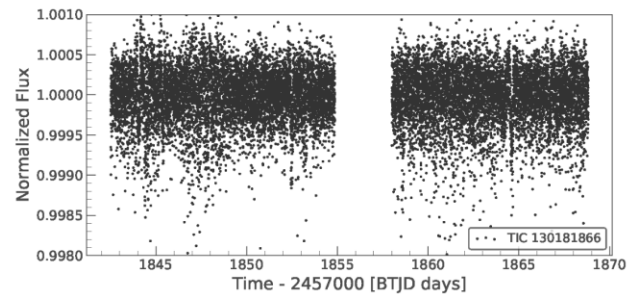




Enhancing PLATO with the TESS data

Daniel Bayliss – University of Warwick



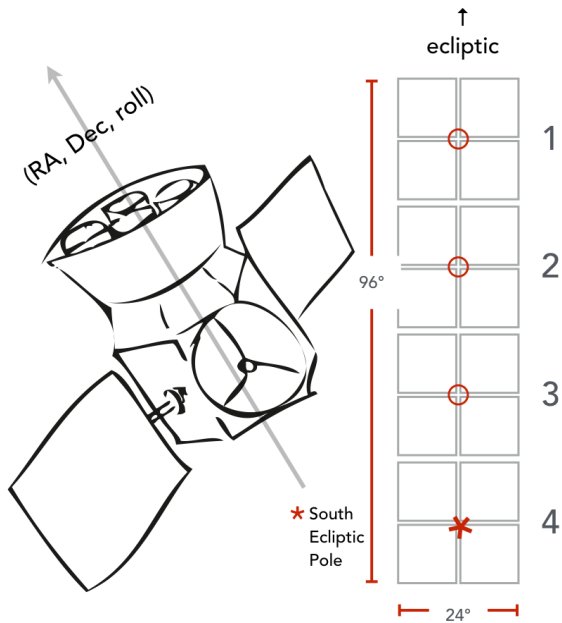
Fangetal., 2023

Getting Ready for PLATO Meeting - 15 September 2023

A close-up photograph of a DNA microarray, showing a grid of small colored spots (red, blue, green, yellow) on a white background. In the foreground, a clear glass petri dish is partially visible, slightly out of focus. The text "This is a work in progress." is overlaid in white on the image.

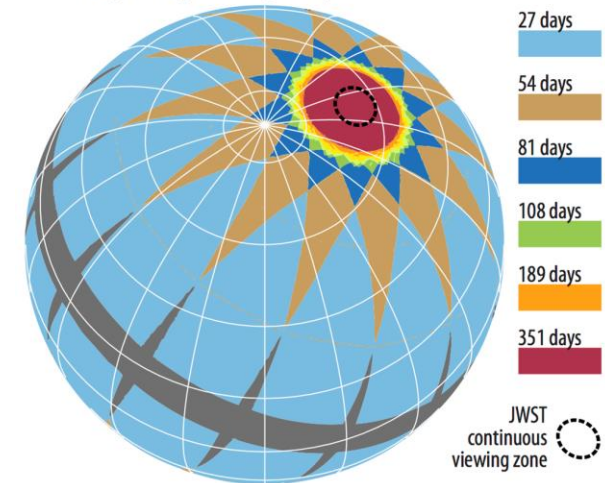
This is a work in progress.

Overview of TESS survey



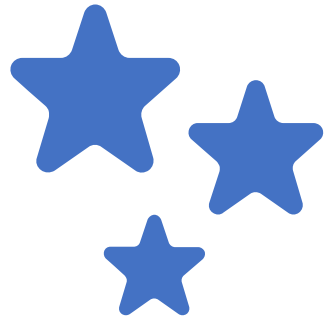
- Four 10cm wide-field telescopes.
- 13.5 day elliptical orbit.
- FoV=2300 sq degs

TESS 2-year sky coverage map



- 27 day "Sectors"
- Entire ecliptic hemispheres covered every other year.
- Ecliptic poles monitored for 1 year.

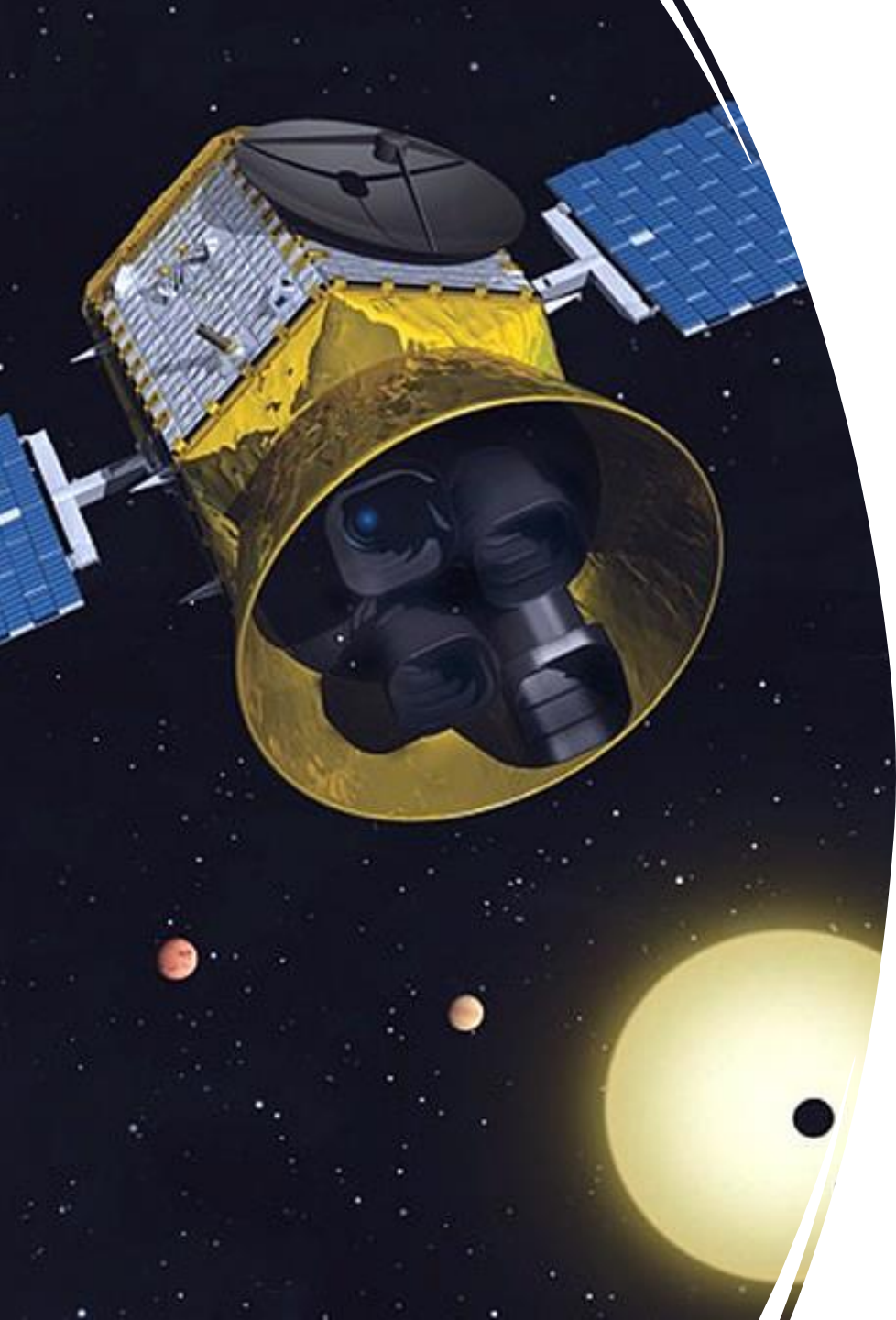
But will TESS be any use to PLATO?



TESS only monitors most stars for
27 days.

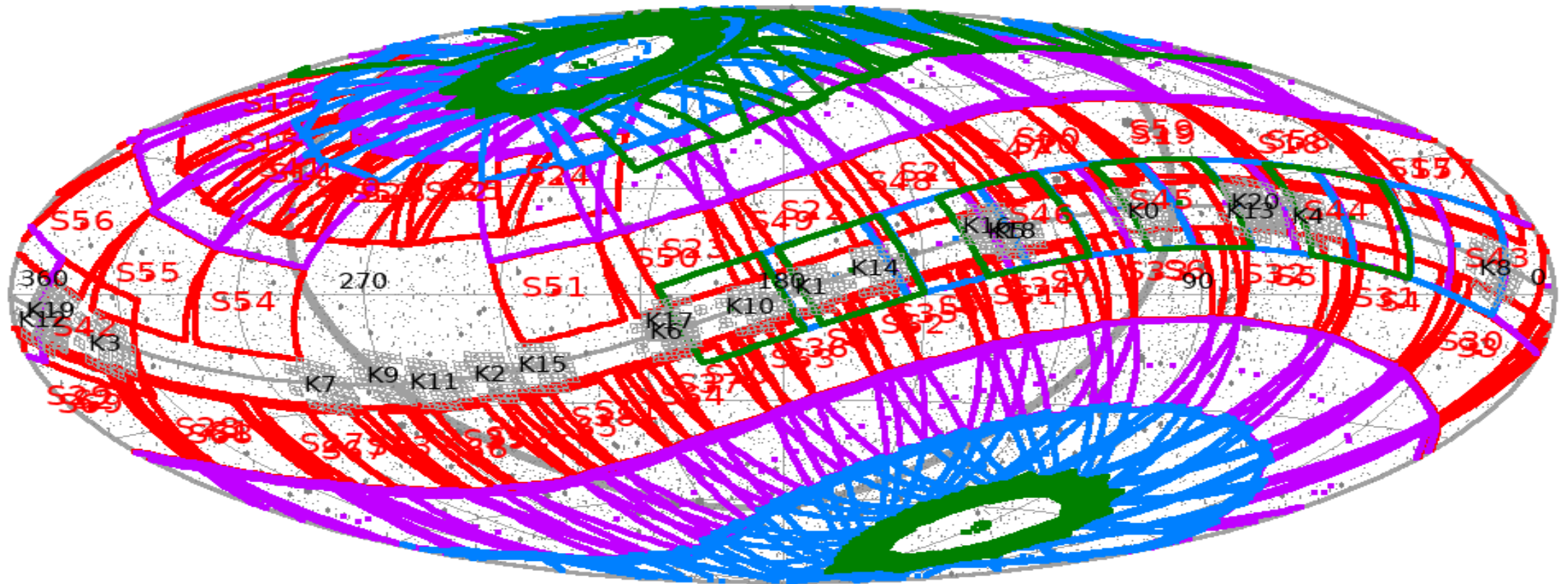


TESS photometric precision is not
good enough to help PLATO.

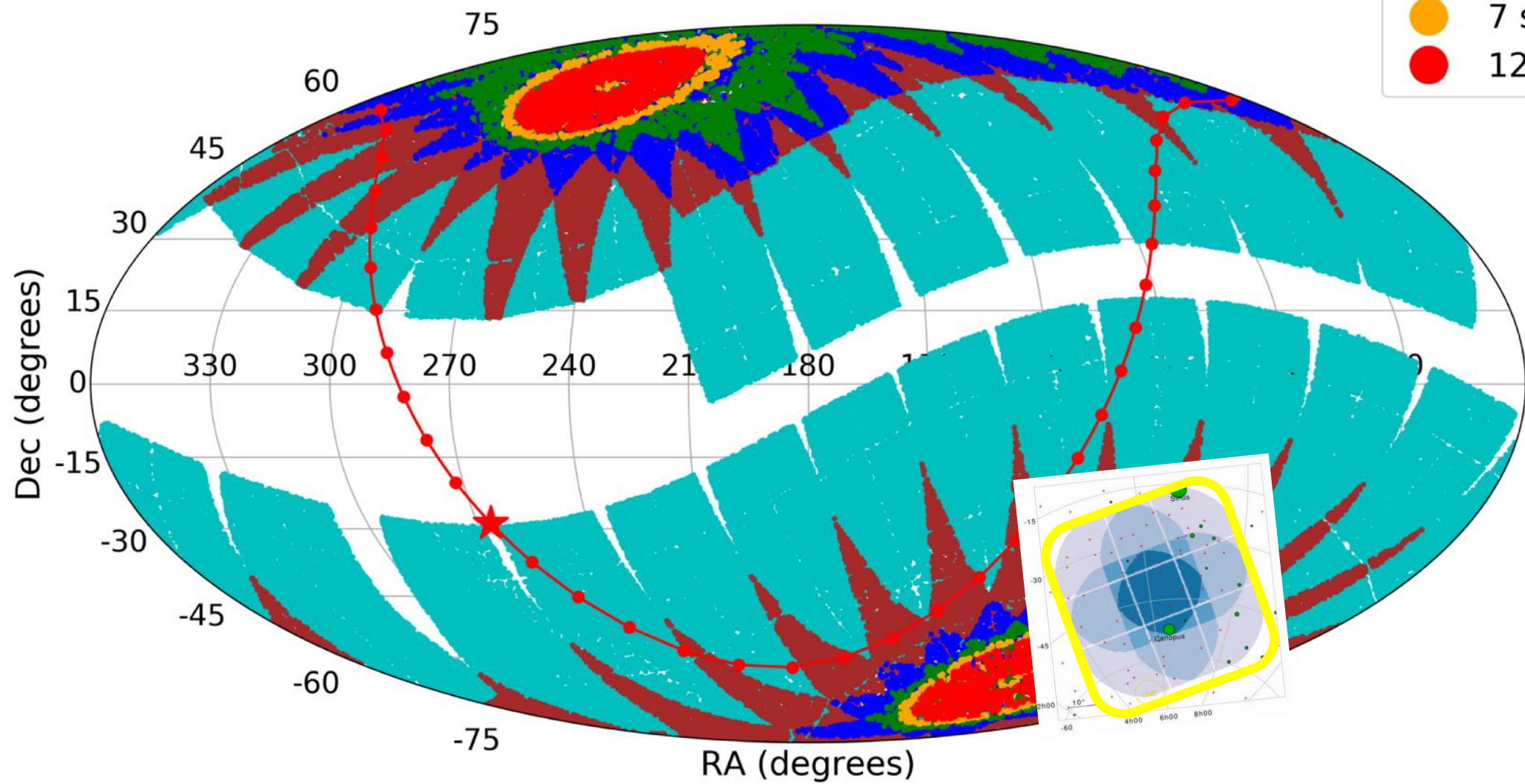
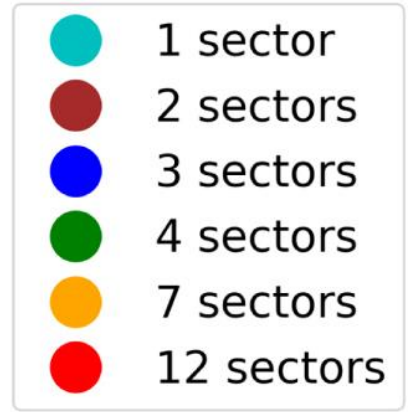


TESS monitoring

Coverage by 2026 – Four visits to Southern Hemisphere



TESS/PLATO Overlap



Take home message 1

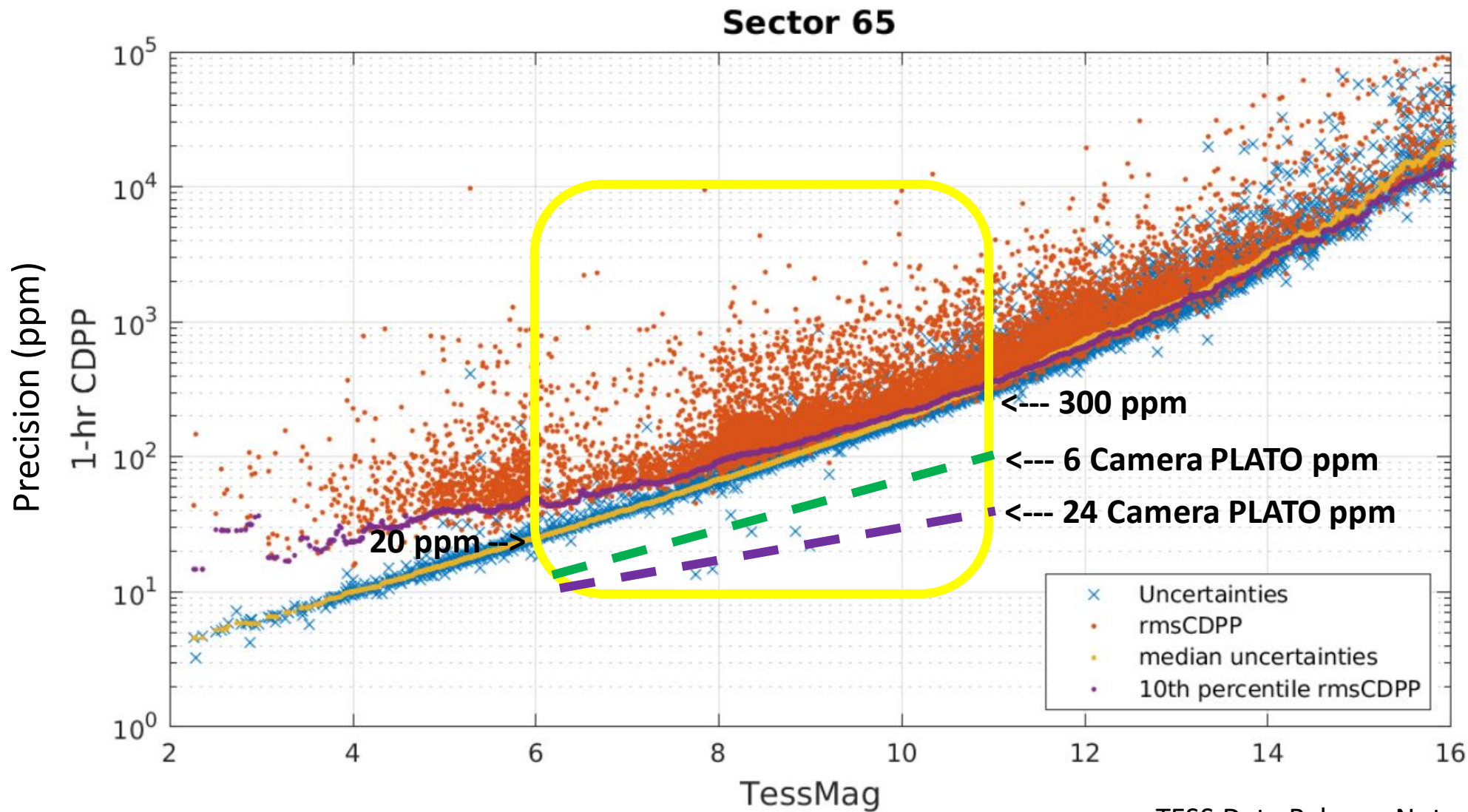
- By PLATO launch (Dec 2026), most stars in the LOPS1 will have TESS monitoring for:
2.5 Sectors x 27 days x 4 visits = **270 days**



The slide features a solid orange background. A large white circle is centered on the page. The text "TESS Precision" is written in a black, sans-serif font within the white circle. On the left side of the white circle, there is a dashed yellow arc. At the bottom right edge of the white circle, there is a small solid blue circle.

TESS Precision

TESS Precision:



Matuszewski
et al., 2023

Take home message 2

- TESS is less precise than PLATO by $\sim 10\text{ppm}$ at $V=6$ to $\sim 250\text{ppm}$ at $V=11$.
- This means that the 270 days of TESS monitoring pre-PLATO launch equates to approx **3 months of PLATO data**.



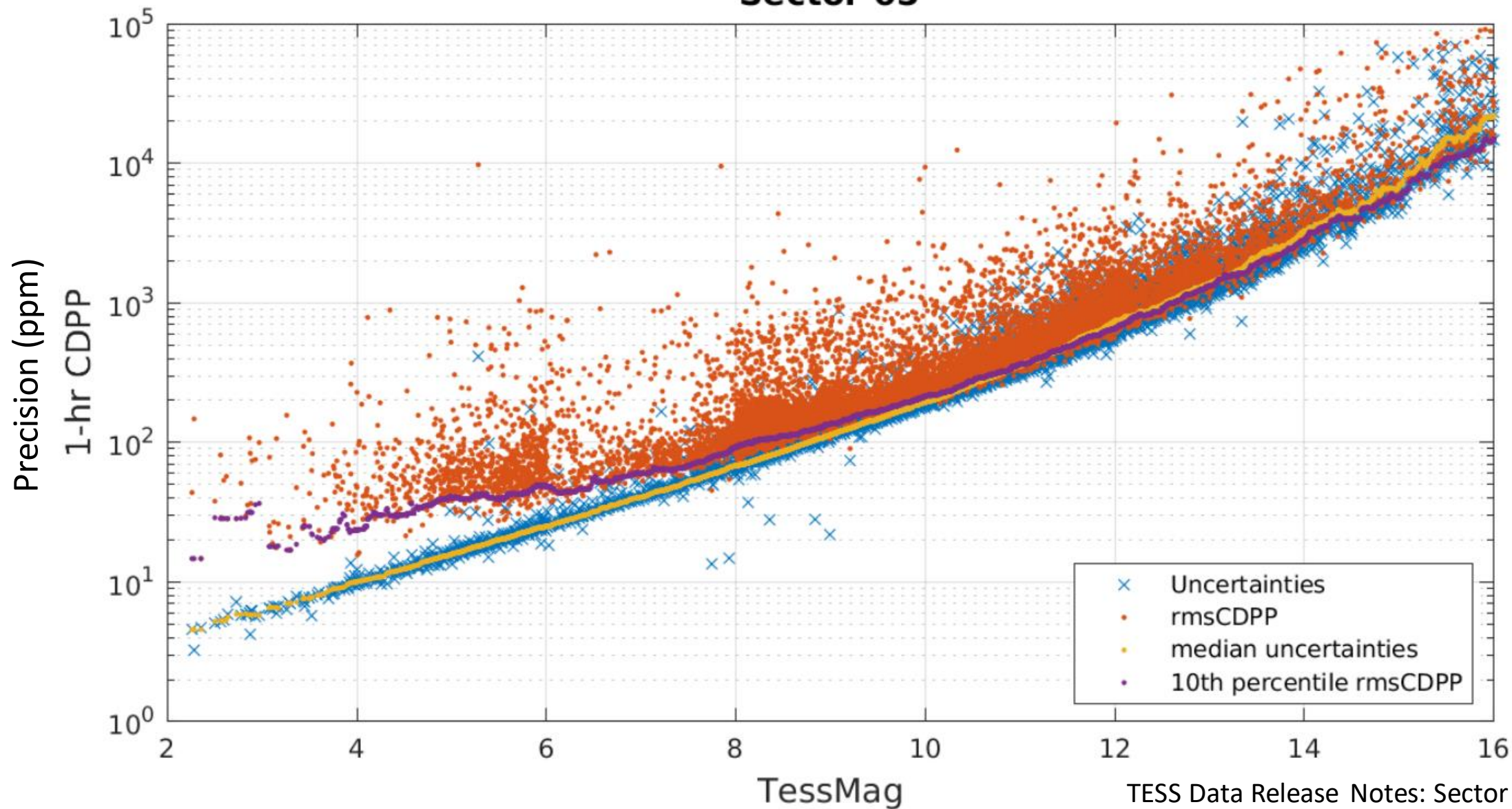


What can
PLATO learn
from TESS?



1-hour Combined Differential Photometric Precision values (CDPP)

Sector 65





-
- "All happy families are alike; each unhappy family is unhappy in its own way.", *Anna Karenina*, Tolstoy



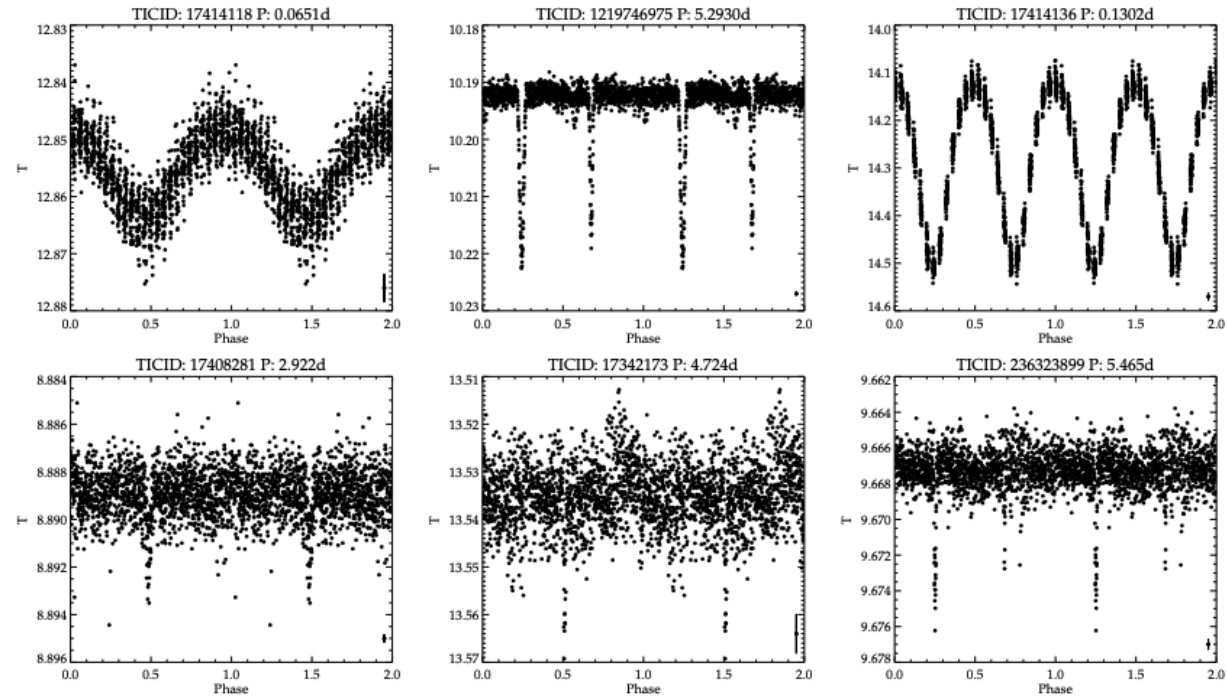
-
- "All **quiet stars** are alike; each **active star** is active in its own way.", *this work*
 - A star with a low CDPP will be a good candidate for a quiet star to be monitored by PLATO.



-
- "All **stars** are active in their own way.", S.A.
 - "All families are unhappy in their own way."

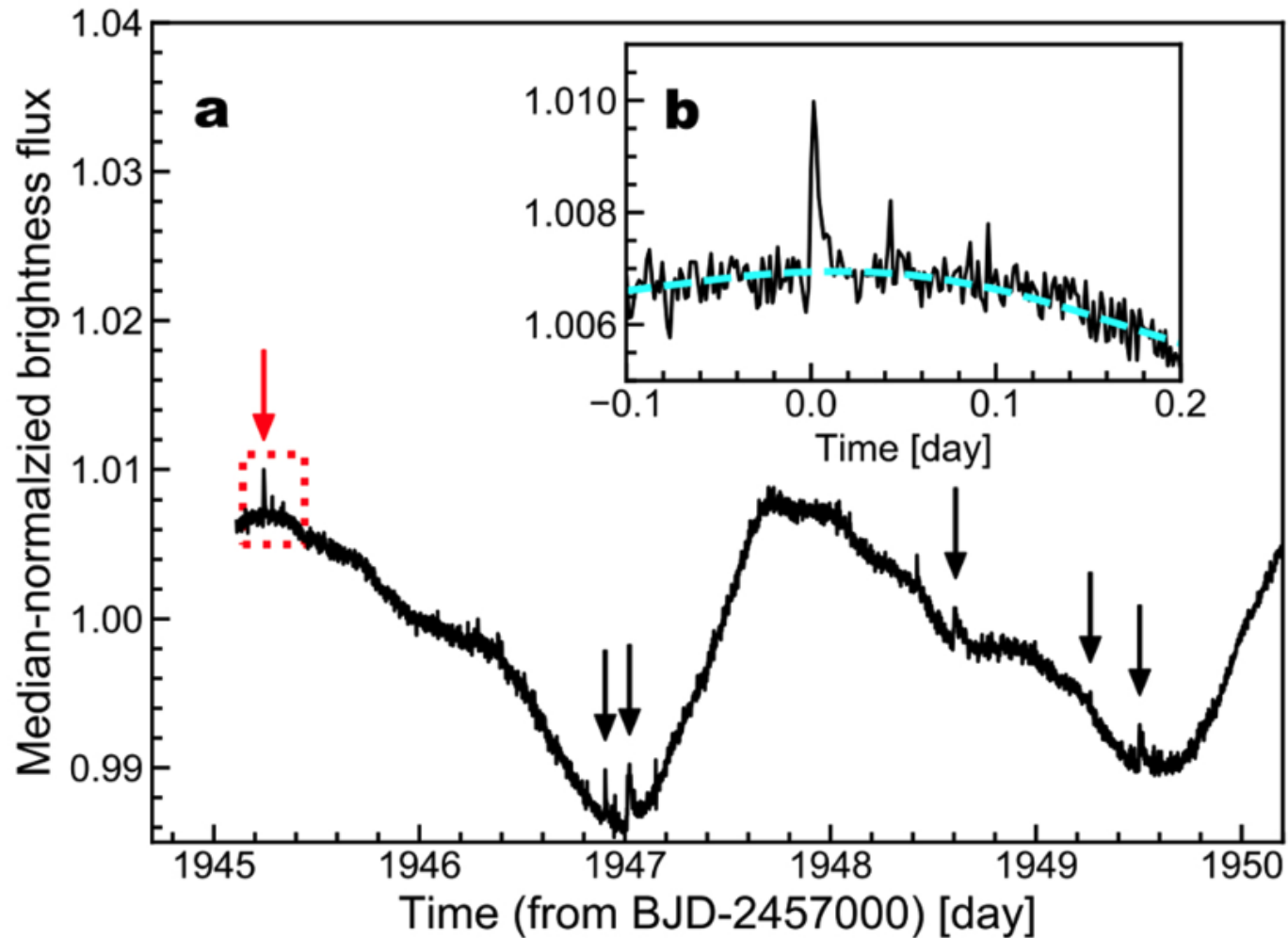
System Identification

- TESS data can be used to identify specific types of systems/stars:
 - Transiting exoplanets
 - Short period binaries
 - Eclipsing binaries
 - Pulsating stars



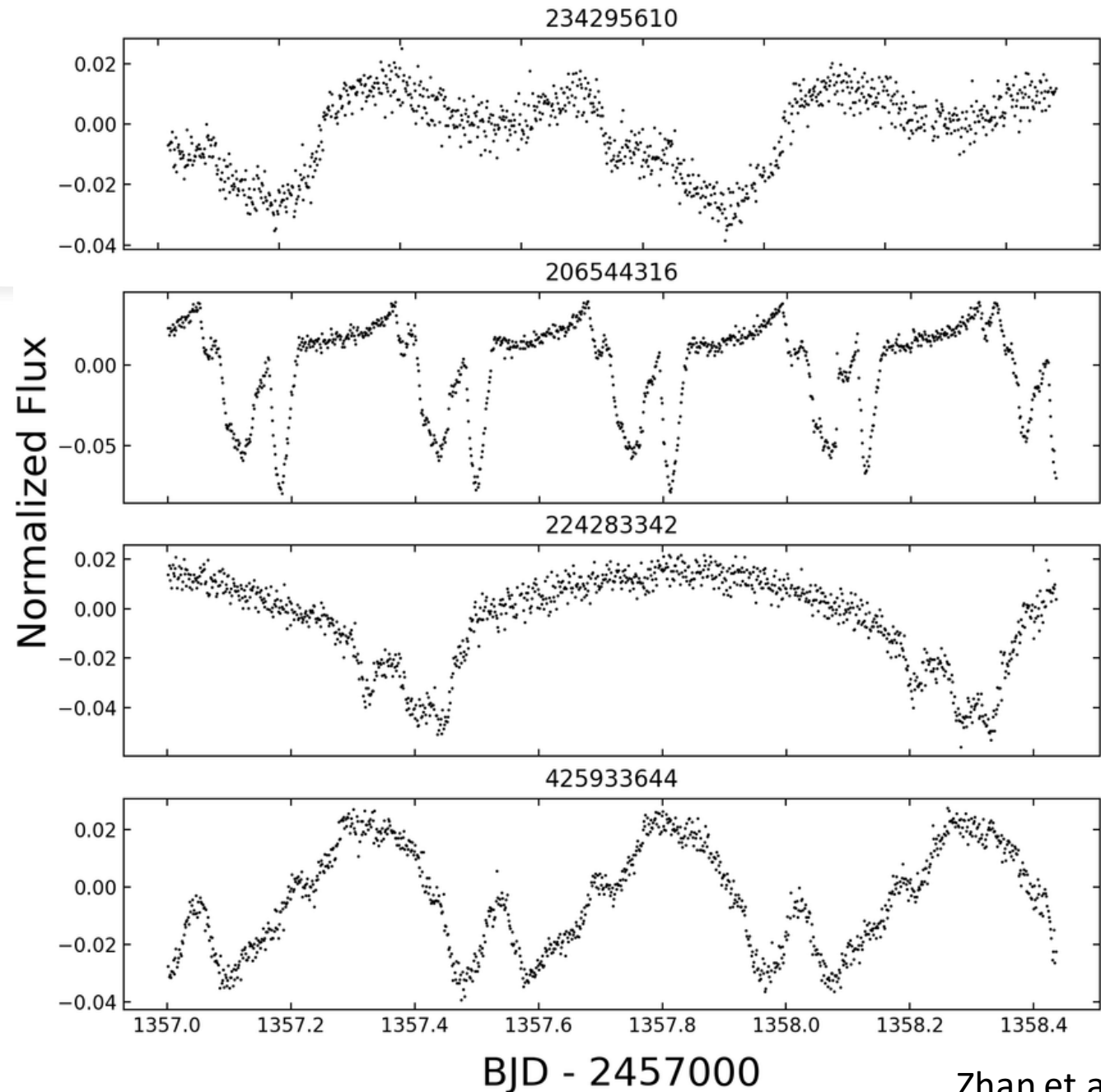
Flare Identification

- TESS data can be used to identify flare events and rates.




Spot Rotation

- TESS data can be used to identify spots and determine the rotation rate of stars.

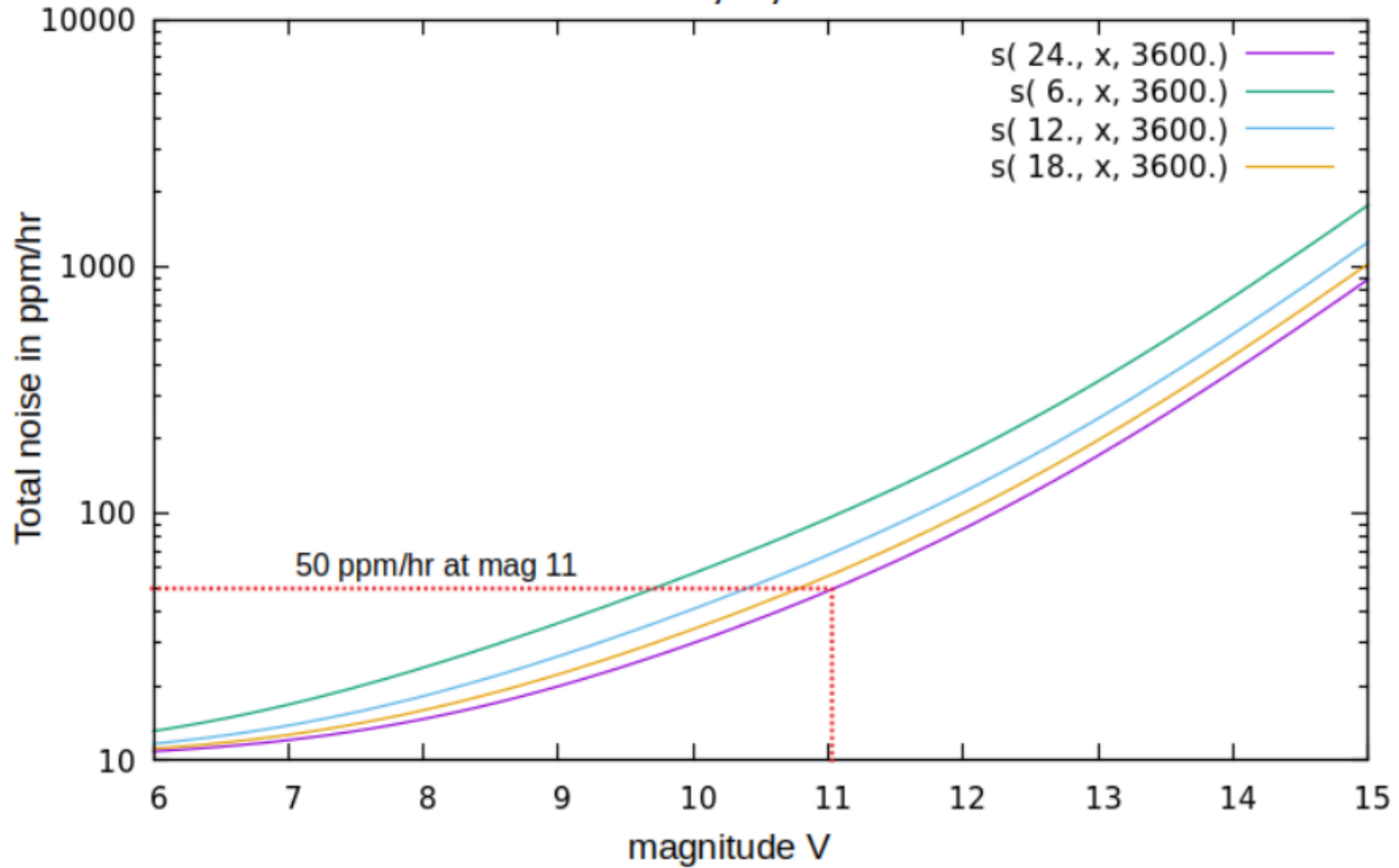




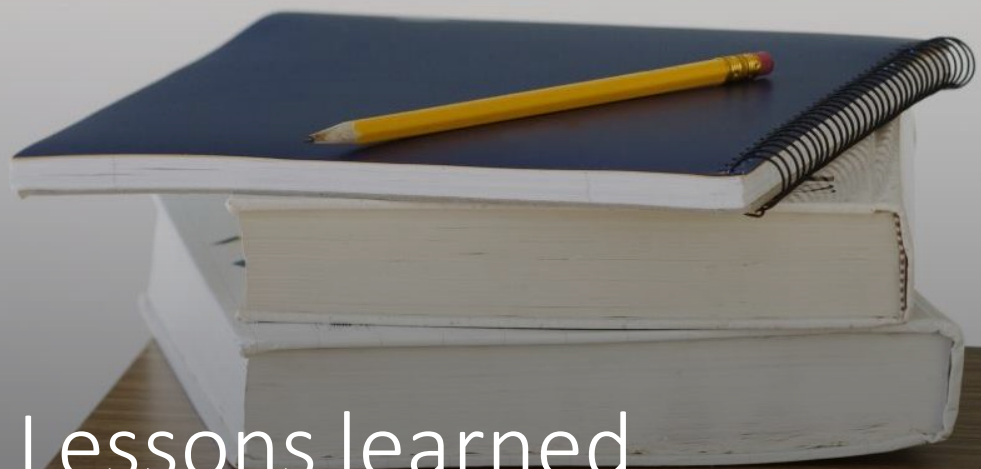
Work to be
done

- Work proper will begin with a 1 Year MSc project starting October 2023.
 - Input from this working group is very welcome!
- 

Noise model for 6,12,18 and 24 cameras



Matuszewski
et al., 2023



Lessons learned