200 planets from K2

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EAYAM 2017, Ishigaki, Japan

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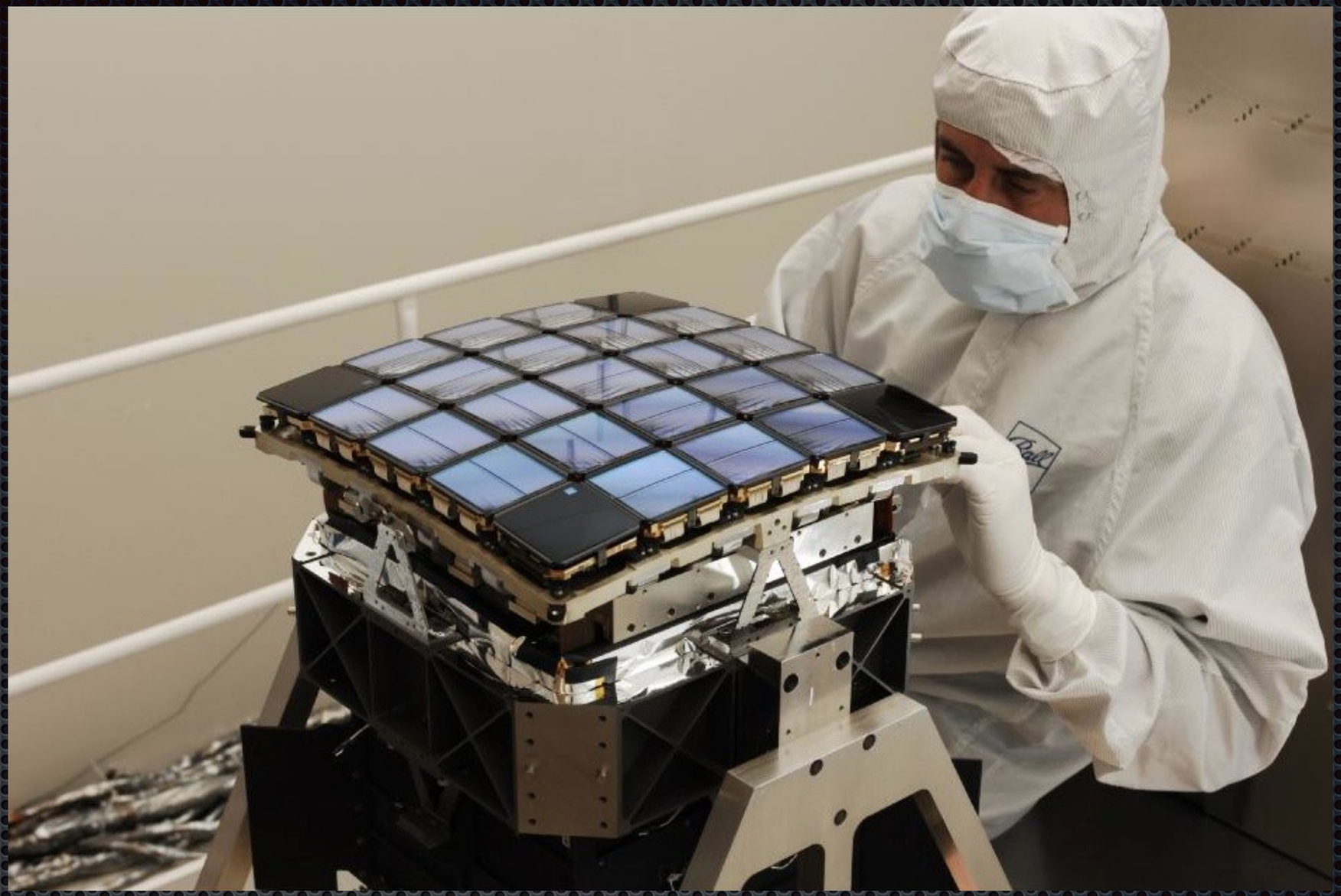
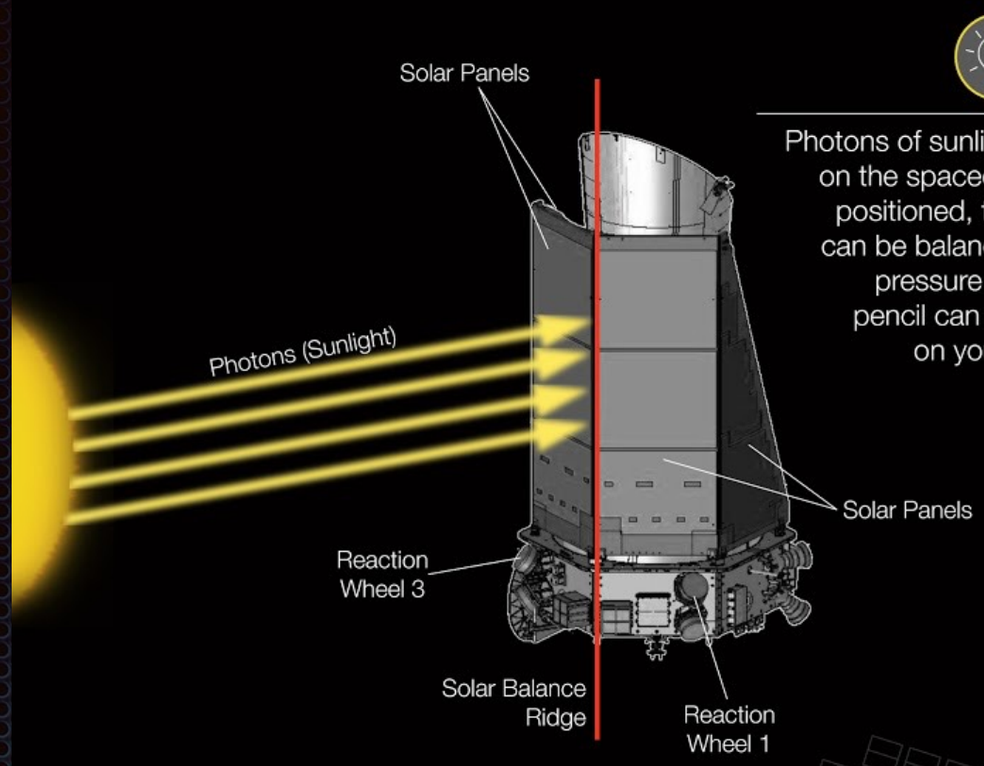
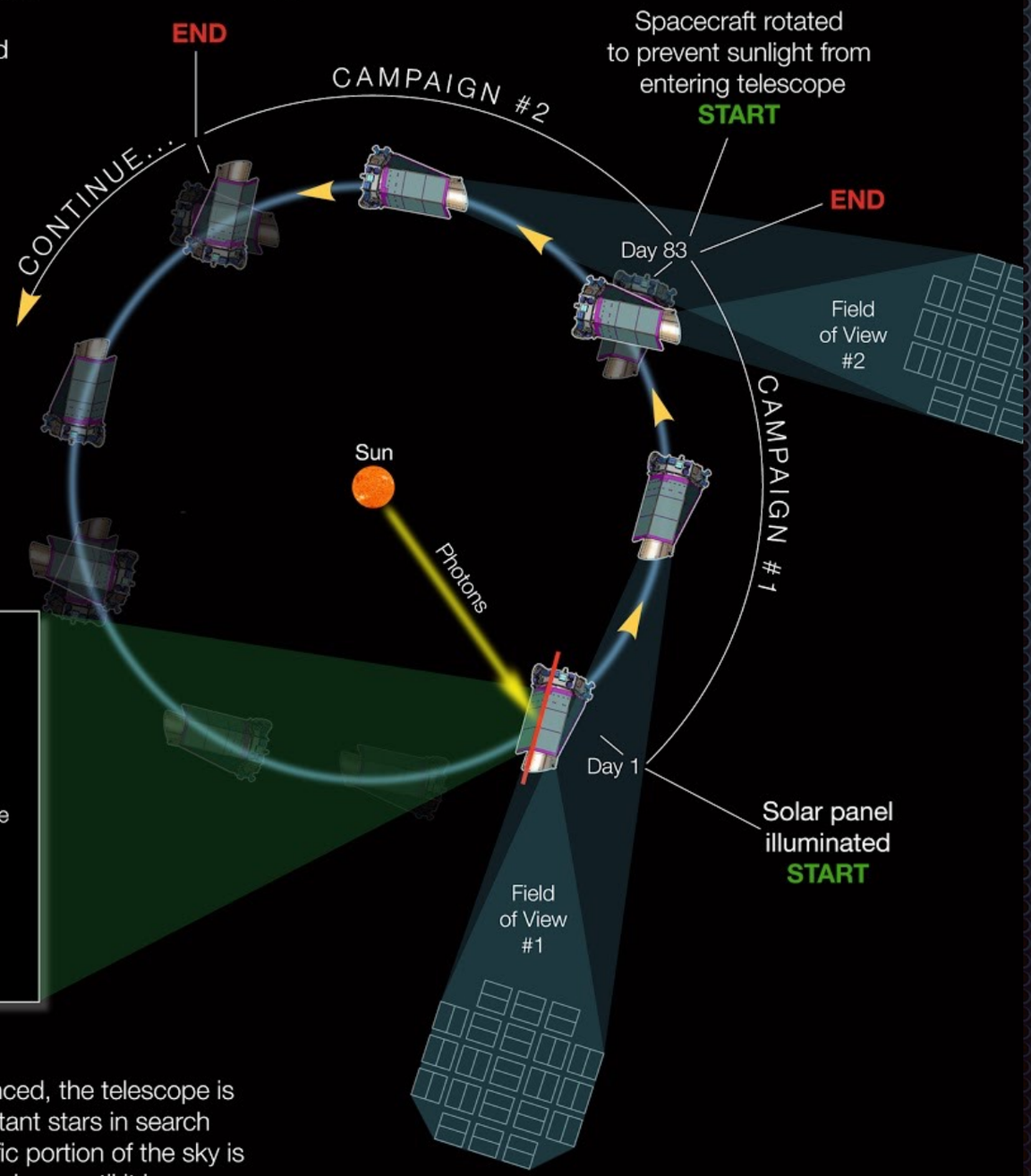


From pixels to planets

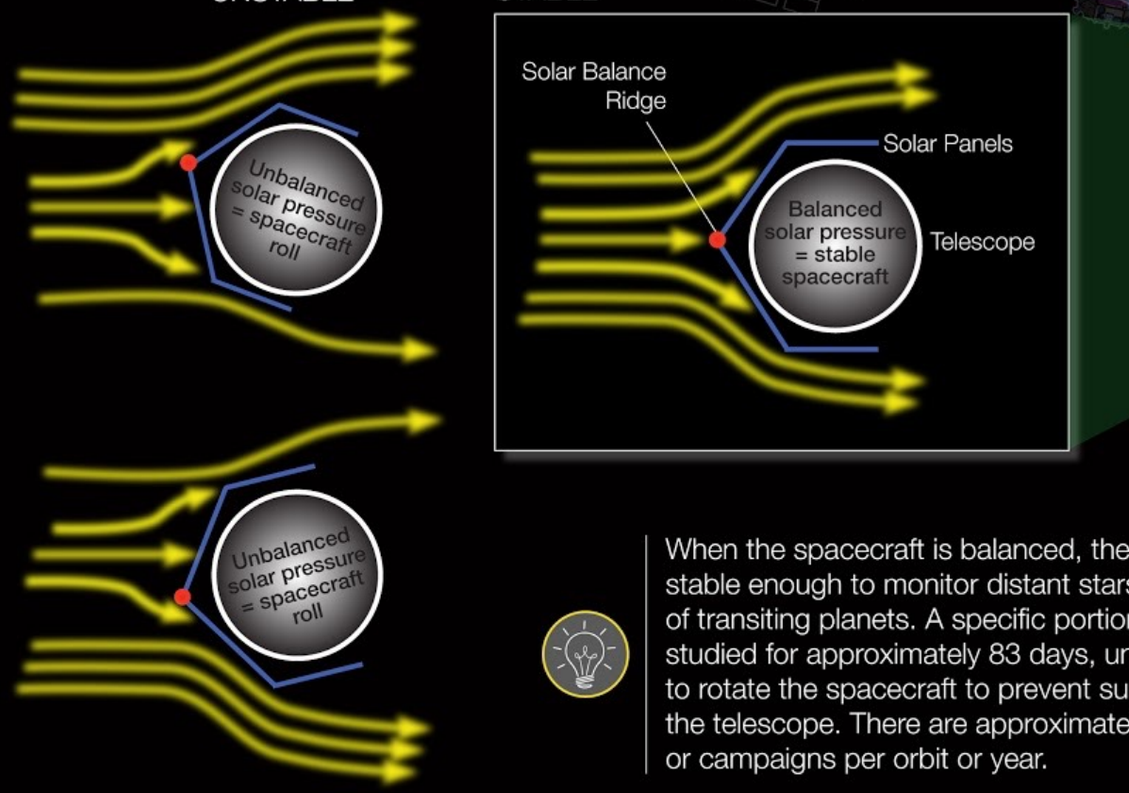
42 2200x1024 CCDs = 95M pixels



Photons of sunlight exert pressure on the spacecraft. If properly positioned, the spacecraft can be balanced against the pressure much as a pencil can be balanced on your finger.

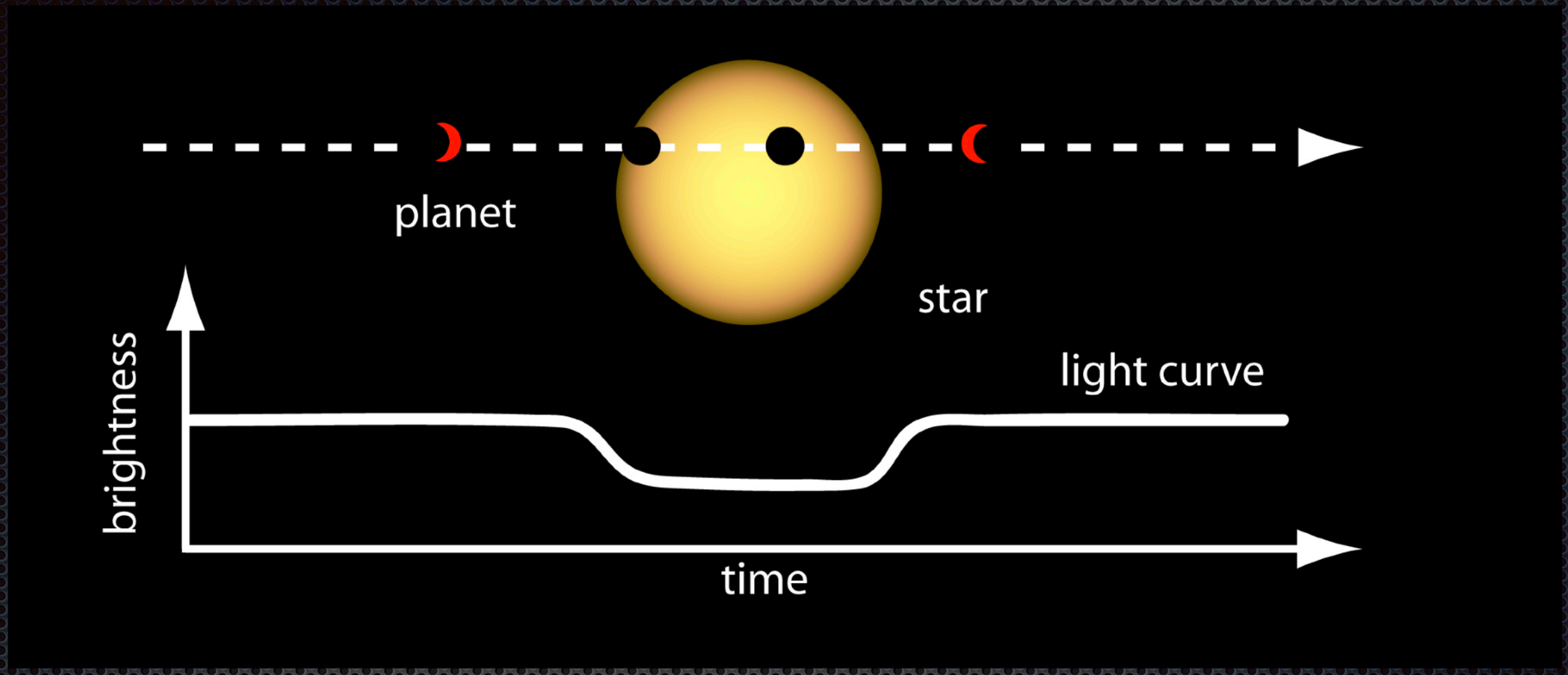


TOP-DOWN VIEWS OF SPACECRAFT



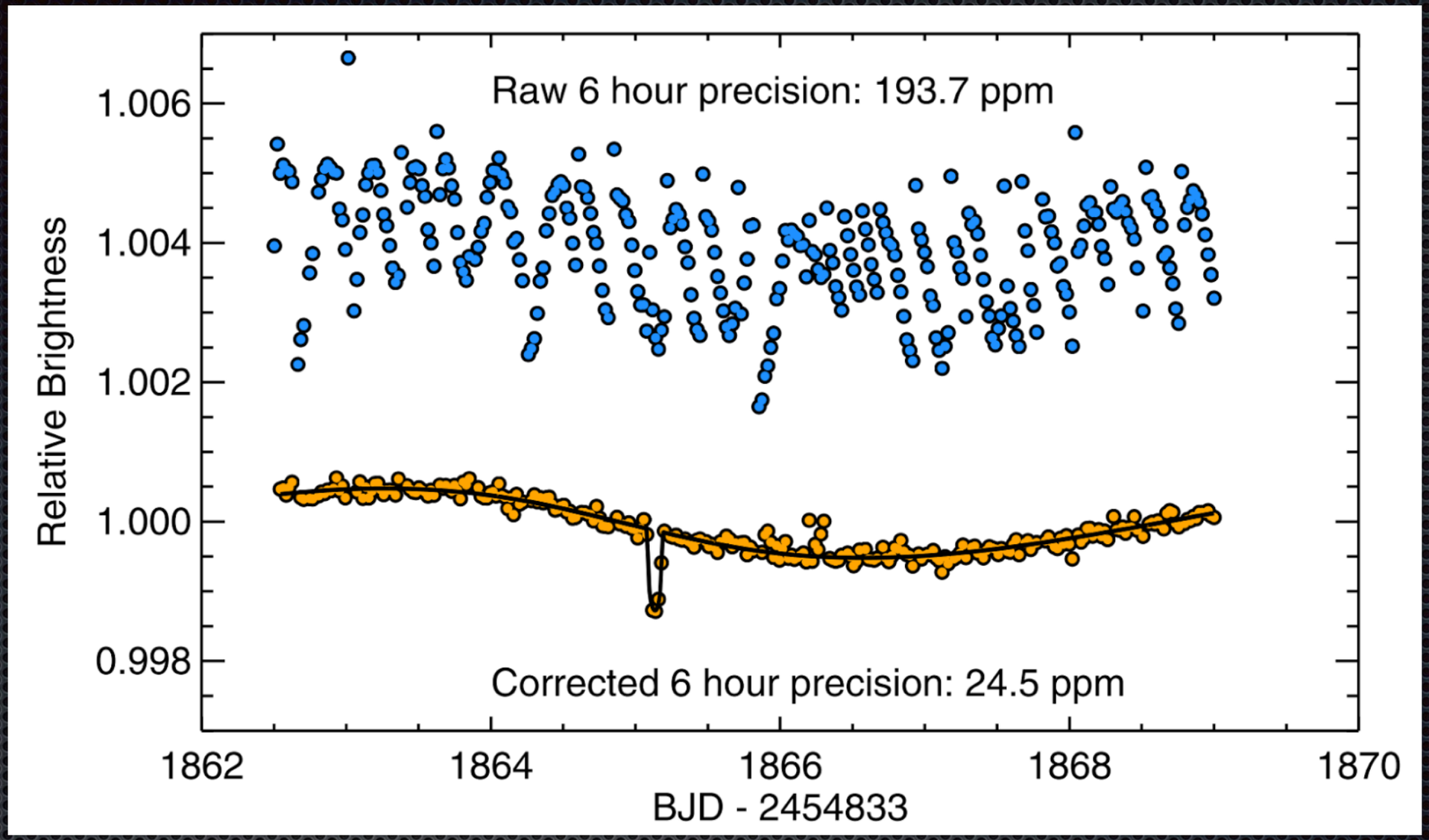
When the spacecraft is balanced, the telescope is stable enough to monitor distant stars in search of transiting planets. A specific portion of the sky is studied for approximately 83 days, until it is necessary to rotate the spacecraft to prevent sunlight from entering the telescope. There are approximately 4.5 viewing periods or campaigns per orbit or year.

CONCEPTUAL ILLUSTRATION OF SPACECRAFT SOLAR DISTURBANCE. THE ACTUAL DISTURBANCE IS DUE TO PHOTON PRESSURE, NOT SOLAR WIND.



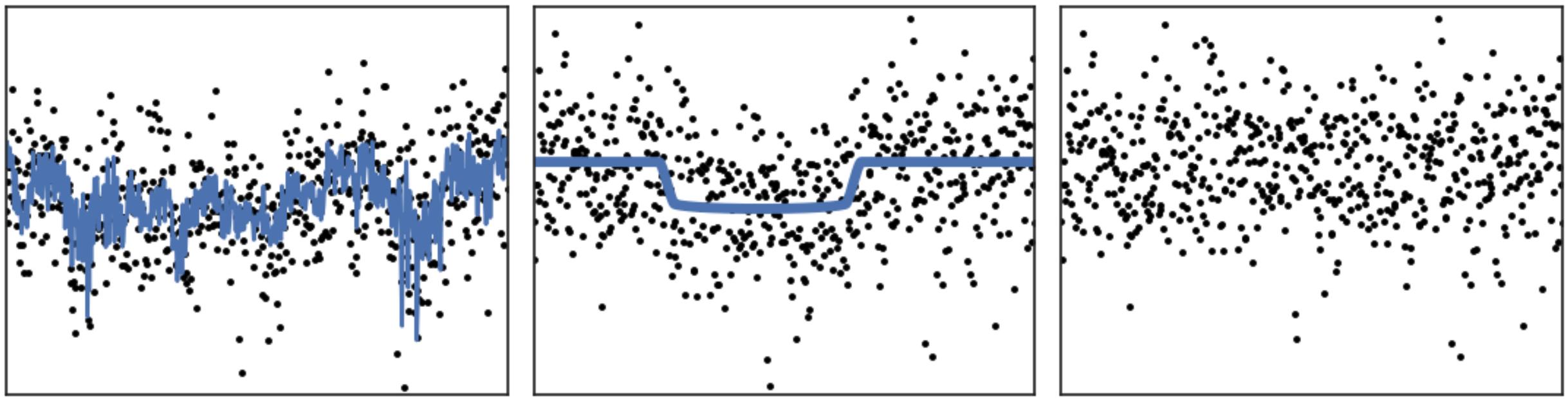
Anatomy of a transit

Planet passes in front of the star



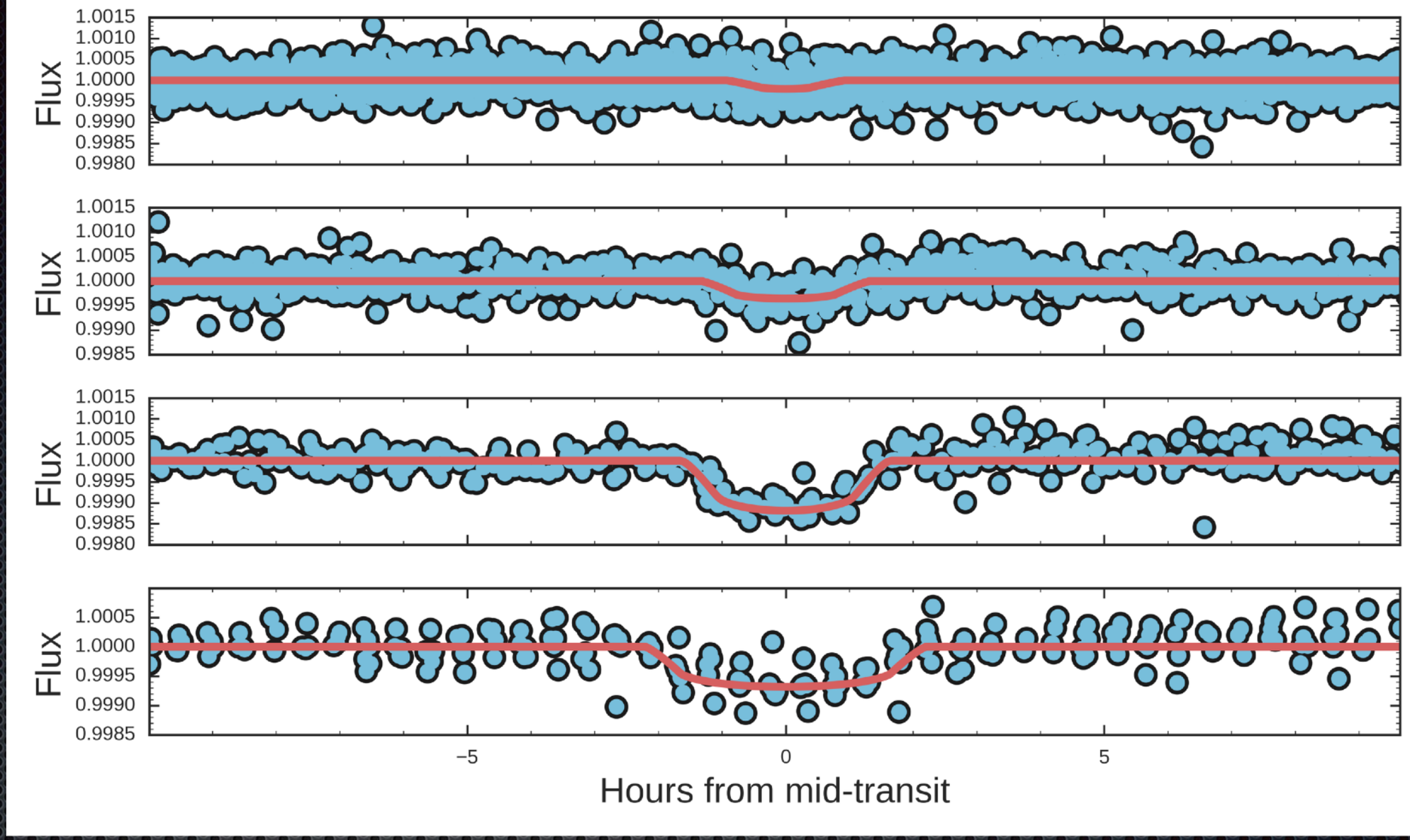
Raw K2 photometry is noisy

Model the systematics!



transit+systematics corrected residuals

Planet signals are often smaller than the noise!

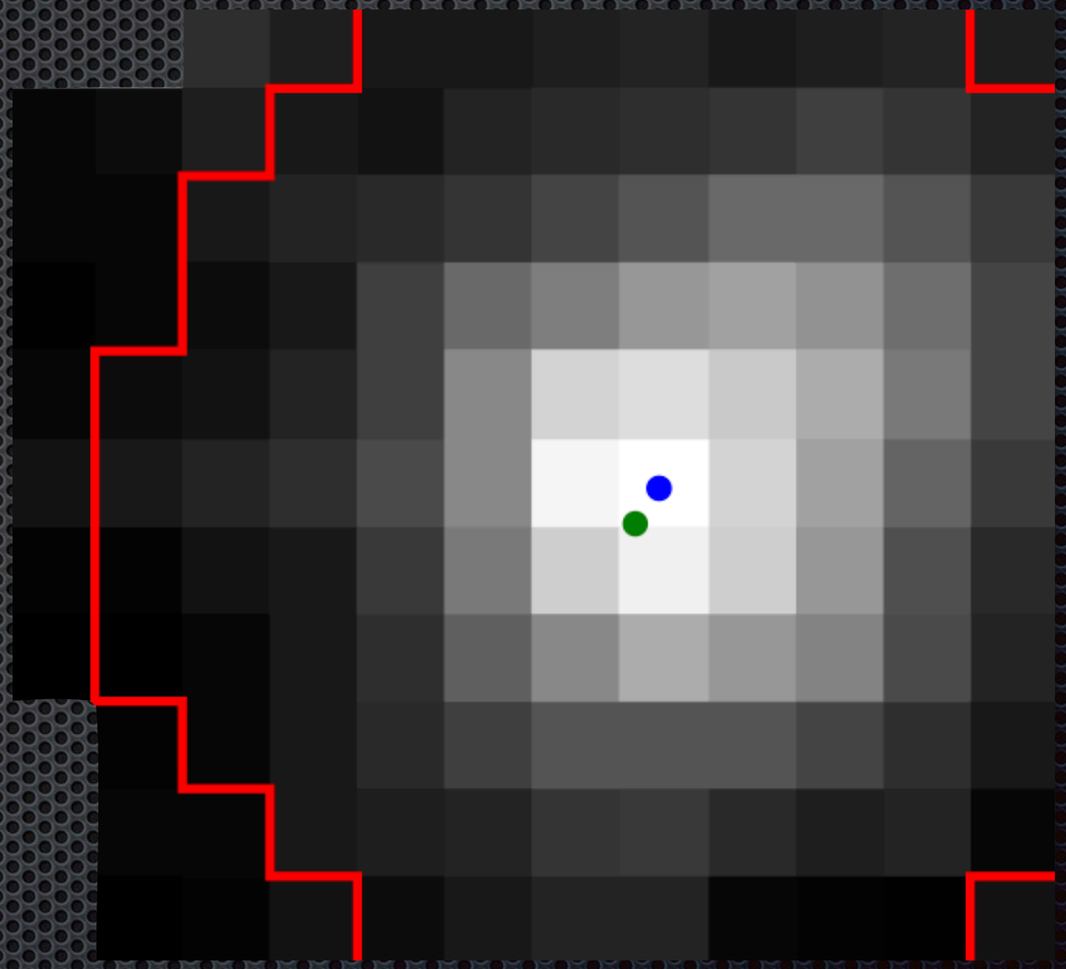


Seeing quadruple

Many multi planet systems!

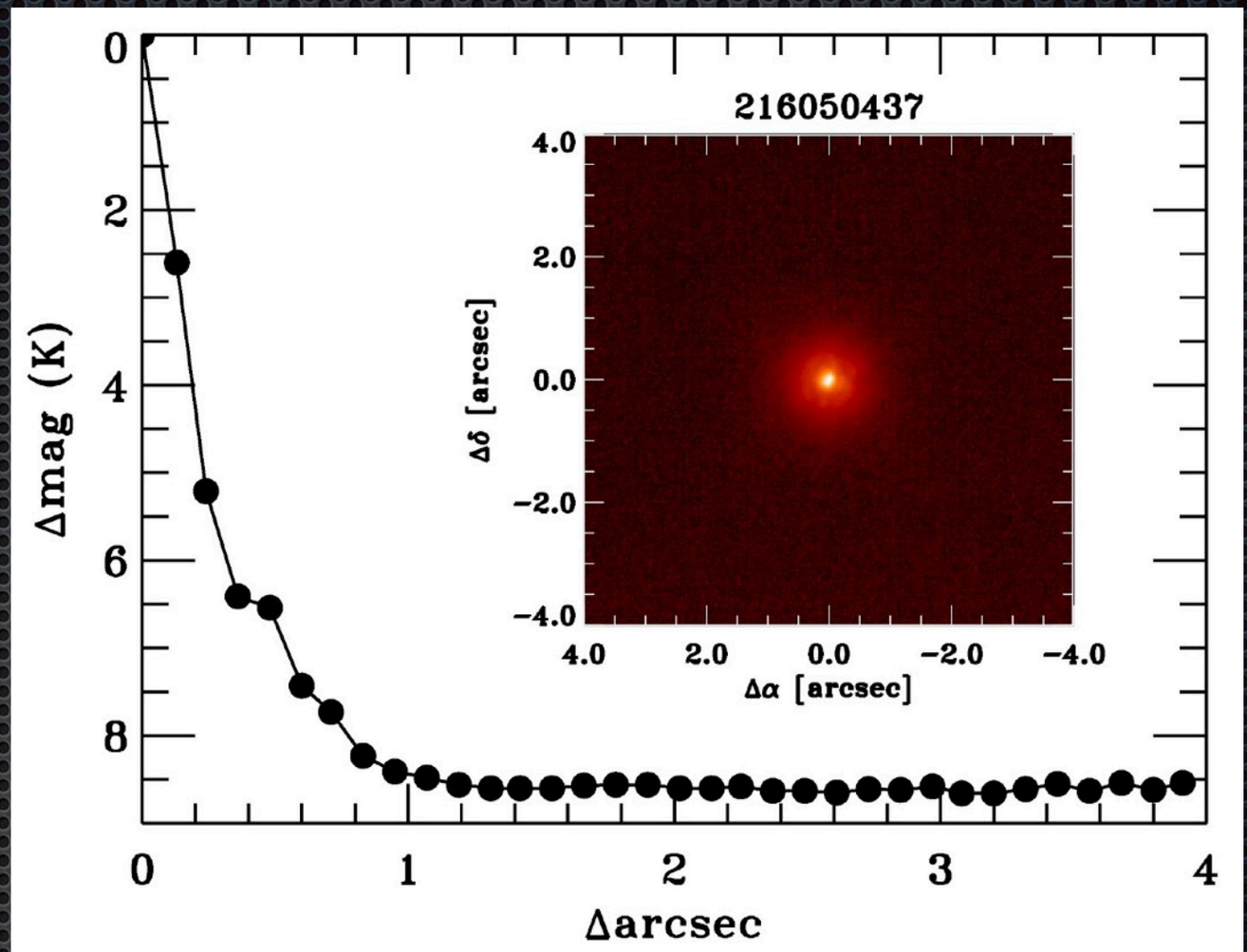
Kepler pixels

Are 4 arcseconds wide!



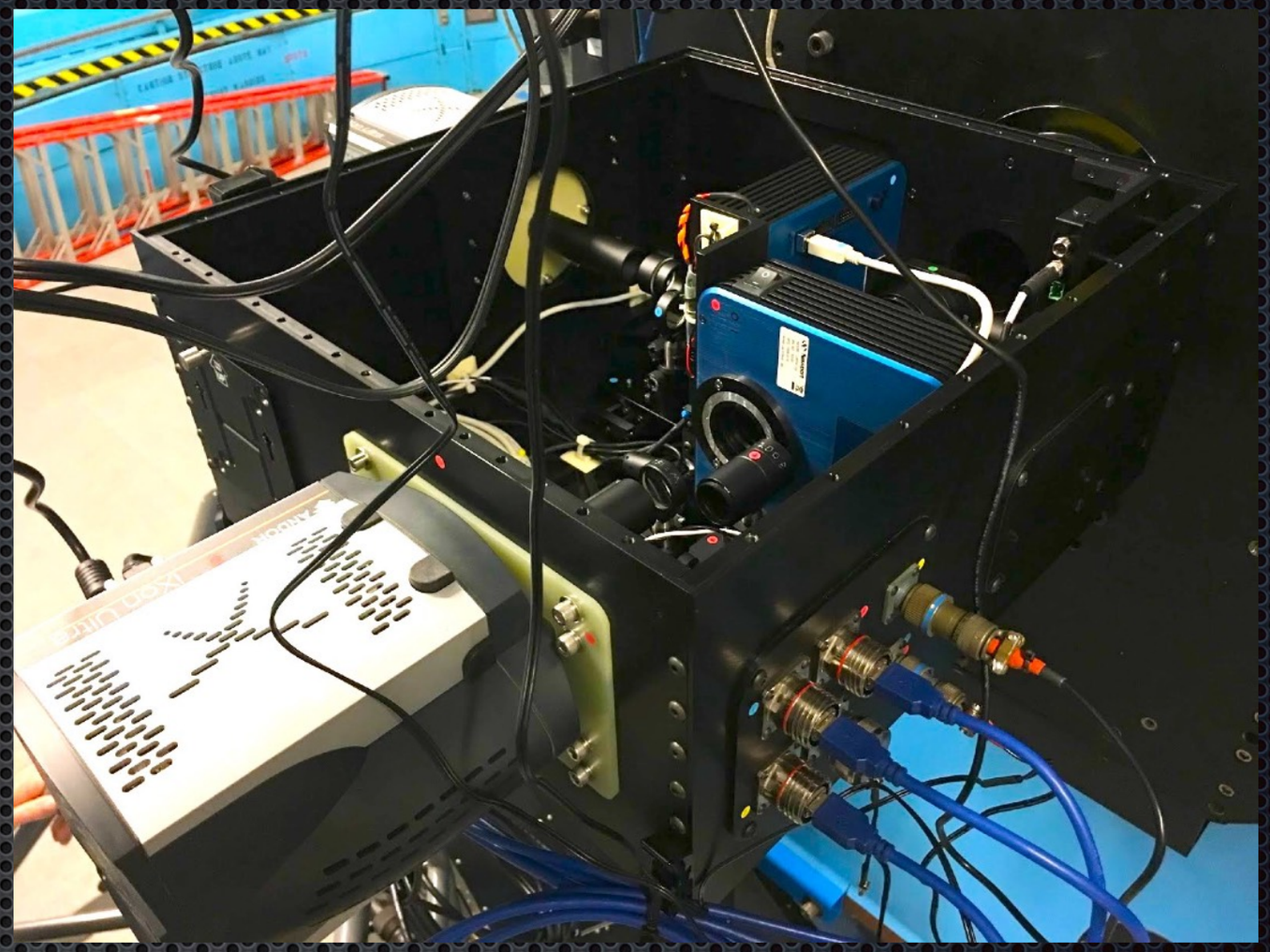
W. M. KECK
OBSERVATORY

Maunakea
Island of Hawai`i



High resolution imaging

Look very close to the star



High resolution imaging

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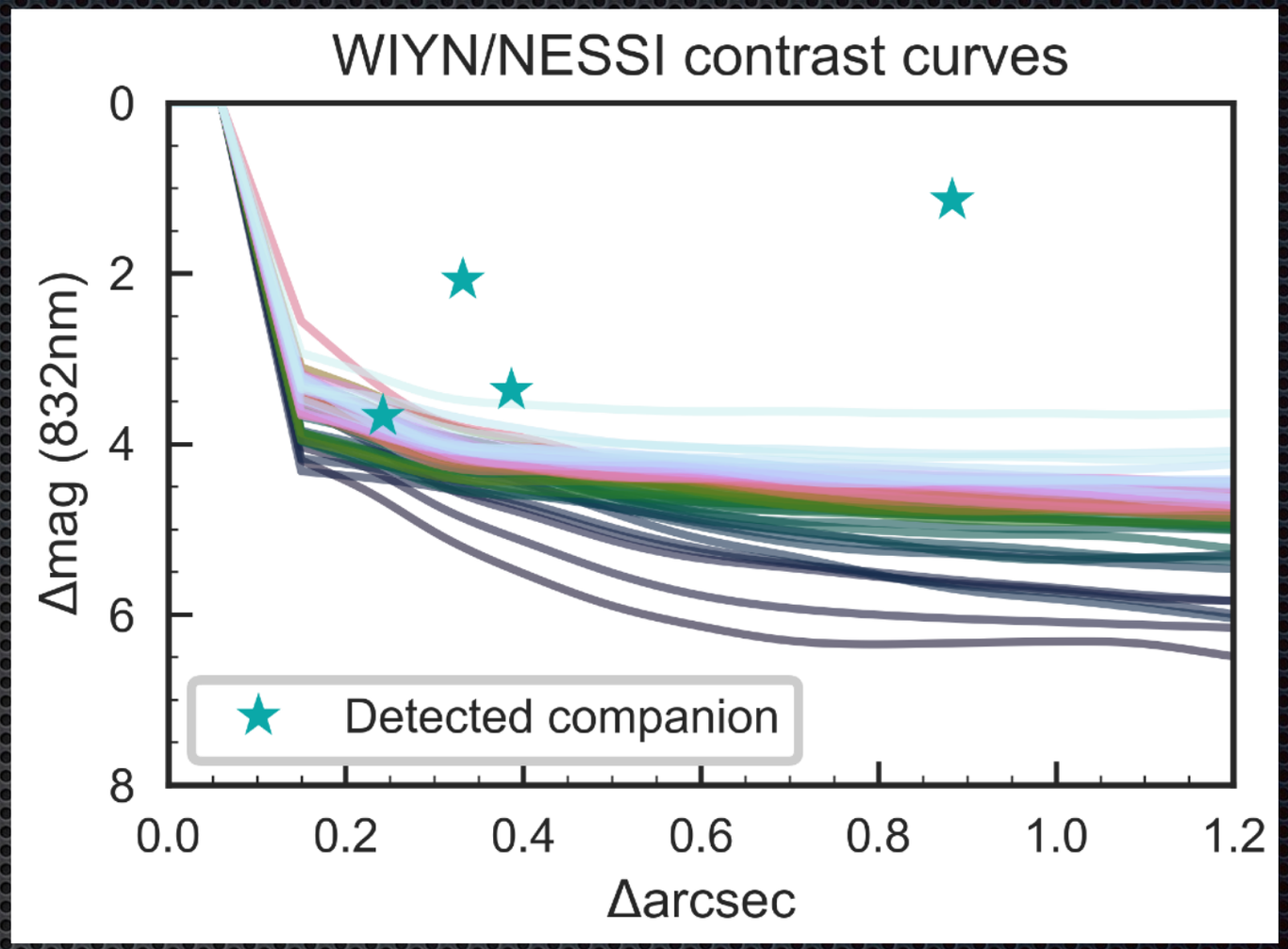

High resolution imaging

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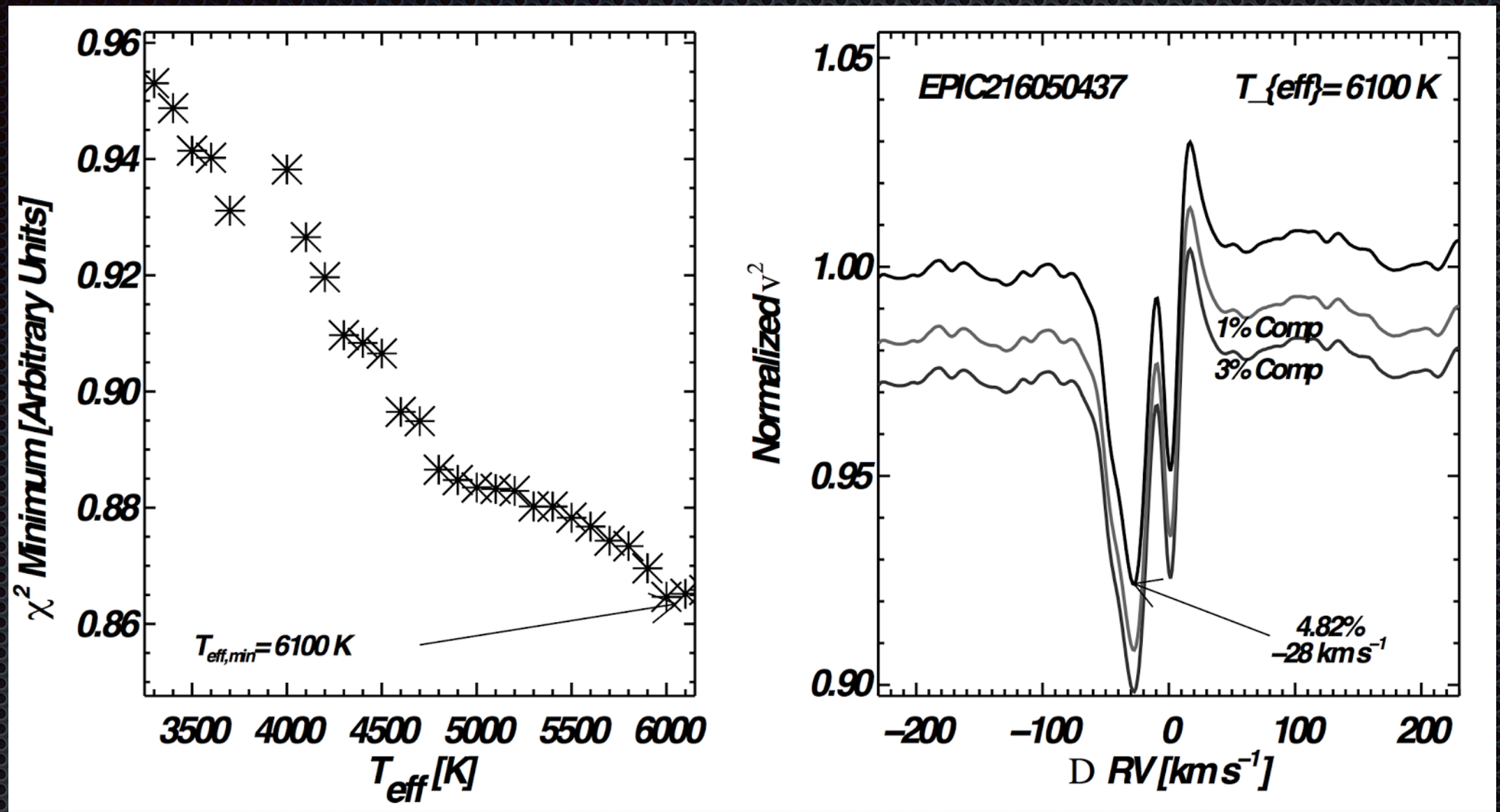
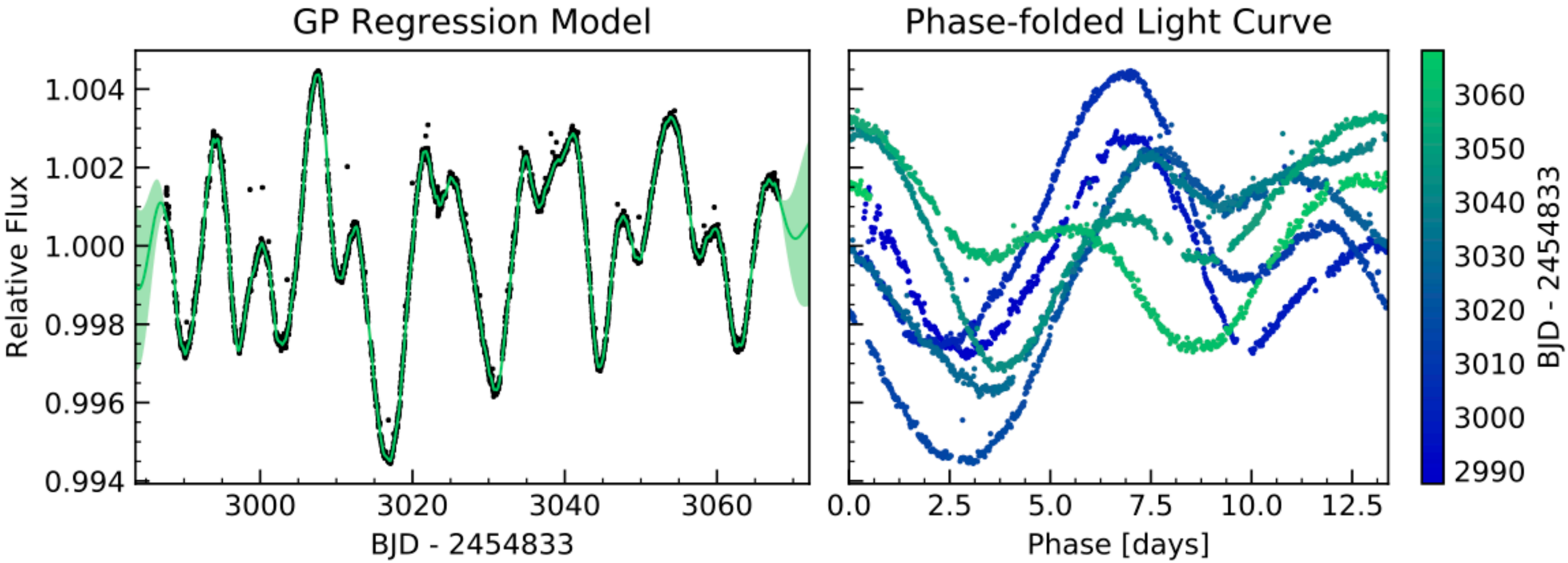


High resolution spectroscopy

Look “behind” the star



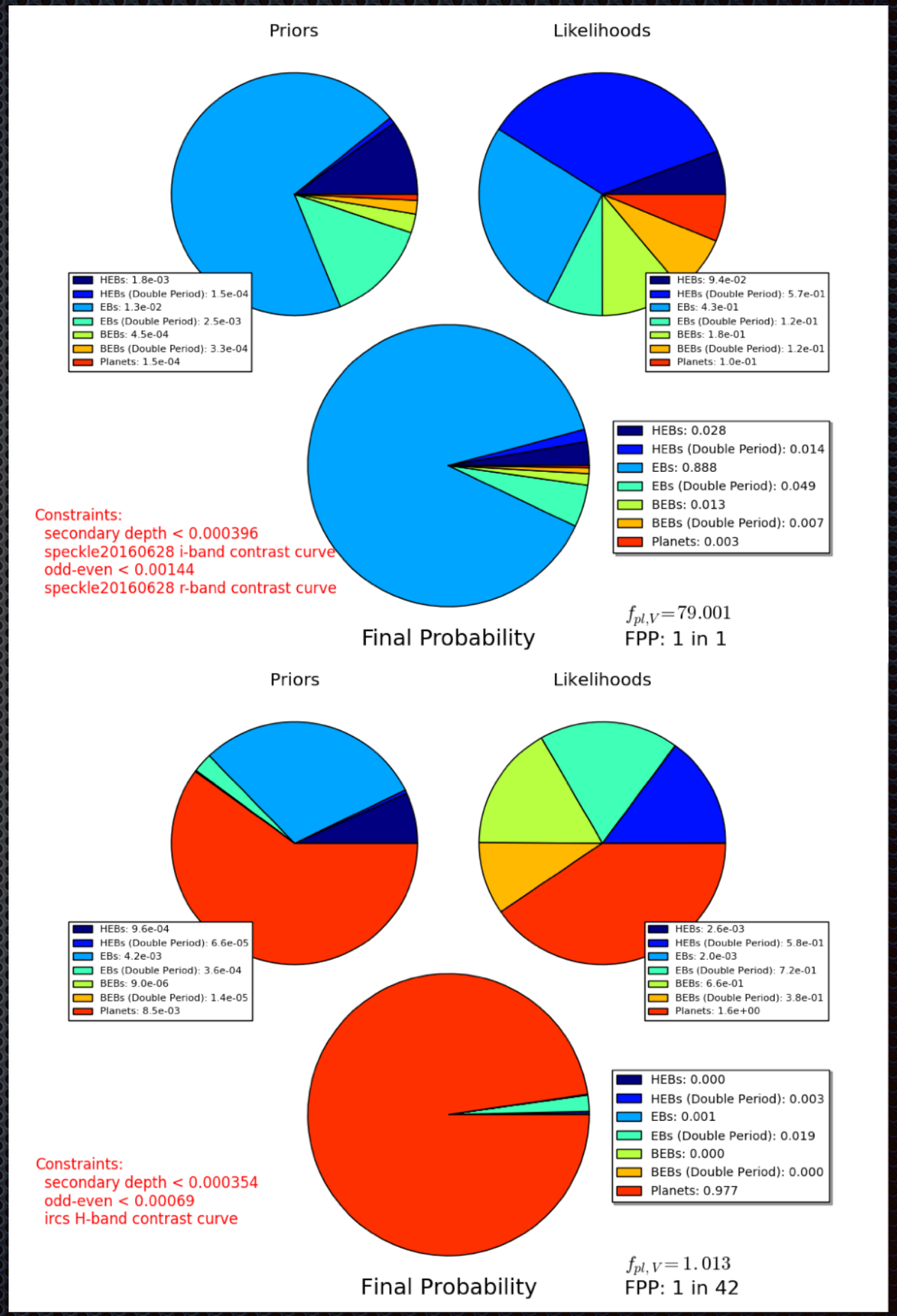
Know the star

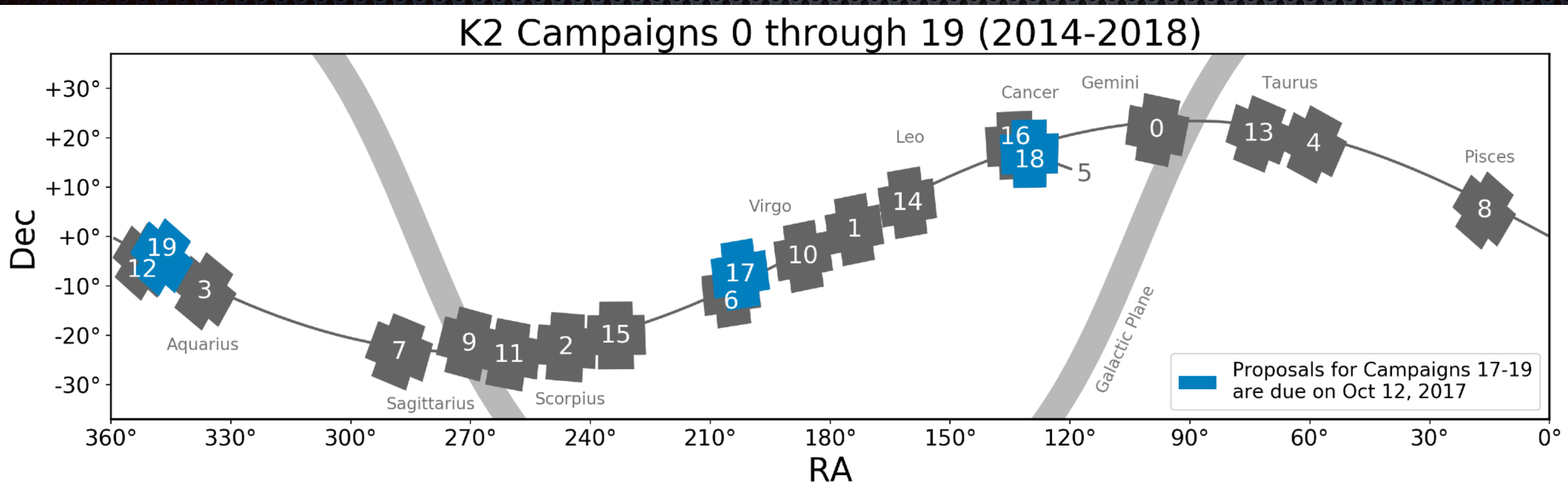
Know the planet

Bayesian statistics for planet validation

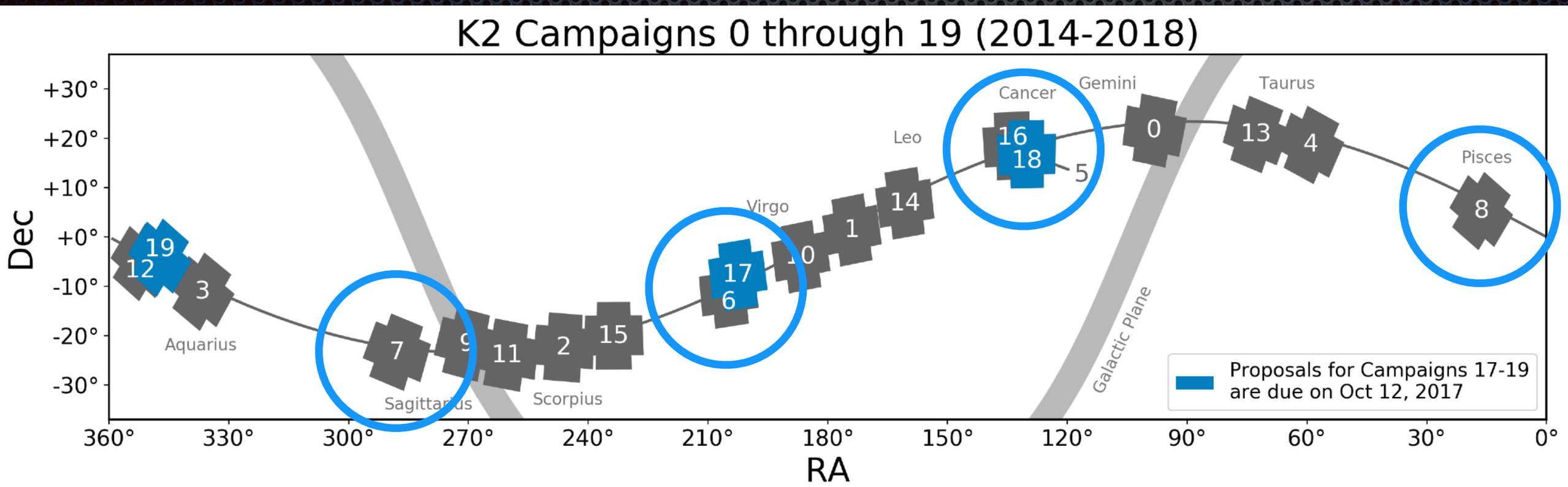
Combine all of our knowledge about the planet and the star

VESPA (Morton 2012,2015)





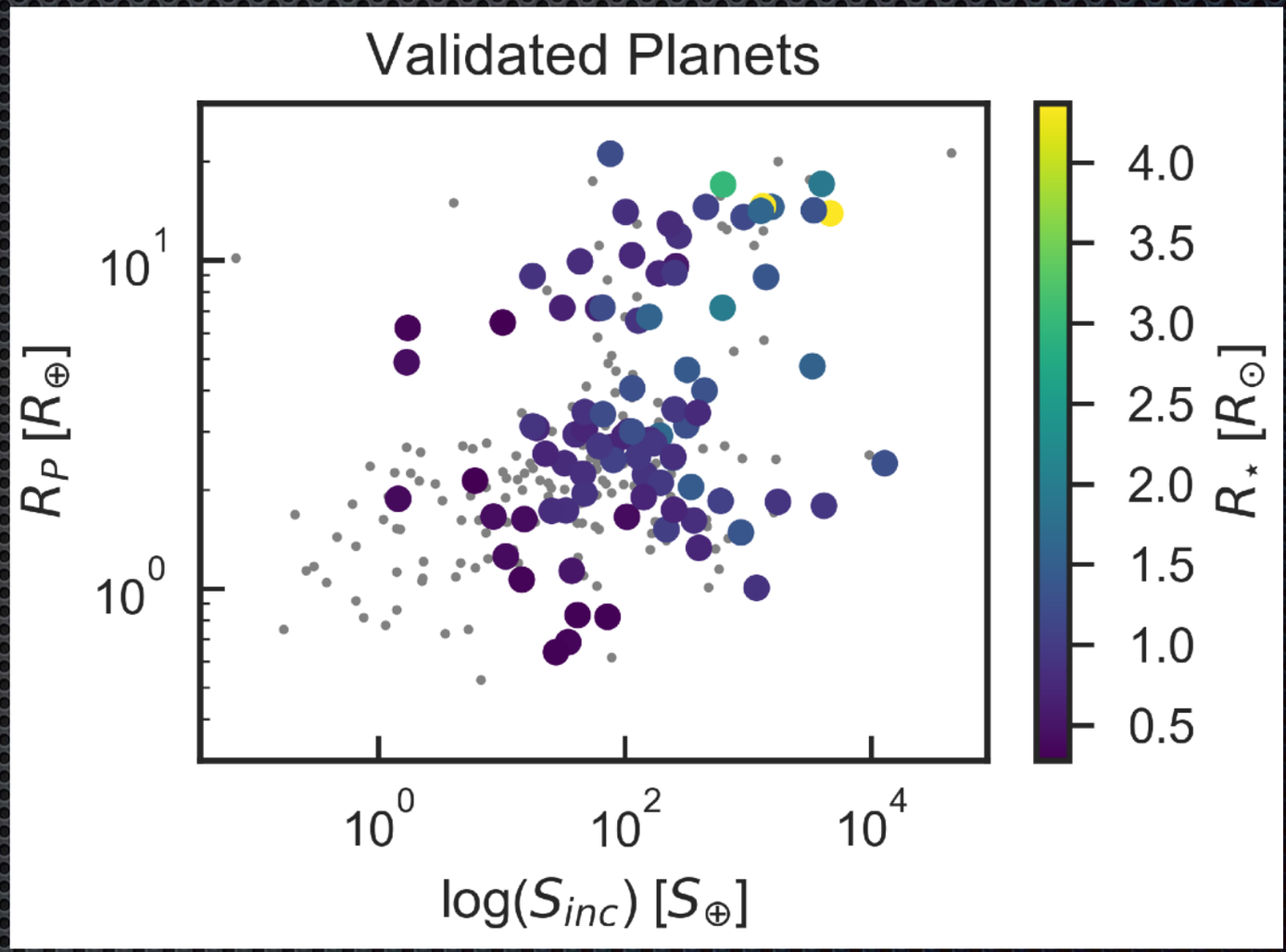
K2 observing campaigns

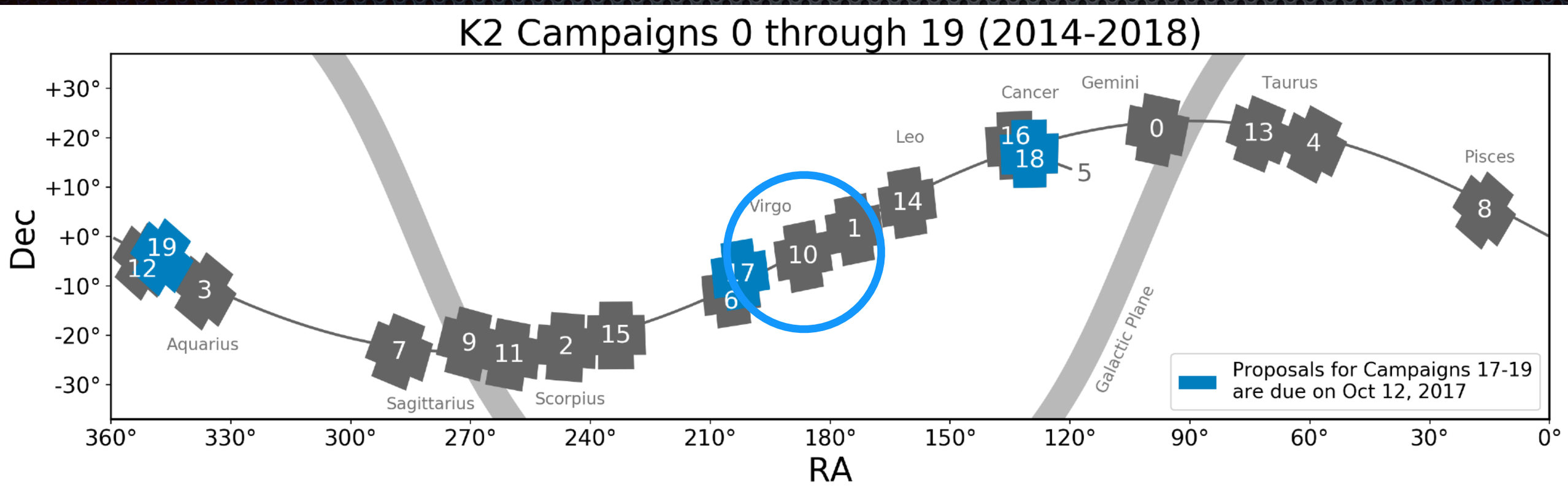


K2 observing campaigns

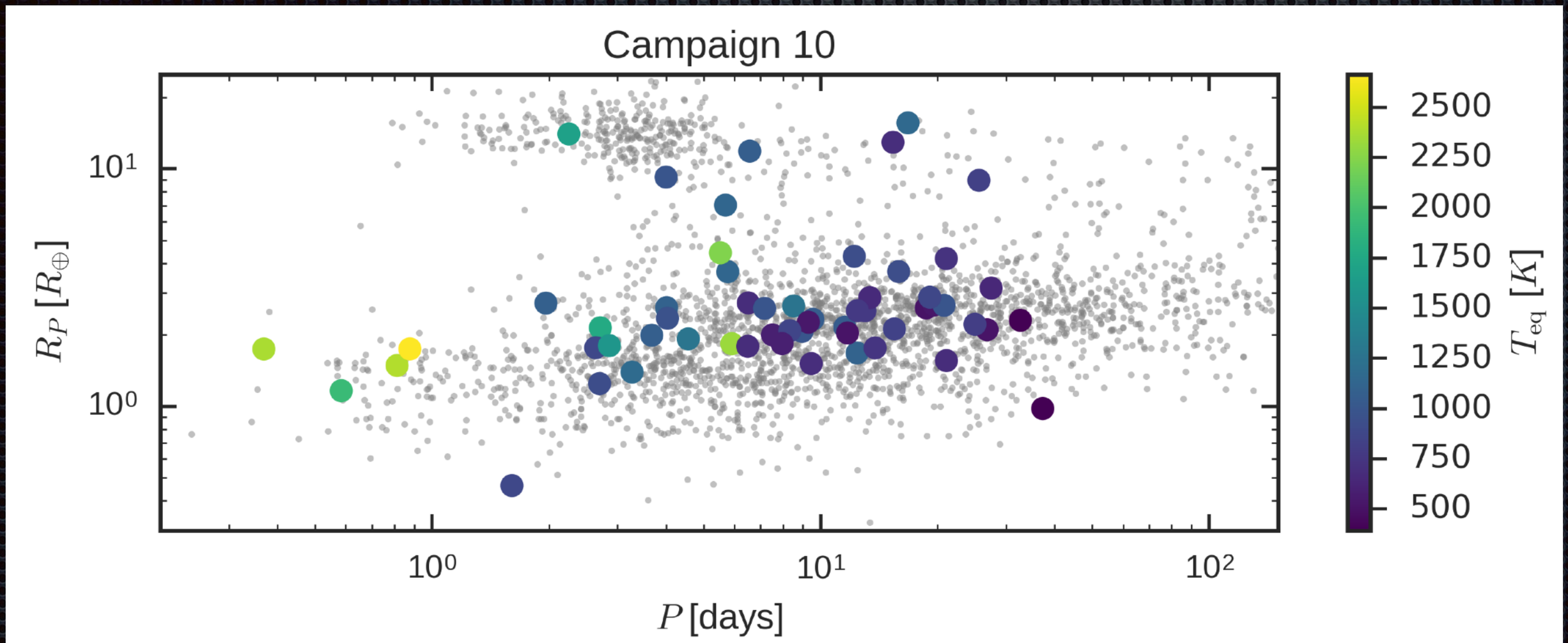
C5-8 yield

~80 new planets
~50 new candidates





K2 observing campaigns



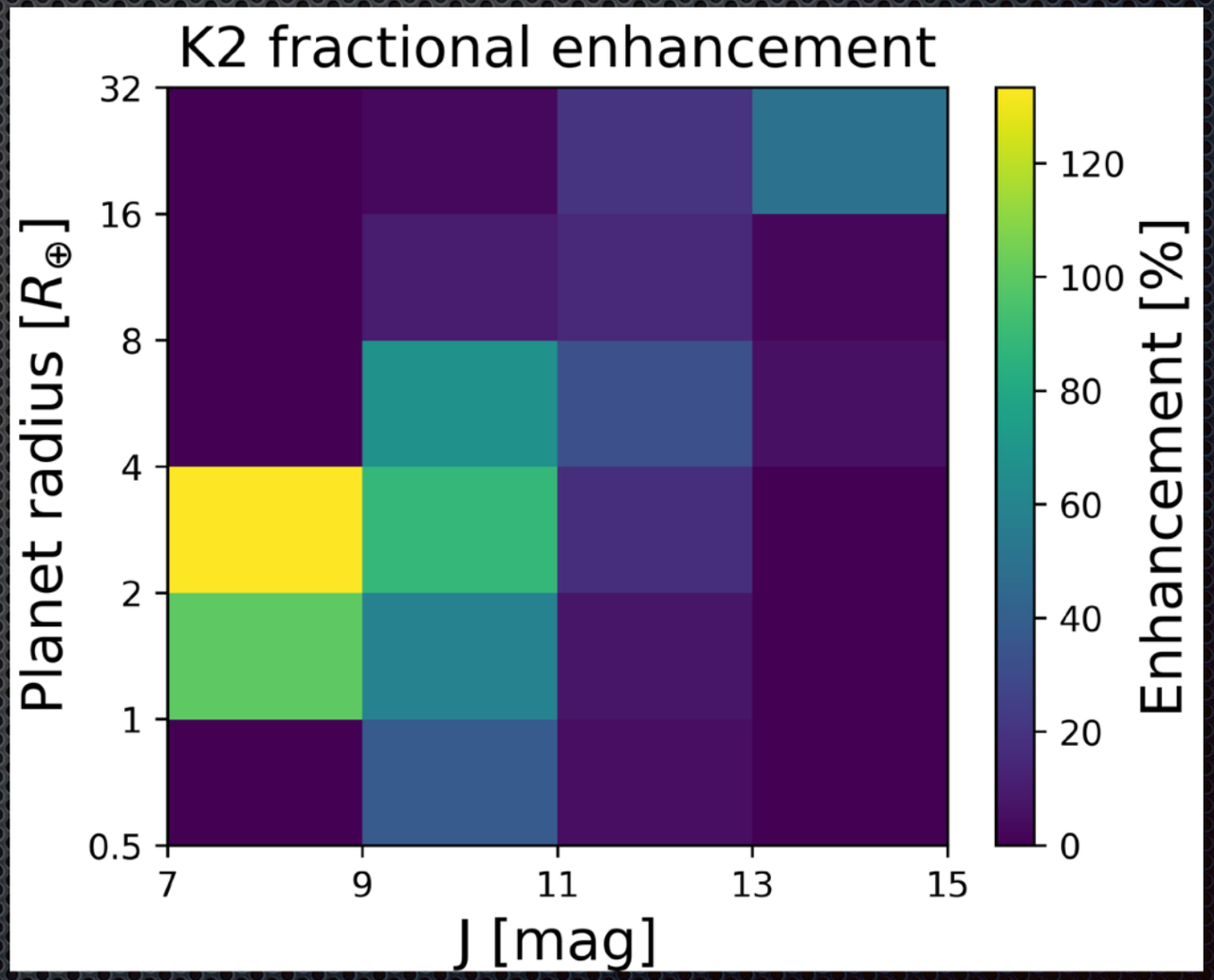
C10 yield

~60 new planets

~10 new candidates

Keep calm and validate on

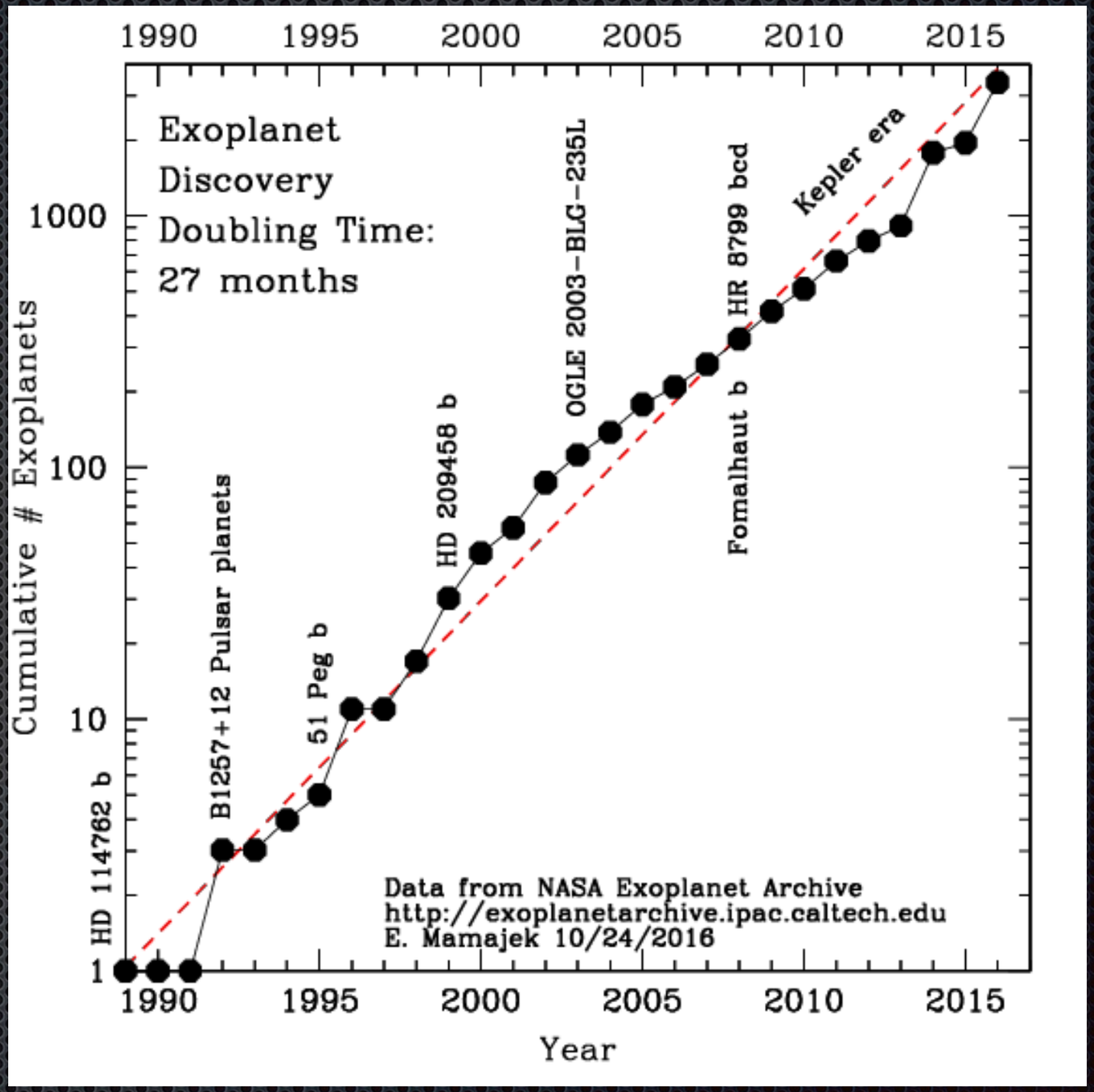
- K2's 2nd year catalog papers
  - C5-8 (Livingston+ in prep.)
    - K2 California consortium
  - C10 (Livingston+ in prep.)
    - KESPRINT consortium



Keep calm and ~~validate~~ on

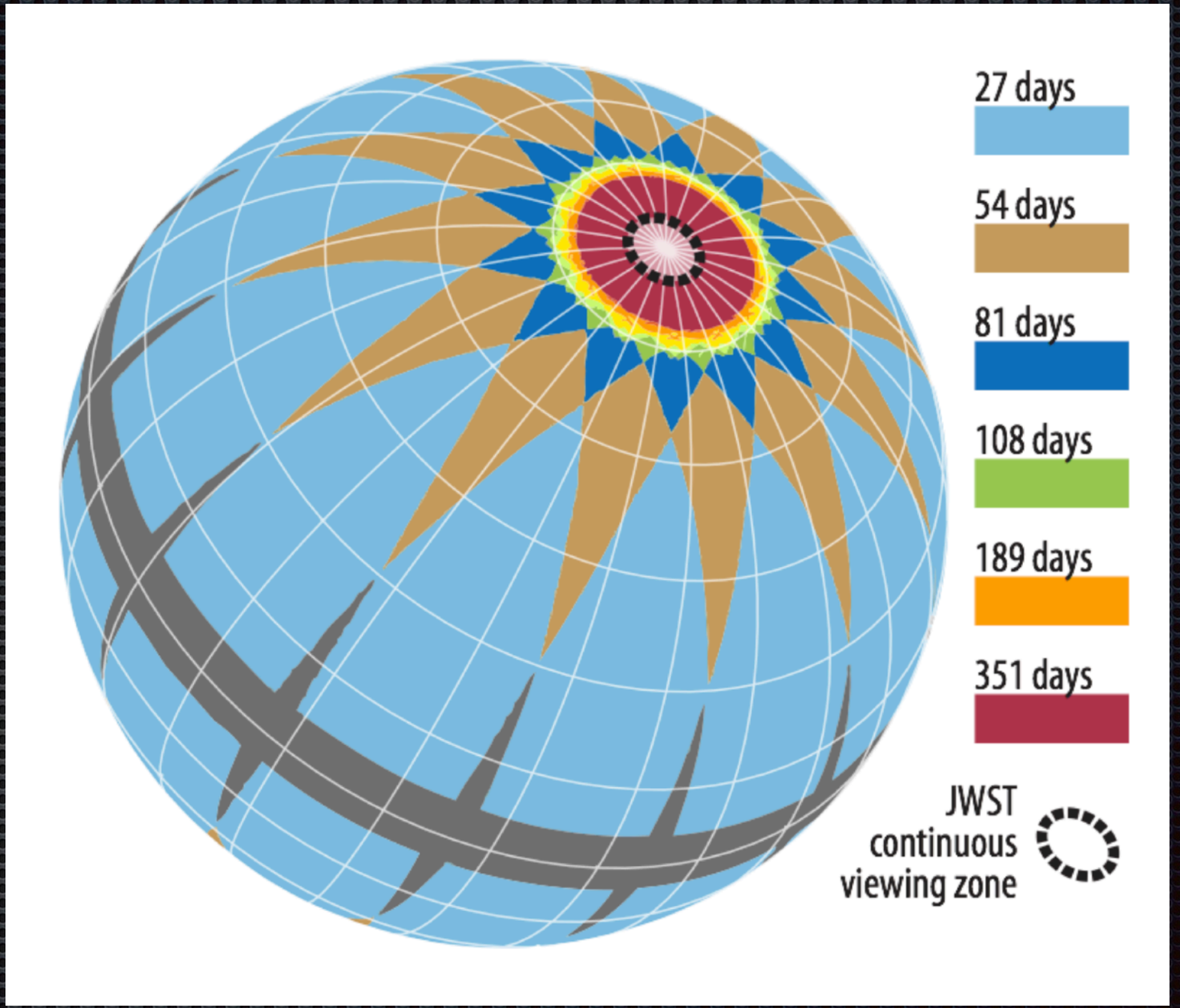
Backup slides

Exponential planet discovery rate



TESS

- ~ All-sky
- 2018 launch



IRD: InfraRed Doppler instrument for Subaru

- Optimized for near IR
- Expected precision ~ 1 m/s
- Sensitive to M dwarf habitable zone
- Engineering runs underway
- TESS M dwarf follow-up