Early Results from the TESS Mission

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TESS DISCOVERY OF A TRANSITING SUPER-EARTH IN THE π MENSAE SYSTEM

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TESS DISCOVERY OF AN ULTRA-SHORT-PERIOD PLANET AROUND THE NEARBY M DWARF LHS 3844

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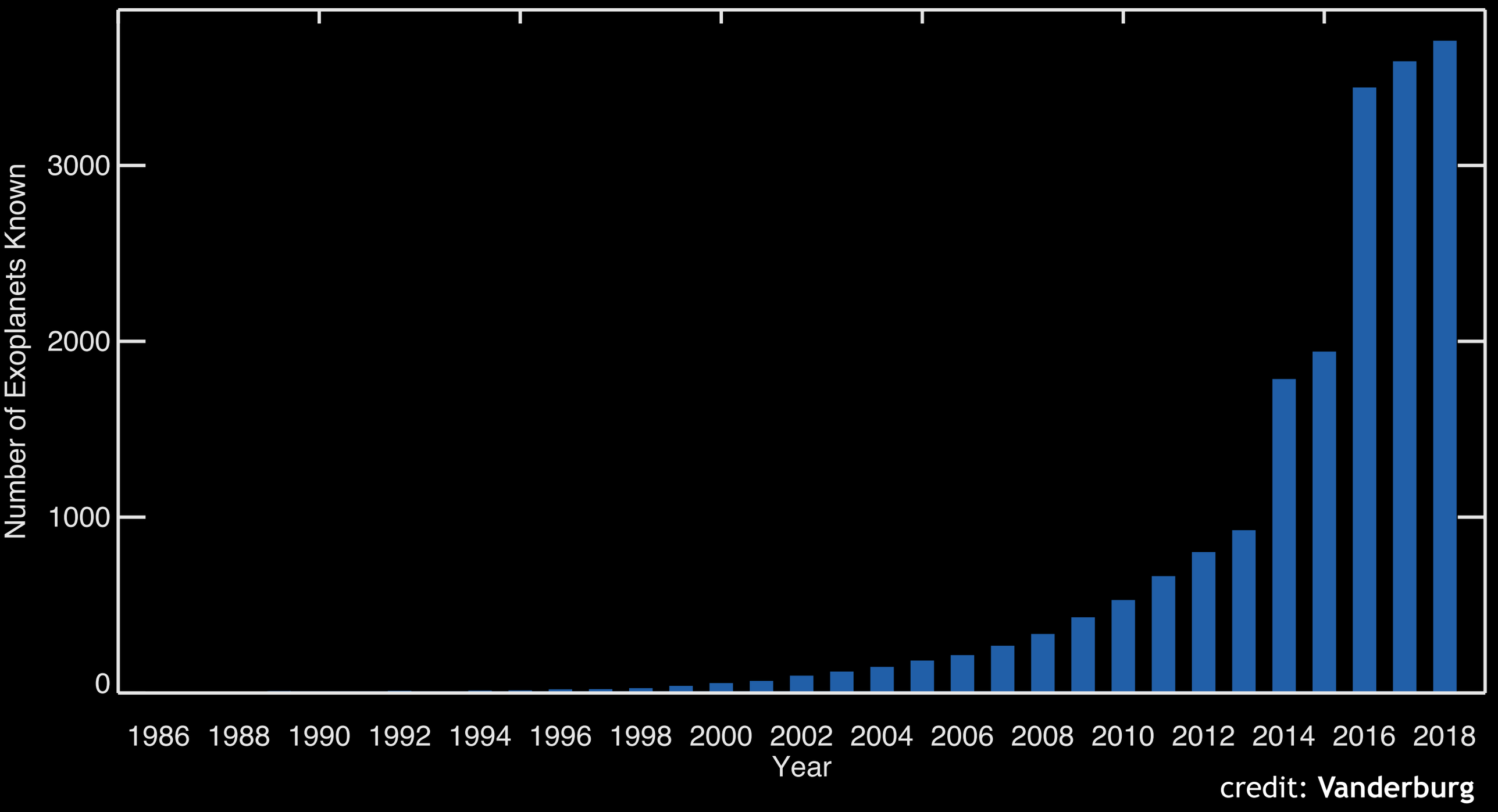
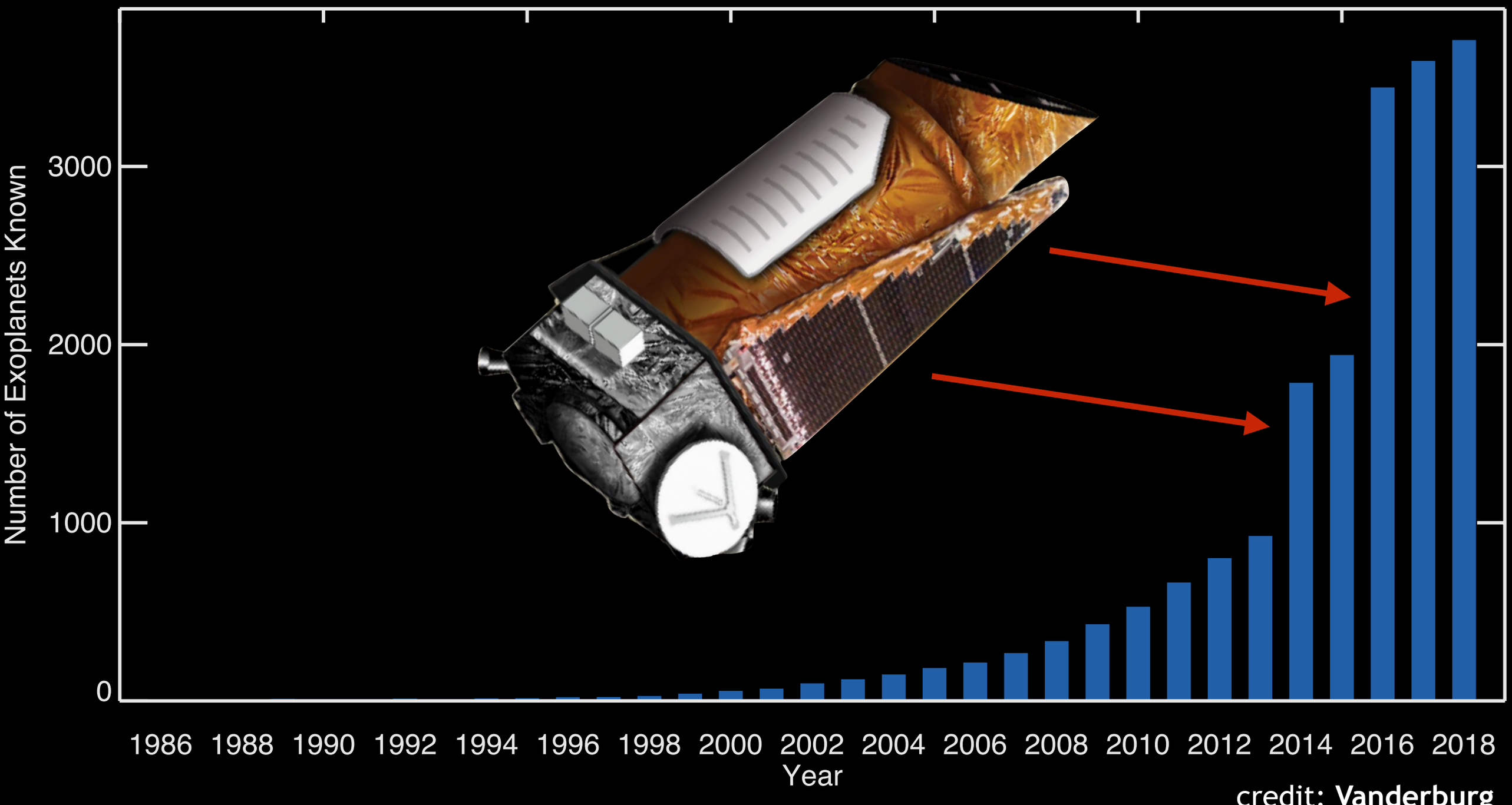
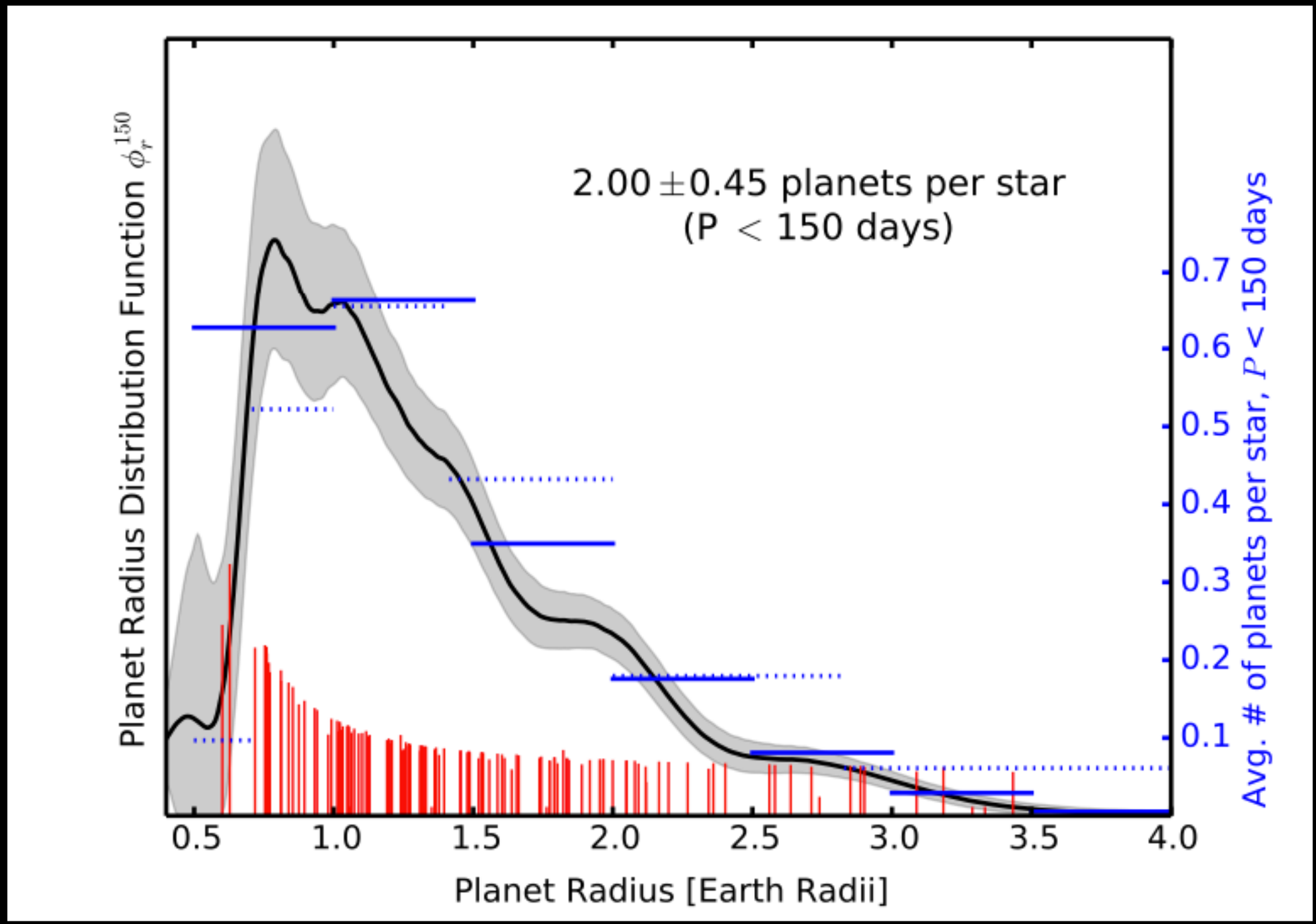
Cumulative number of known exoplanets



Kepler was responsible for leaps in our knowledge of the inner parts of solar systems

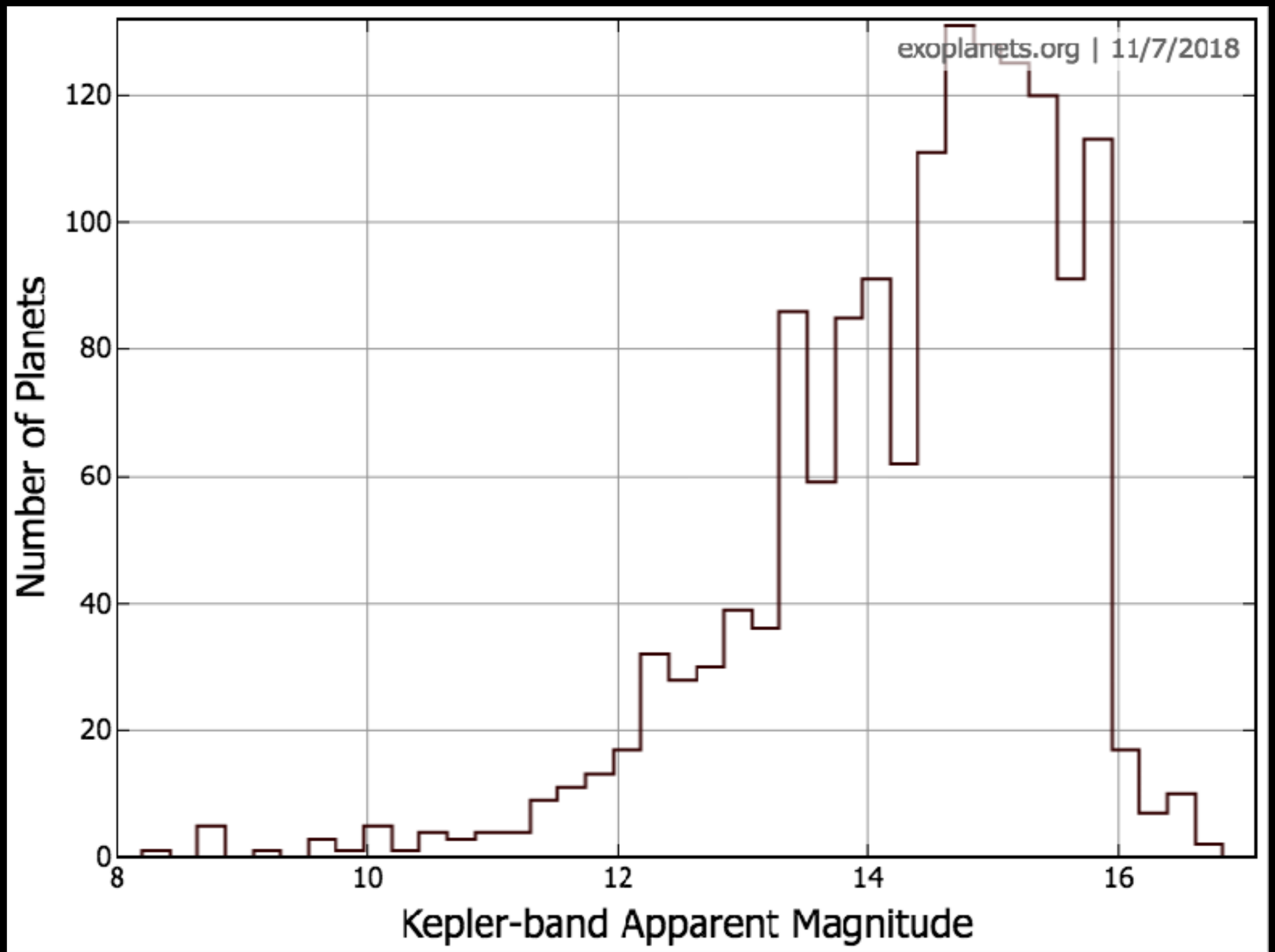


Kepler showed small, close-in planets are common



Morton & Swift 2014

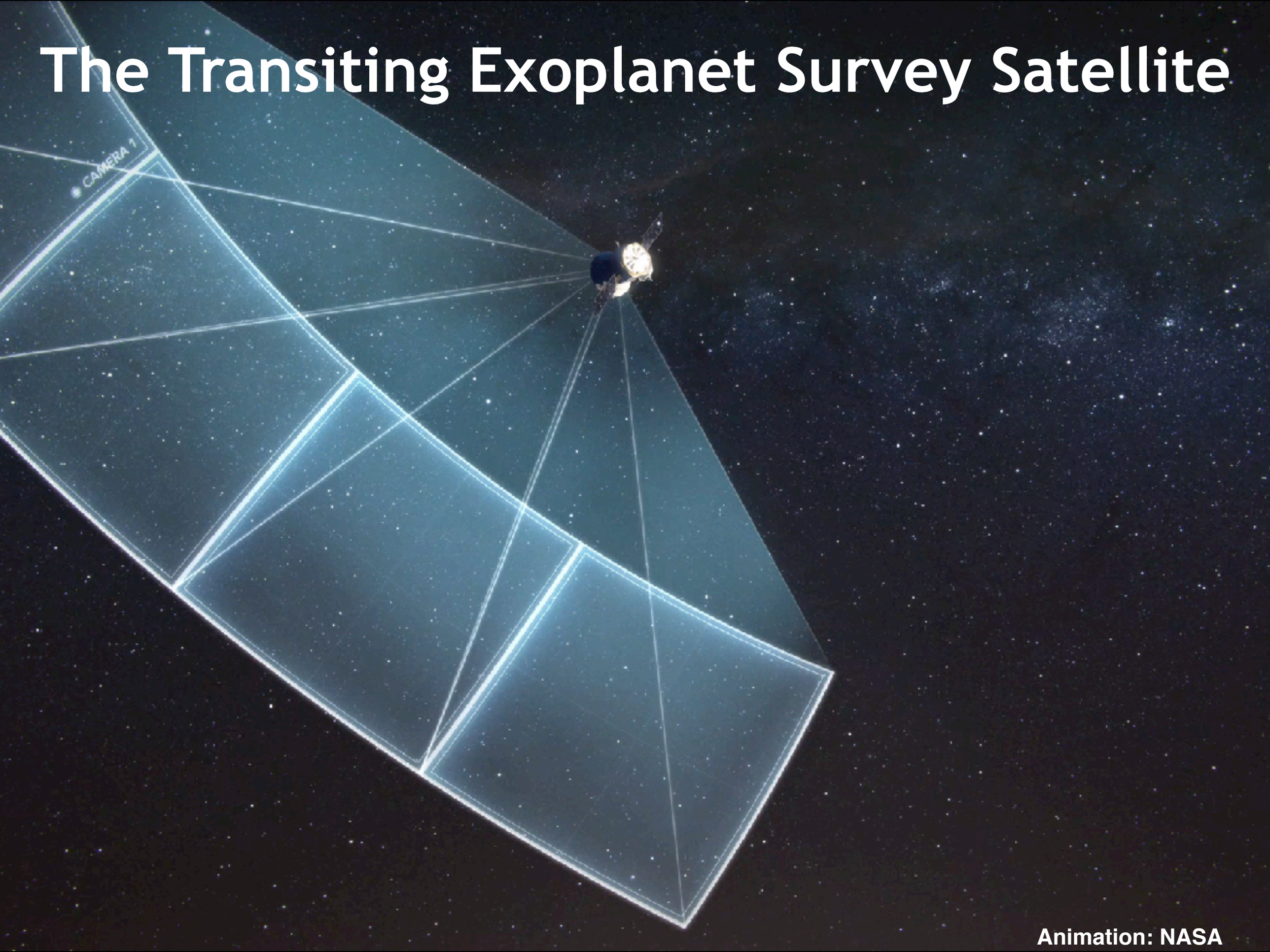
But most of the planets discovered by *Kepler* orbit faint stars



Now that we know planets are common, we want to find the ones orbiting the nearest and brightest stars.

Animation: NASA

The Transiting Exoplanet Survey Satellite



Animation: NASA

April 18, 2018

Video: NASA

First Science Images

Ecliptic Plane

Camera 1

Camera 2

Camera 3

Camera 4

Ecliptic Pole

Image: NASA

Alpha Reticuli

R Doradus
Variable star

Large Magellanic Cloud
Galaxy

Alpha Mensae

NGC 2070
Tarantula Nebula

Image: NASA

Camera 4

π Mensae

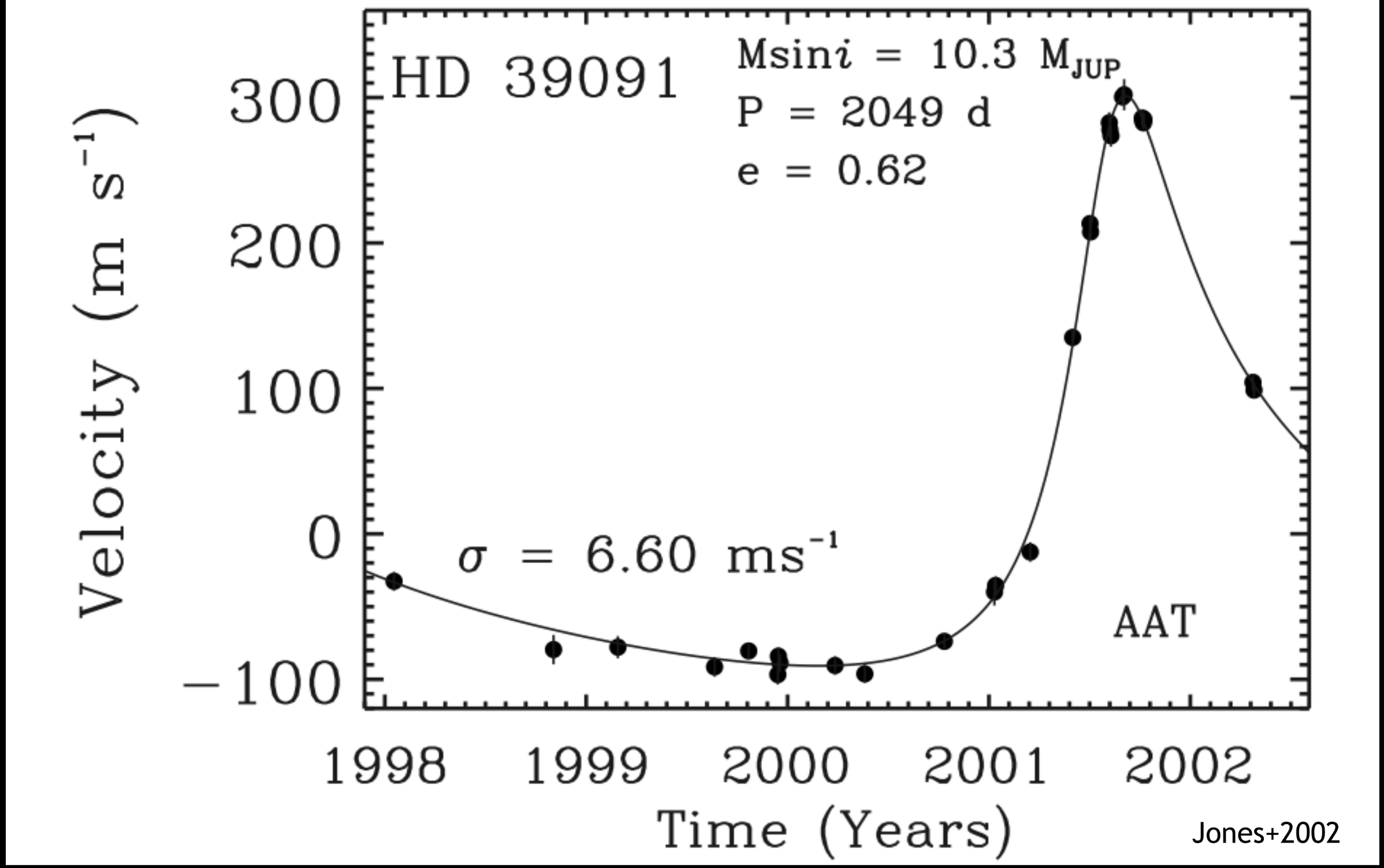
Large Magellanic Cloud
Galaxy

Alpha Mensae

Camera 4

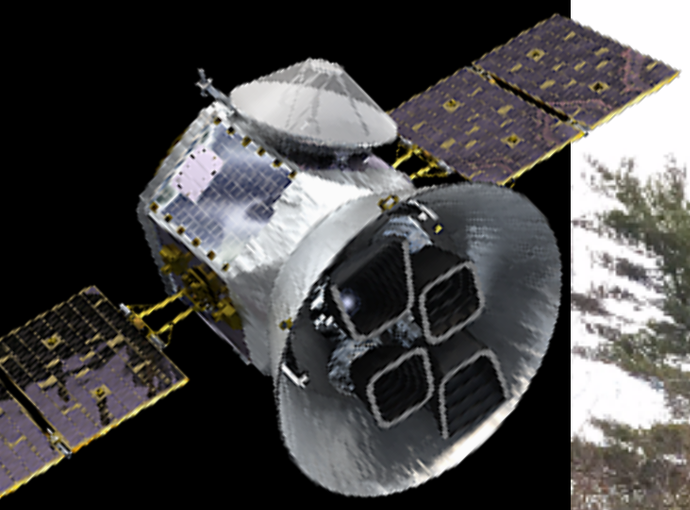
Image: NASA

π Mensae b



Jones+2002

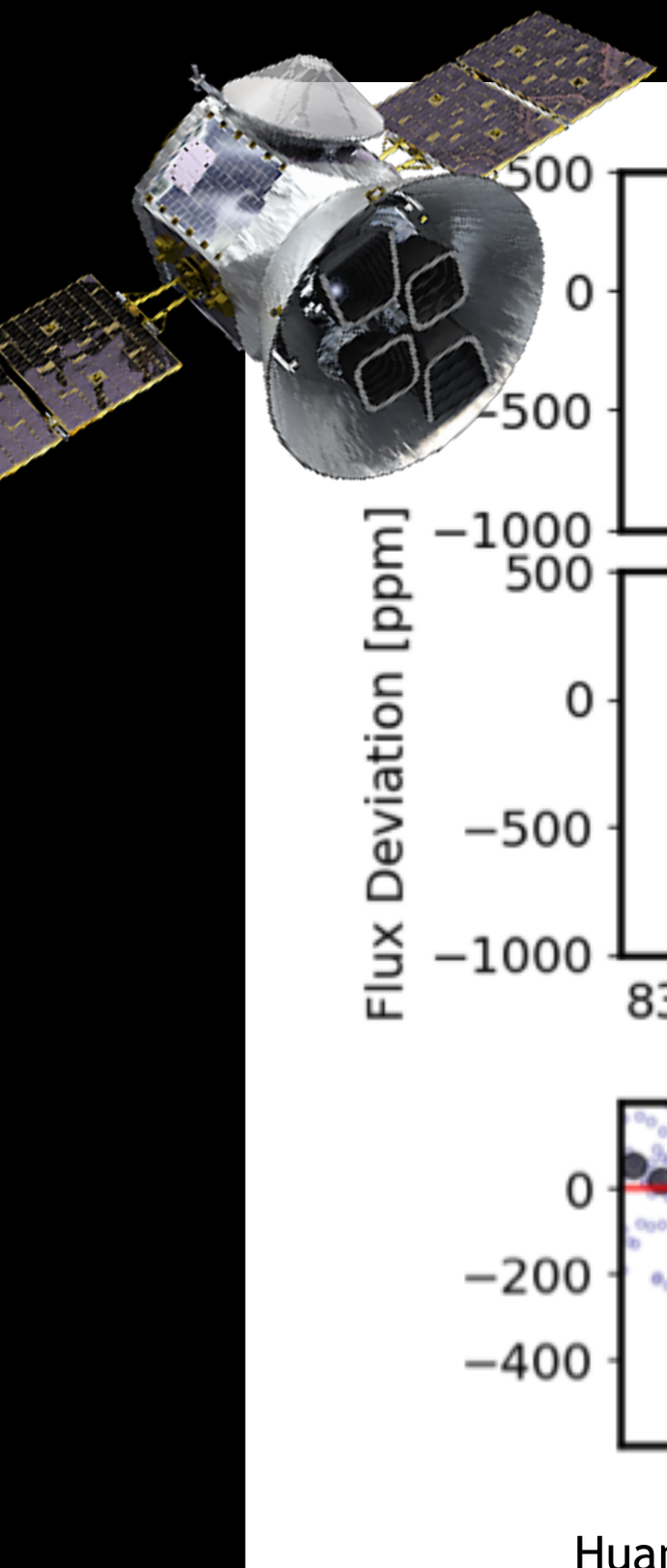
TESS Sector 1 Observations

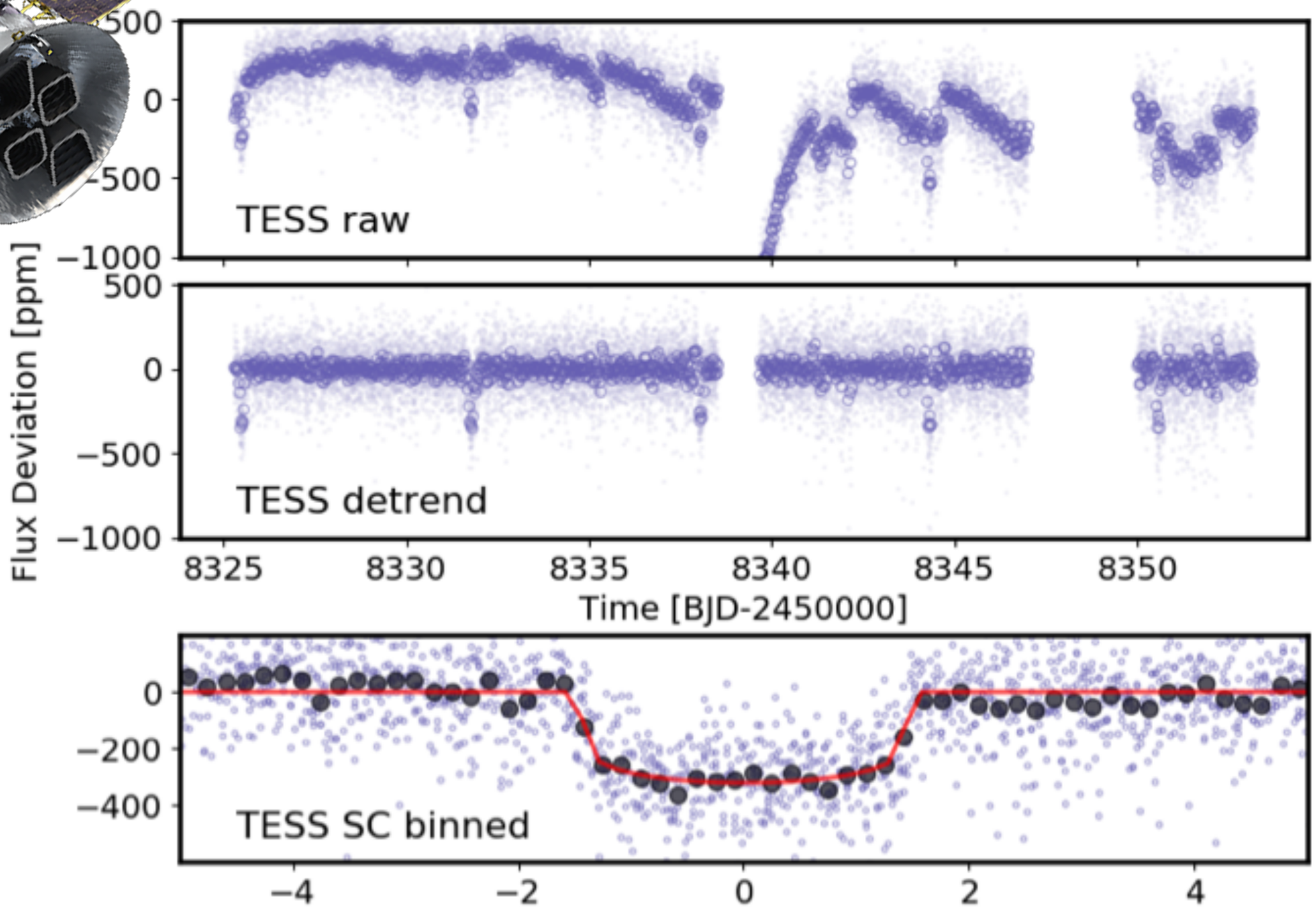


Kepler (the dog, not the telescope)

Chelsea Huang (MIT)

TESS Sector 1 Observations





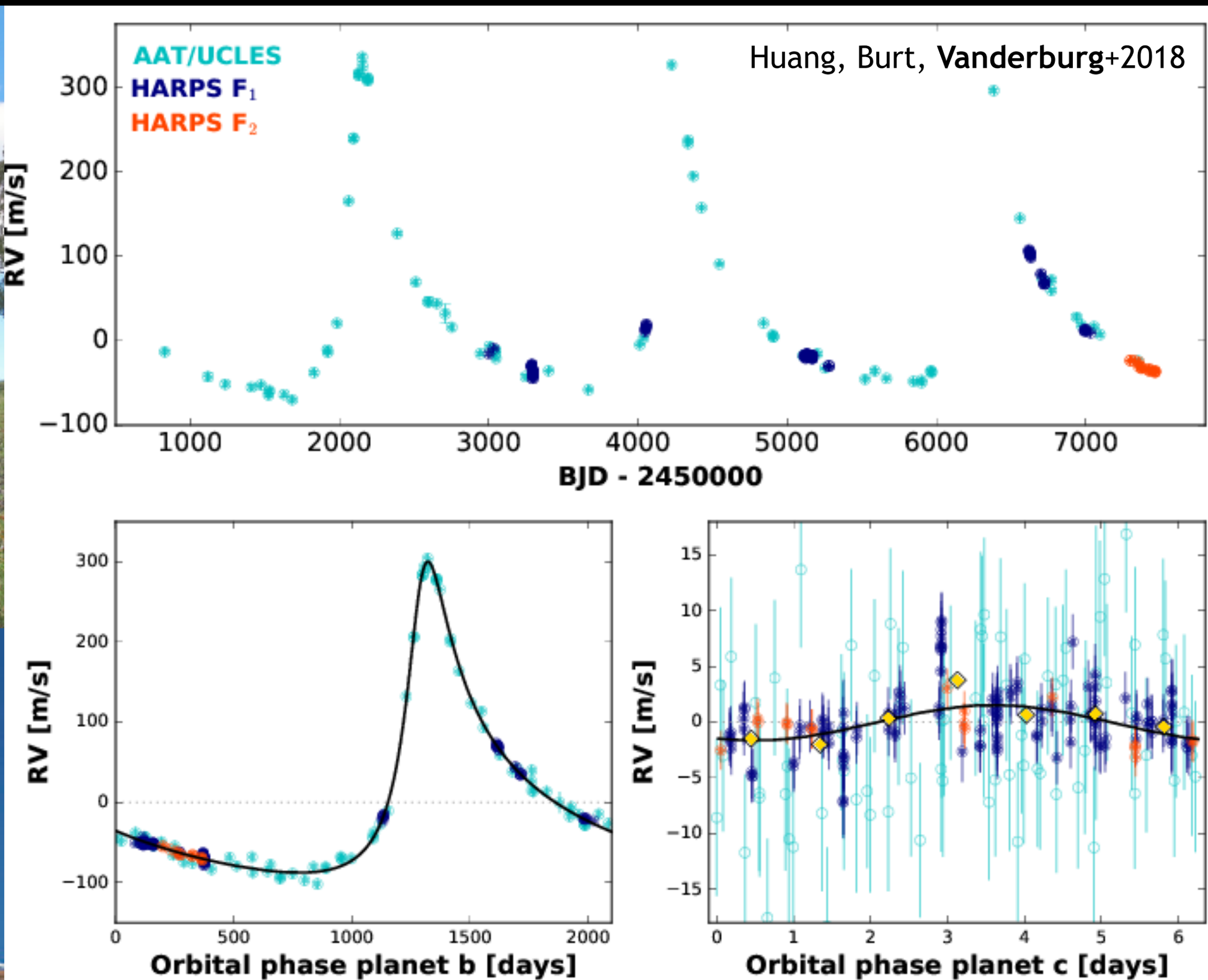
Huang, Burt, **Vanderburg**+2018

See also Gandolfi+2018

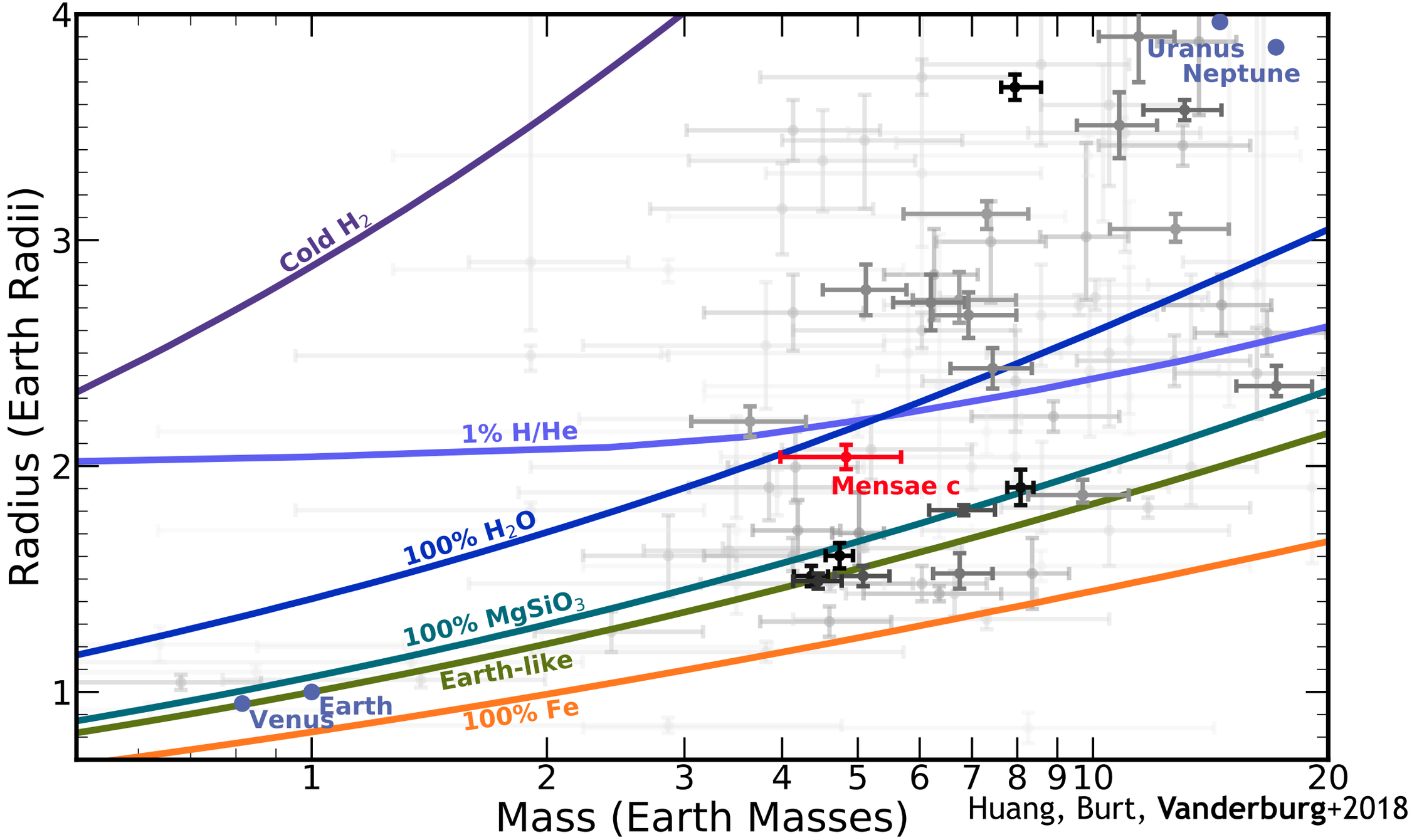
Archival Radial Velocities

Jennifer Burt (MIT)

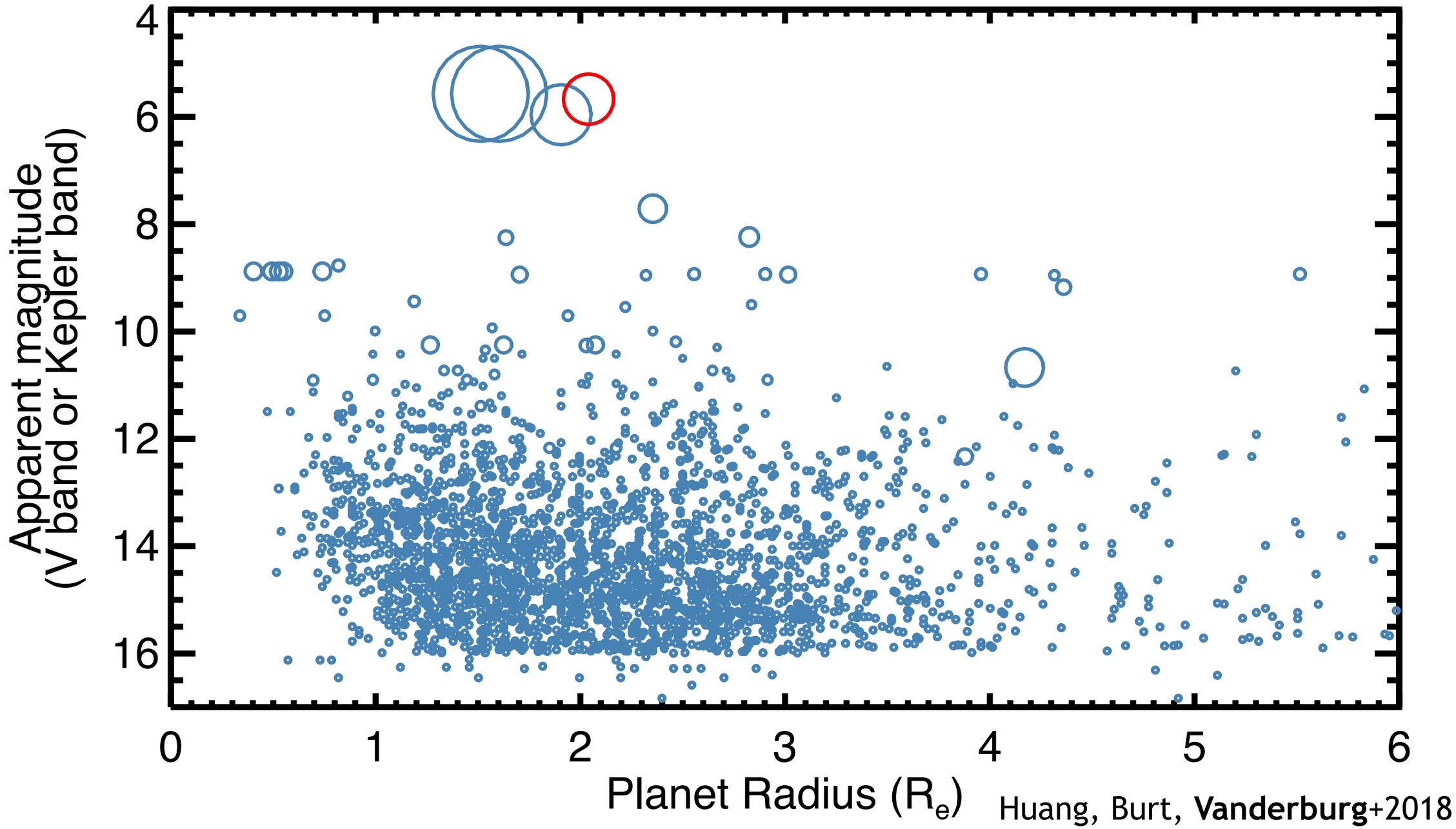
Archival Radial Velocities



π Mensae c is a super-Earth containing volatiles



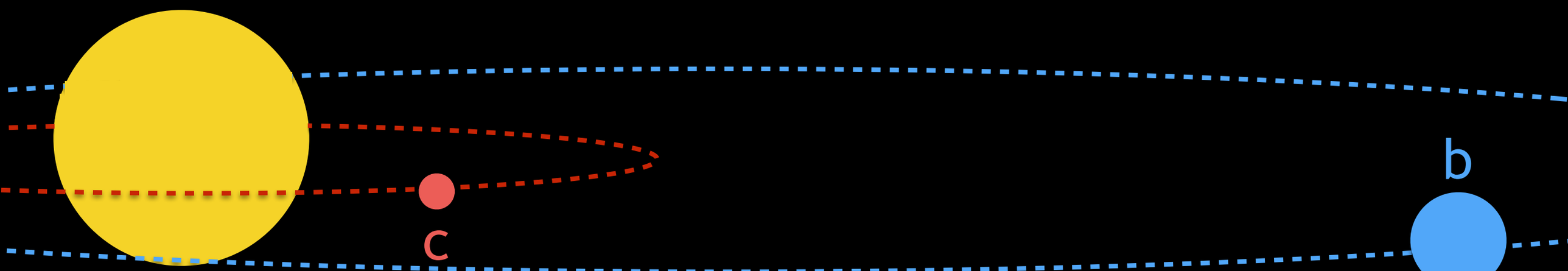
π Mensae is one of the brightest transiting planet hosts known



Huang, Burt, **Vanderburg**+2018

System Architecture

System/spacings not to scale



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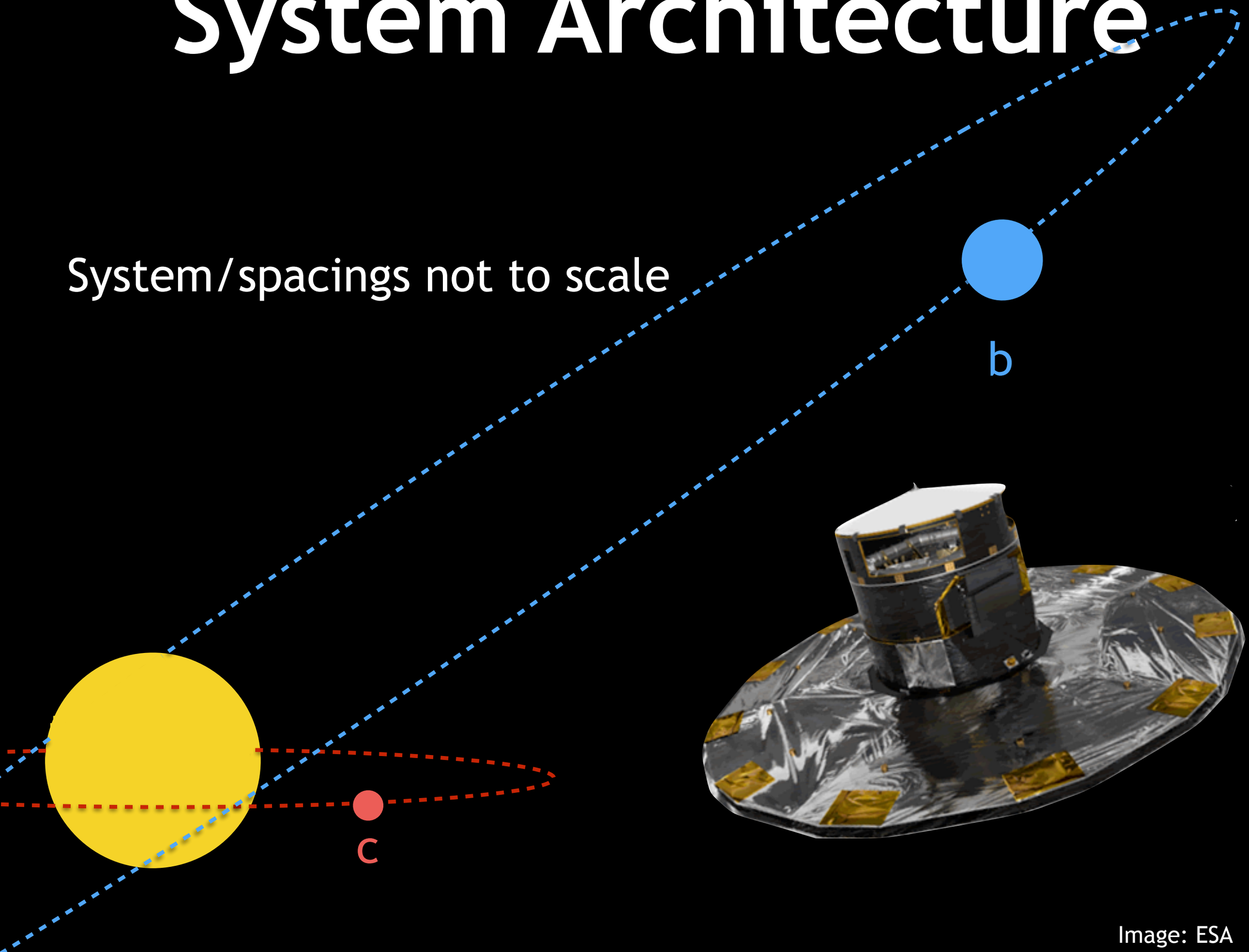


Image: ESA

Ecliptic Plane

Camera 1

Camera 2

Camera 3

Camera 4

Ecliptic Pole

Image: NASA

Beta Tucanae

NGC 104
Globular cluster

NGC 362
Globular cluster

Small Magellanic Cloud
Galaxy

Beta Hydri

Image: NASA

Camera 3

LHS 3844

Image: NASA

Camera 3

TESS Observations of LHS 3844

Roland Vanderspek (MIT)

LHS 3844 is a tiny star

The Sun

LHS 3844

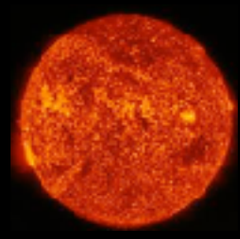
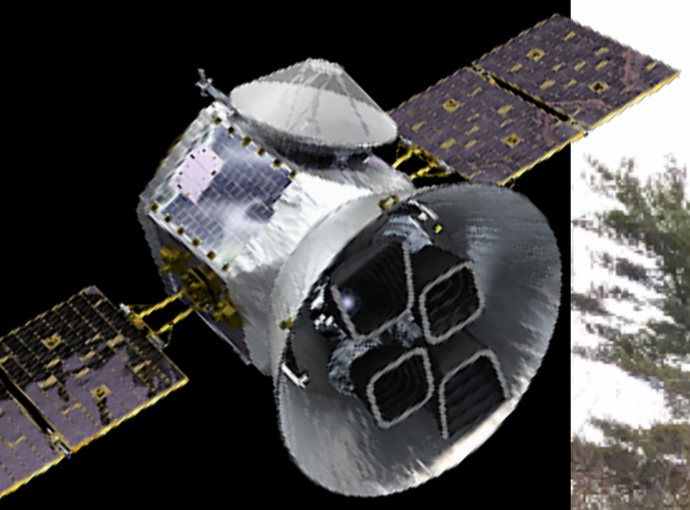


Image: NASA

TESS Sector 1 Observations



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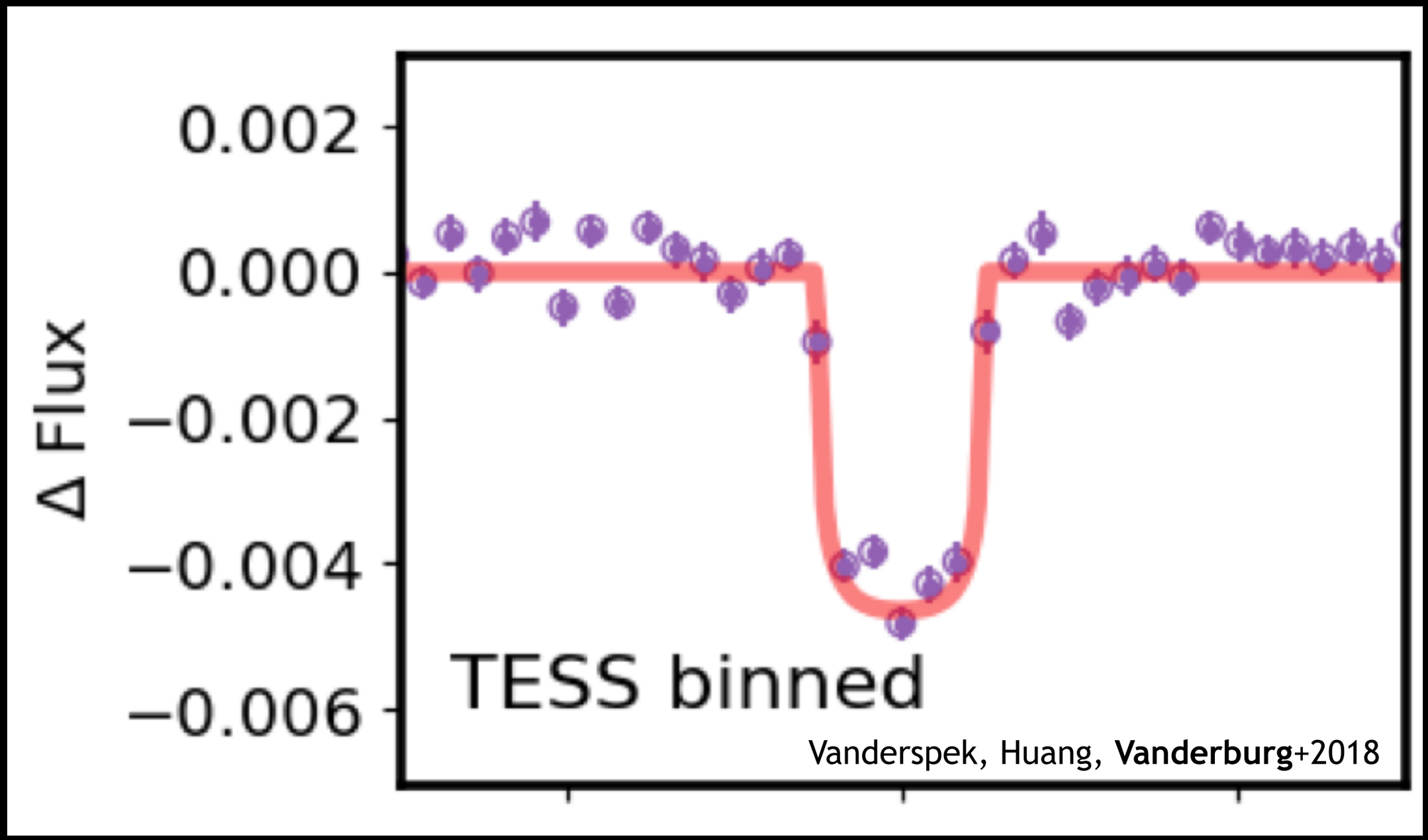
TESS Sector 1 Observations

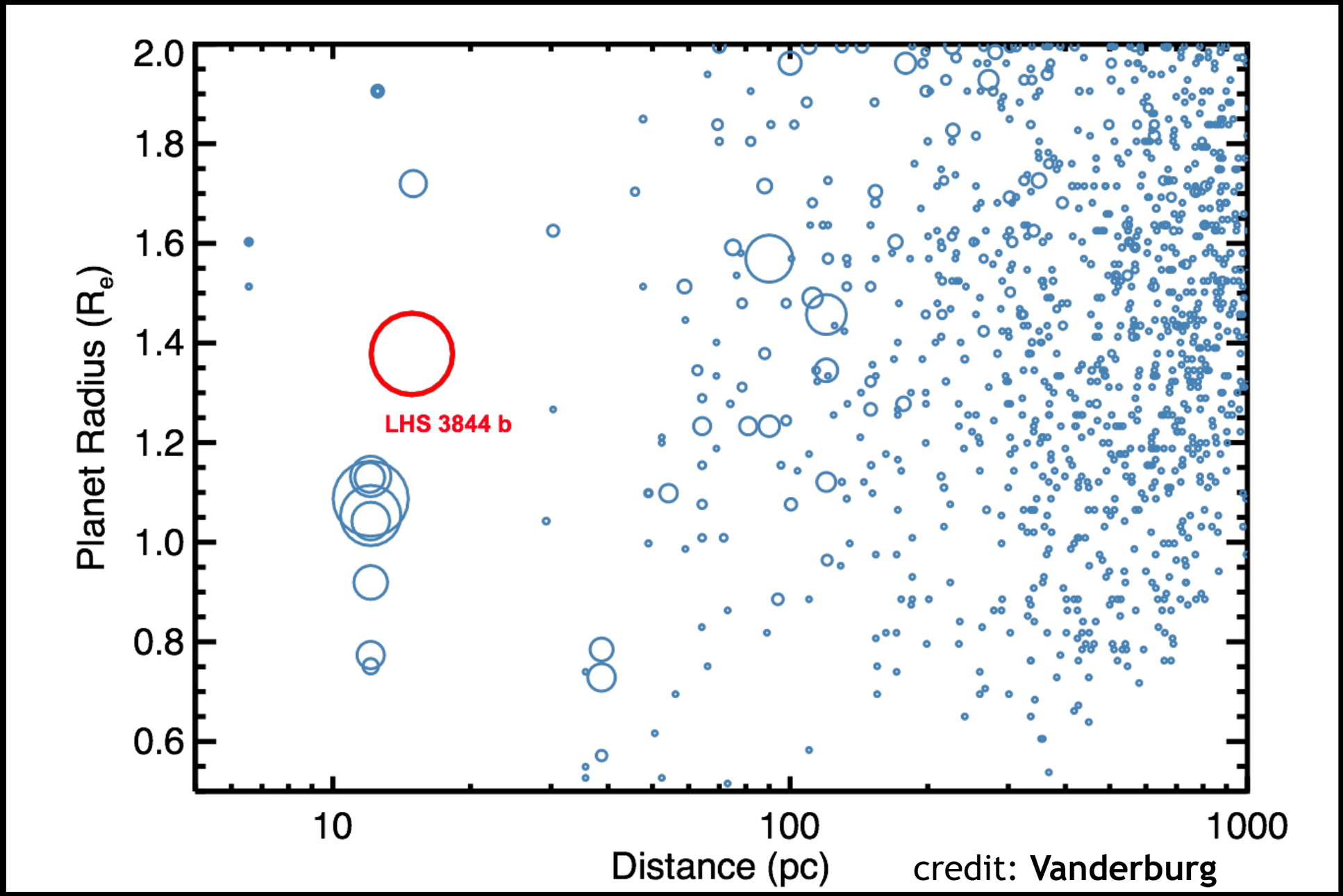


Orbital Period = 11 hours
Radius = 1.3 Earth Radii

LHS 3844 is among the only terrestrial planets where we can detect thermal emission

Symbol Size:
Secondary eclipse depth

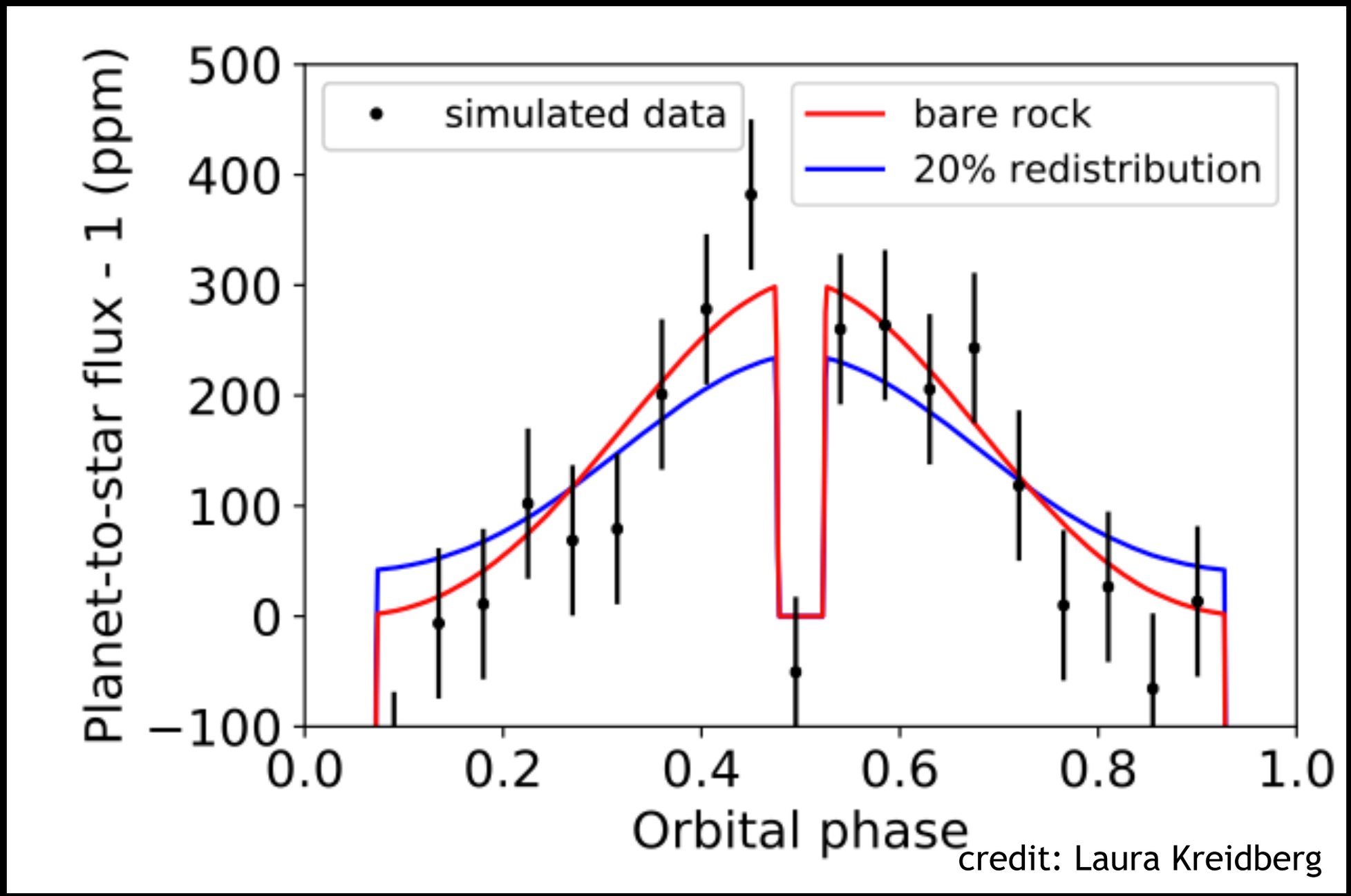
Symbol thickness:
Secondary eclipse S/N



Does LHS 3844 b have an atmosphere?

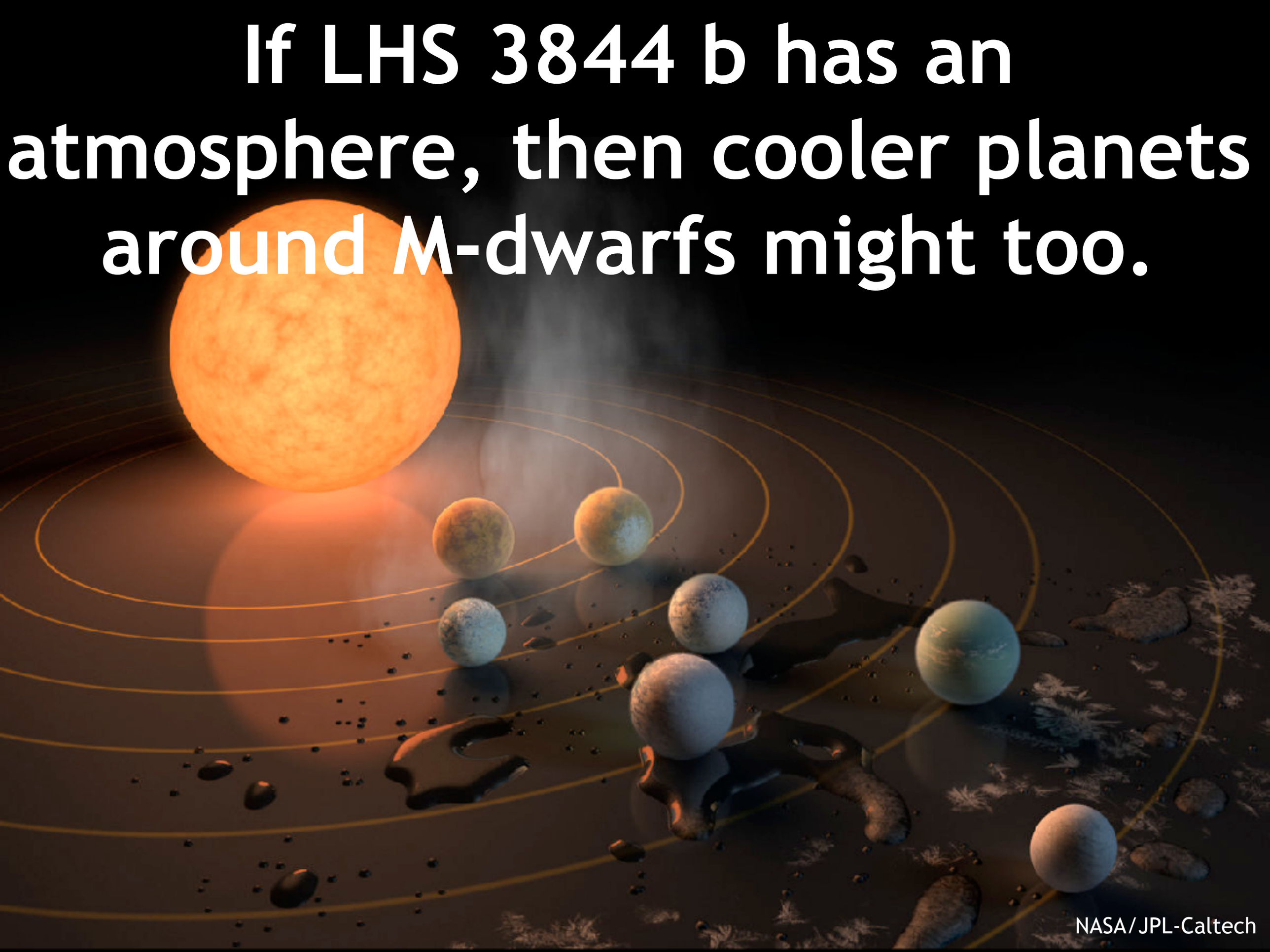
Laura Kreidberg (CfA)

Approved 100 hr *Spitzer* program to detect atmosphere via heat redistribution (PI Kreidberg)



credit: Laura Kreidberg

If LHS 3844 b has an atmosphere, then cooler planets around M-dwarfs might too.



NASA/JPL-Caltech

TESS is already discovering planets around nearby bright stars which unlock our ability to learn about exoplanets and their systems in new and exciting ways.

Movie: NASA