What is left to learn about Kepler/K2 planet host stars?

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January 2019

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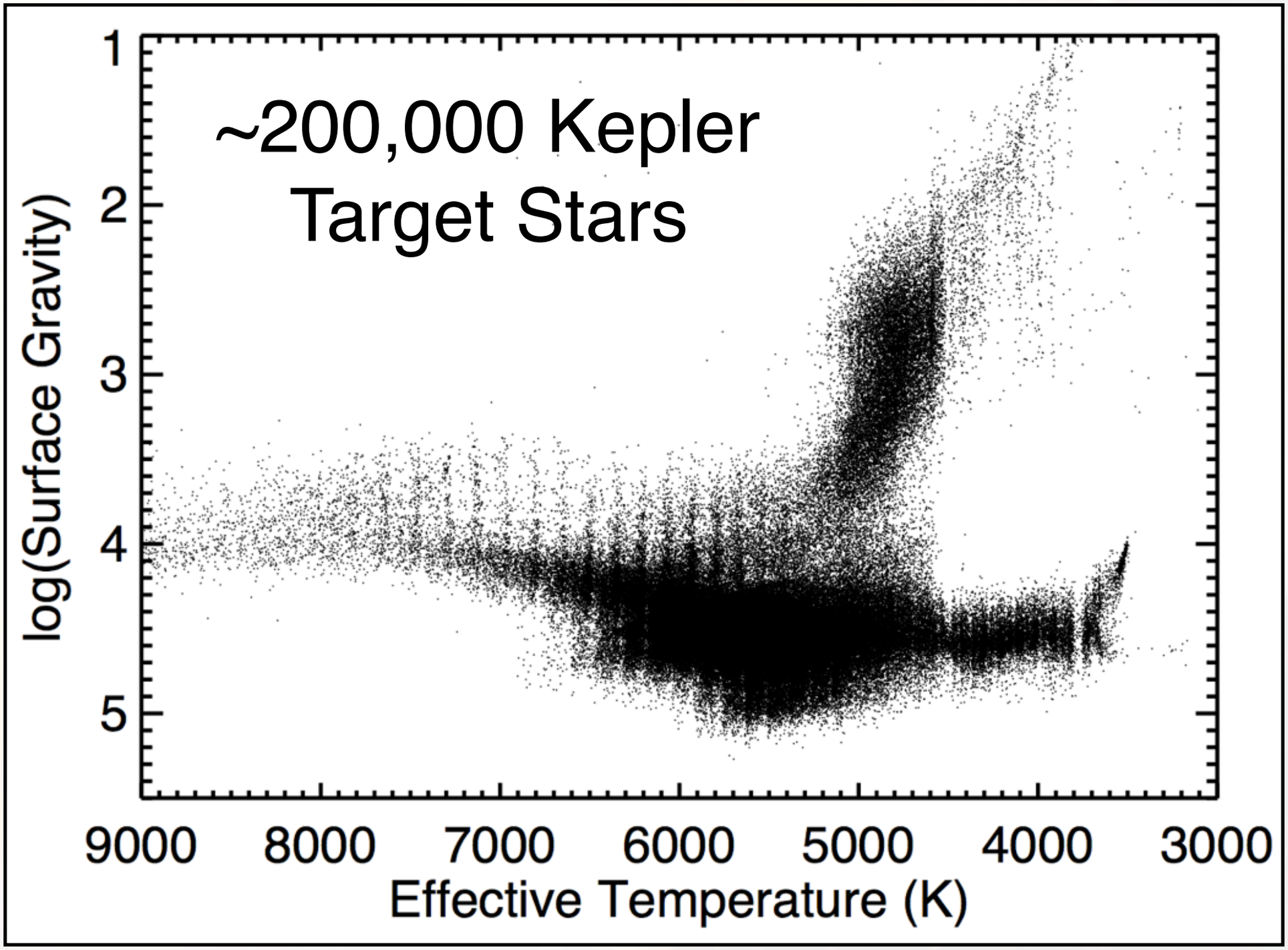
What have we learned about Kepler/K2 stars?

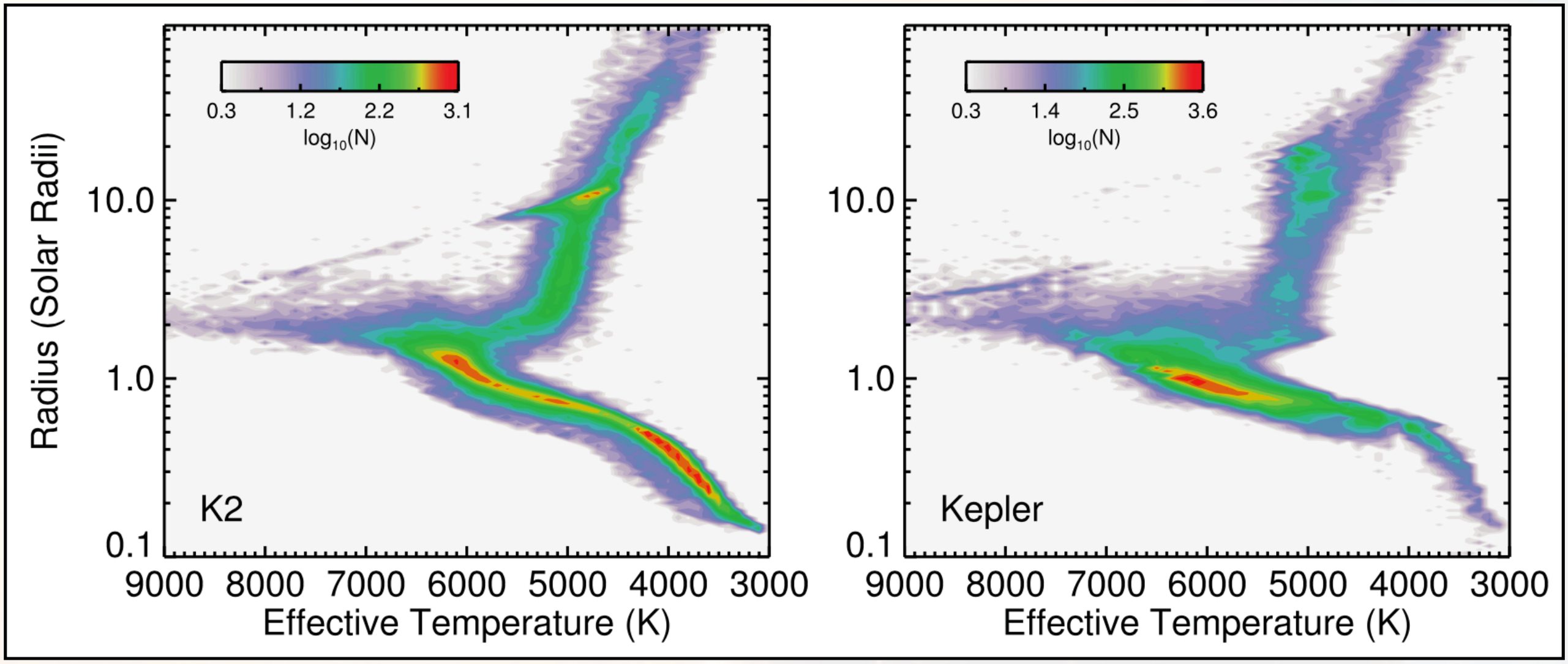
The Kepler Input Catalog (KIC)



Brown+ 2011

K2 Ecliptic Planet Input Catalog (EPIC)

Kepler Stellar Properties Catalog



Colors + proper motions + Hipparcos parallaxes + spectroscopic surveys

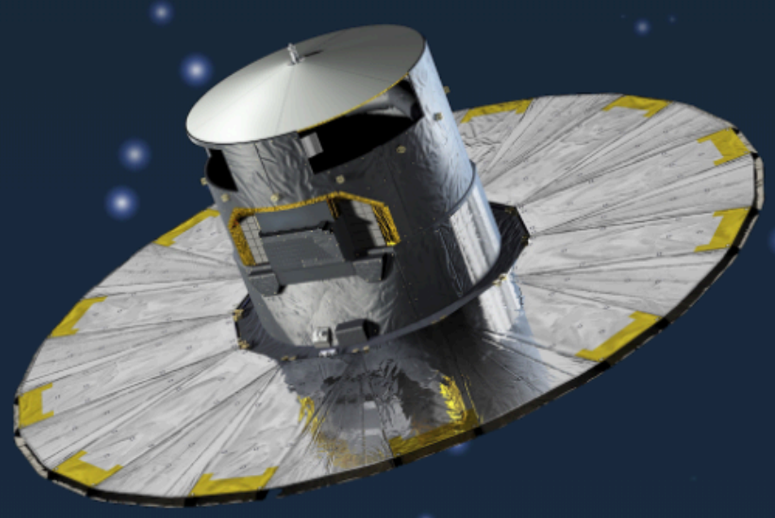
Huber+ 2016

Colors + asteroseismology + granulation + spectroscopy

Huber+ 2014, Mathur+ 2017

Gaia DR2 Day

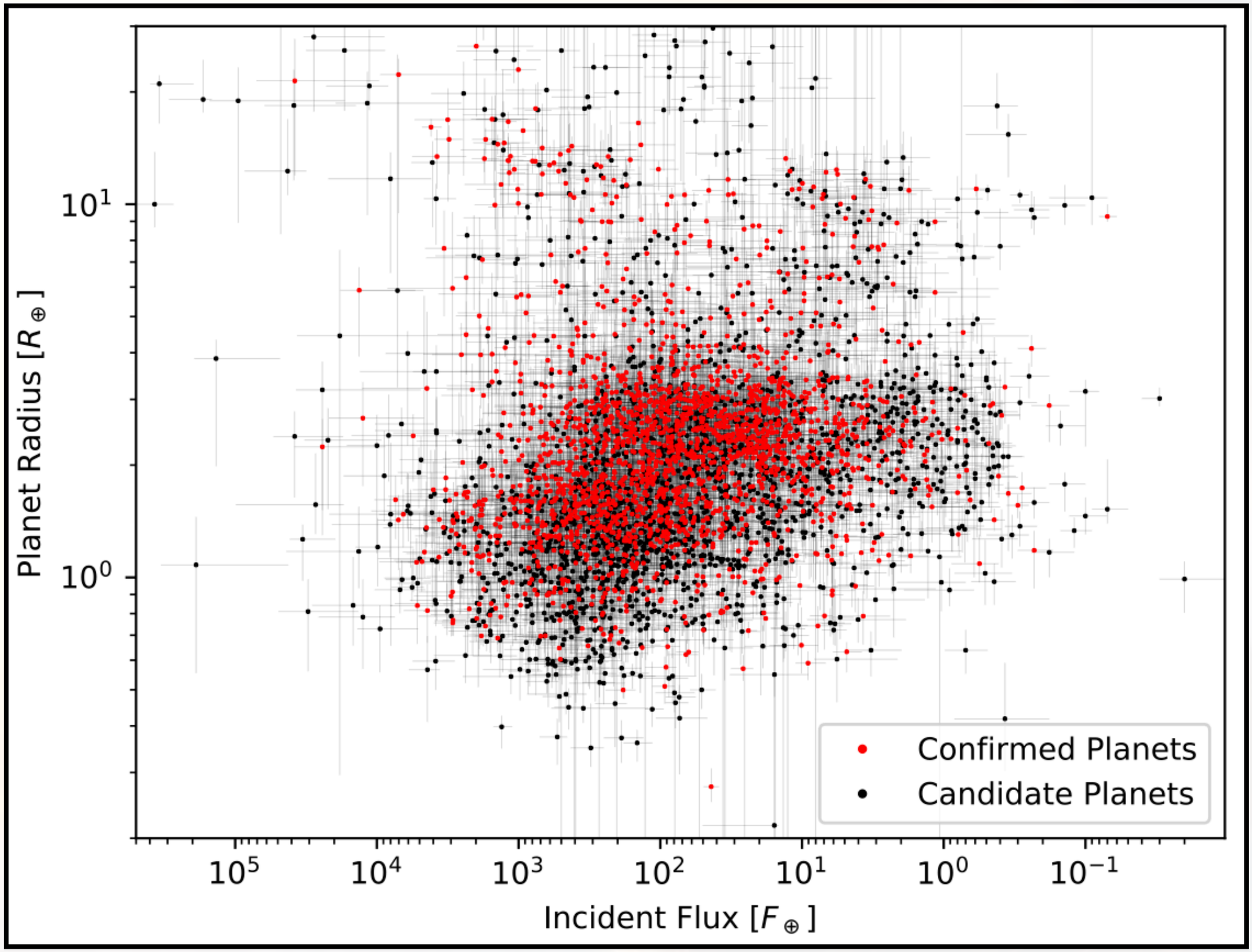
April 25 2018 00:00 HST



The Gaia-Kepler HR Diagram

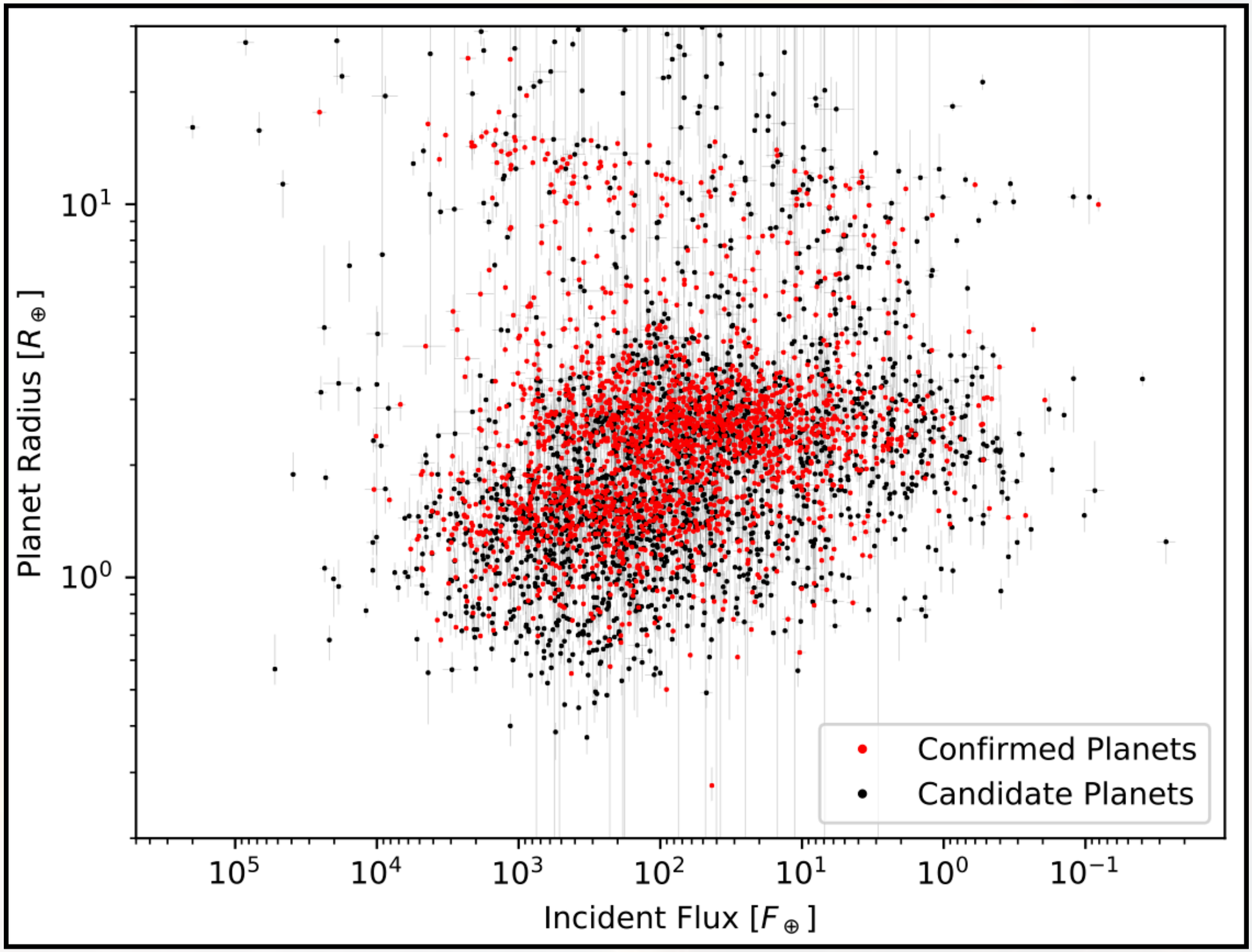
Berger+ 2018

The Gaia View of Kepler Exoplanets



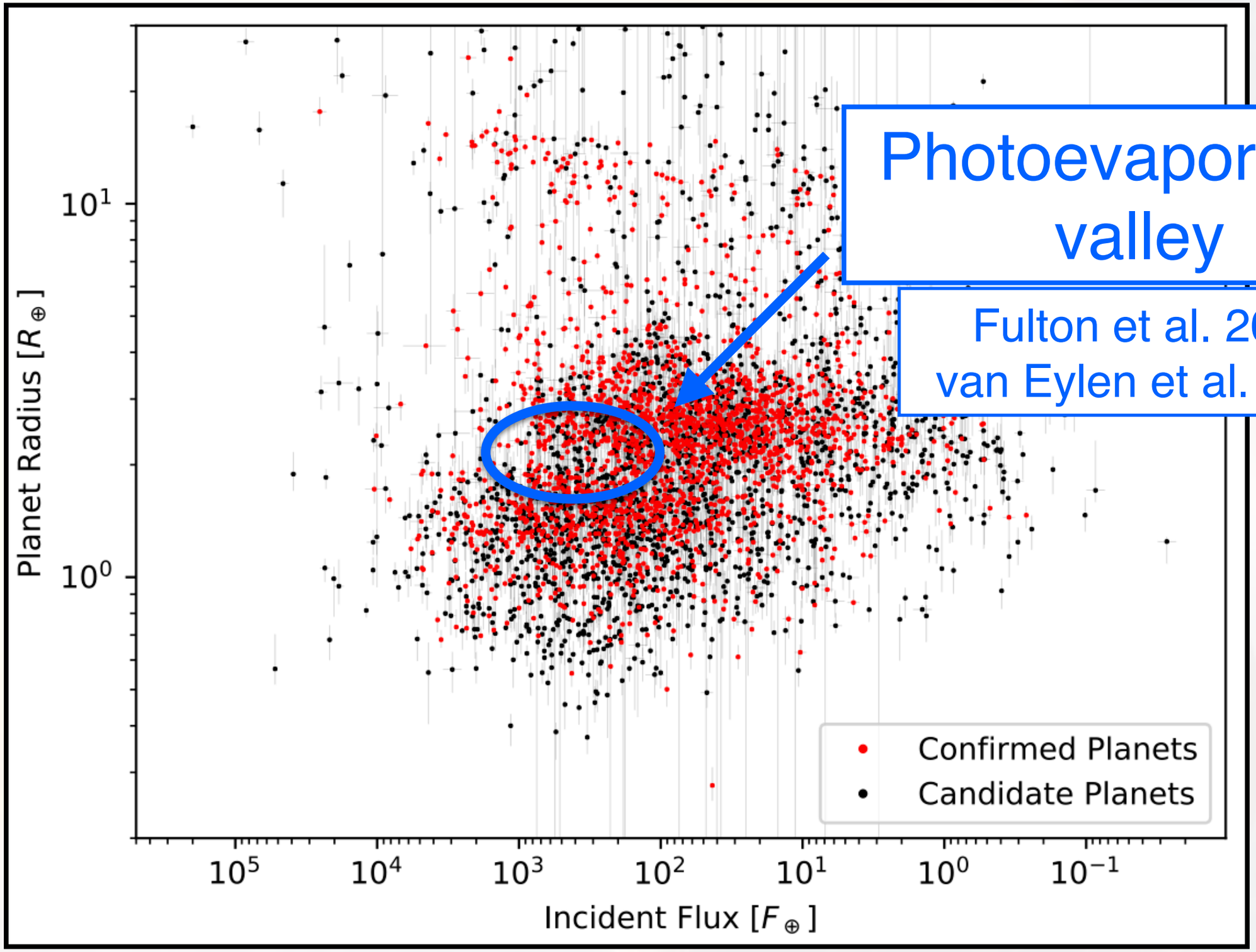
Berger+ 2018

The Gaia View of Kepler Exoplanets



Berger+ 2018

The Gaia View of Kepler Exoplanets



Berger+ 2018

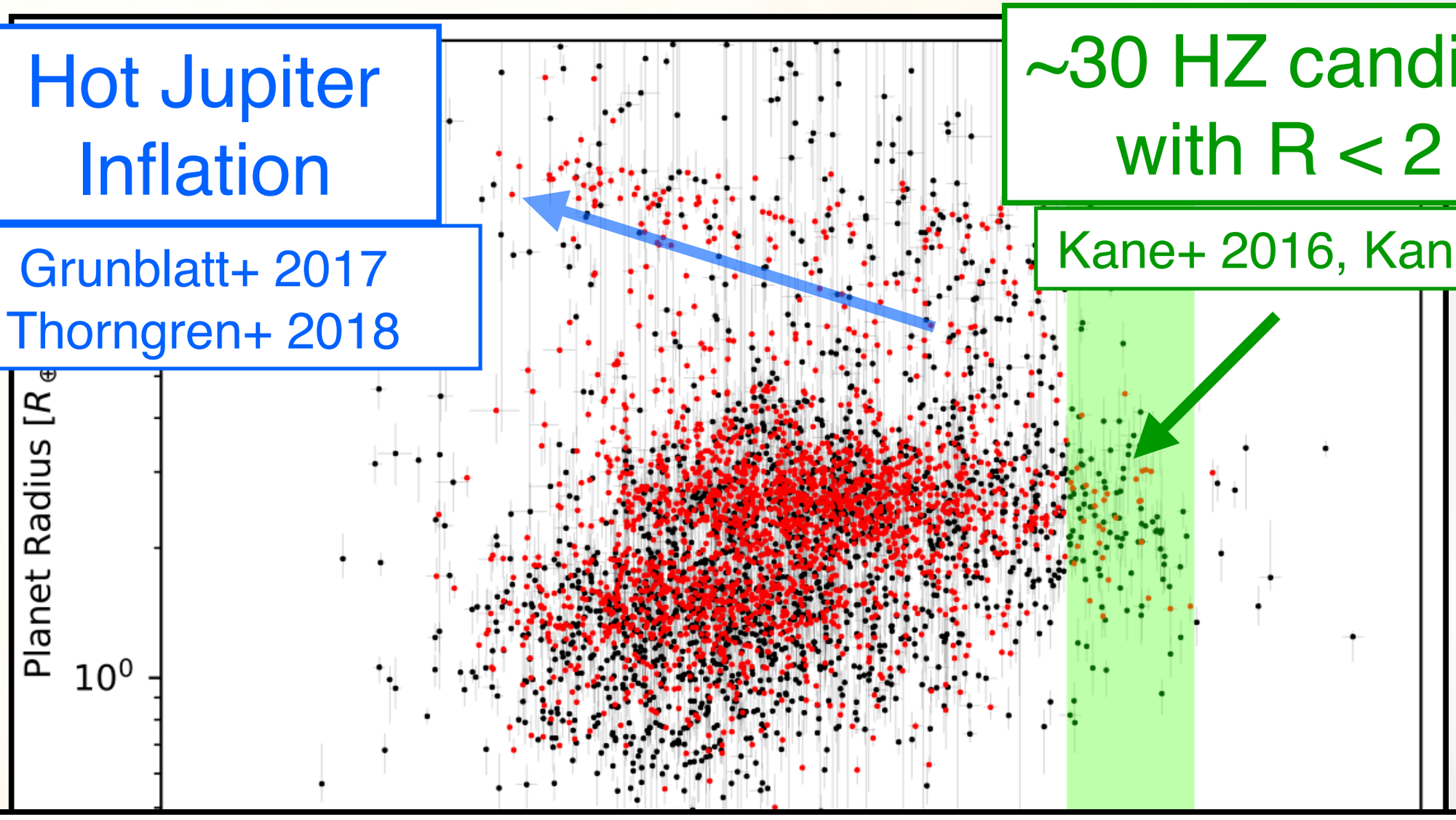
The Gaia View of Kepler Exoplanets

Hot Jupiter Inflation

Grunblatt+ 2017
Thorngren+ 2018

~30 HZ candidates with $R < 2\ R_\oplus$

Kane+ 2016, Kane 2018



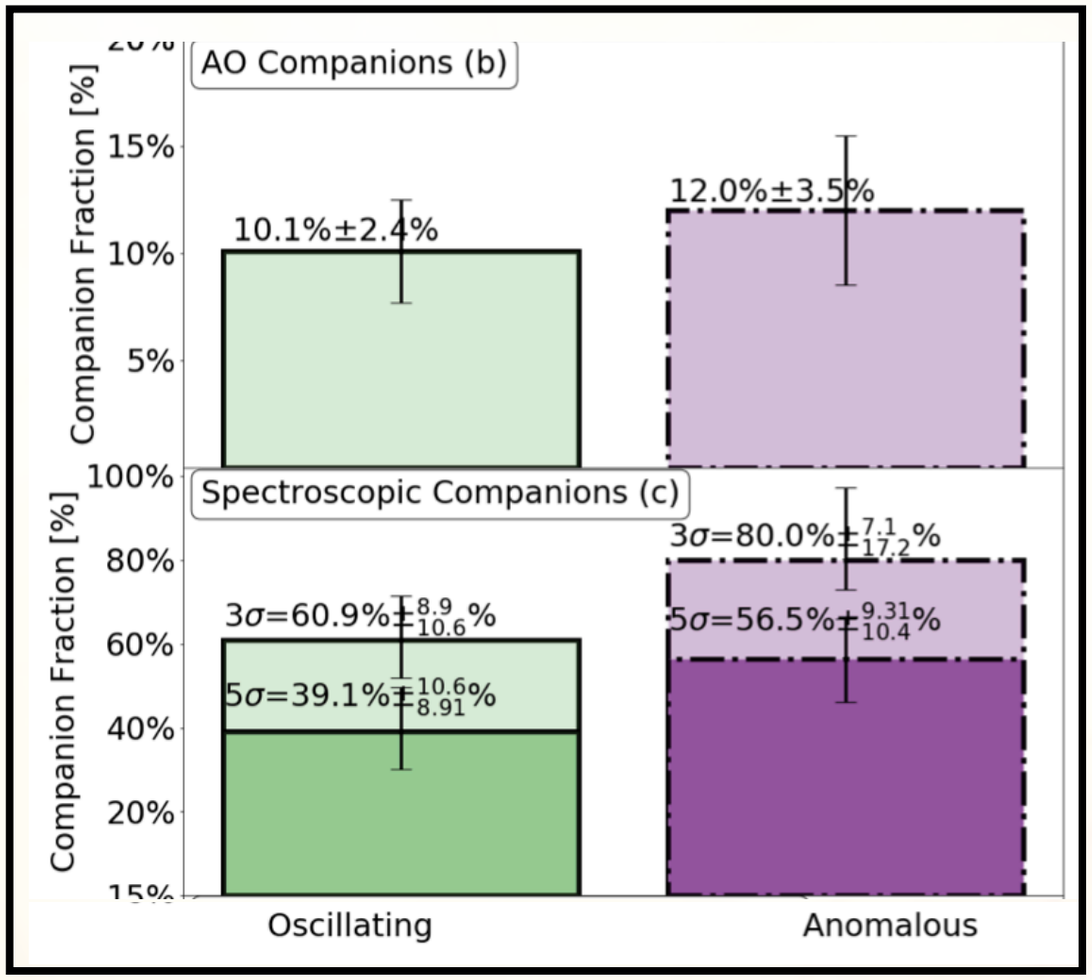
Host Star Metallicity - Planet Occurrence Relations!

(e.g. Buchhave+ 2012, 2014, Mulders+ 2016, Petigura+ 2018)

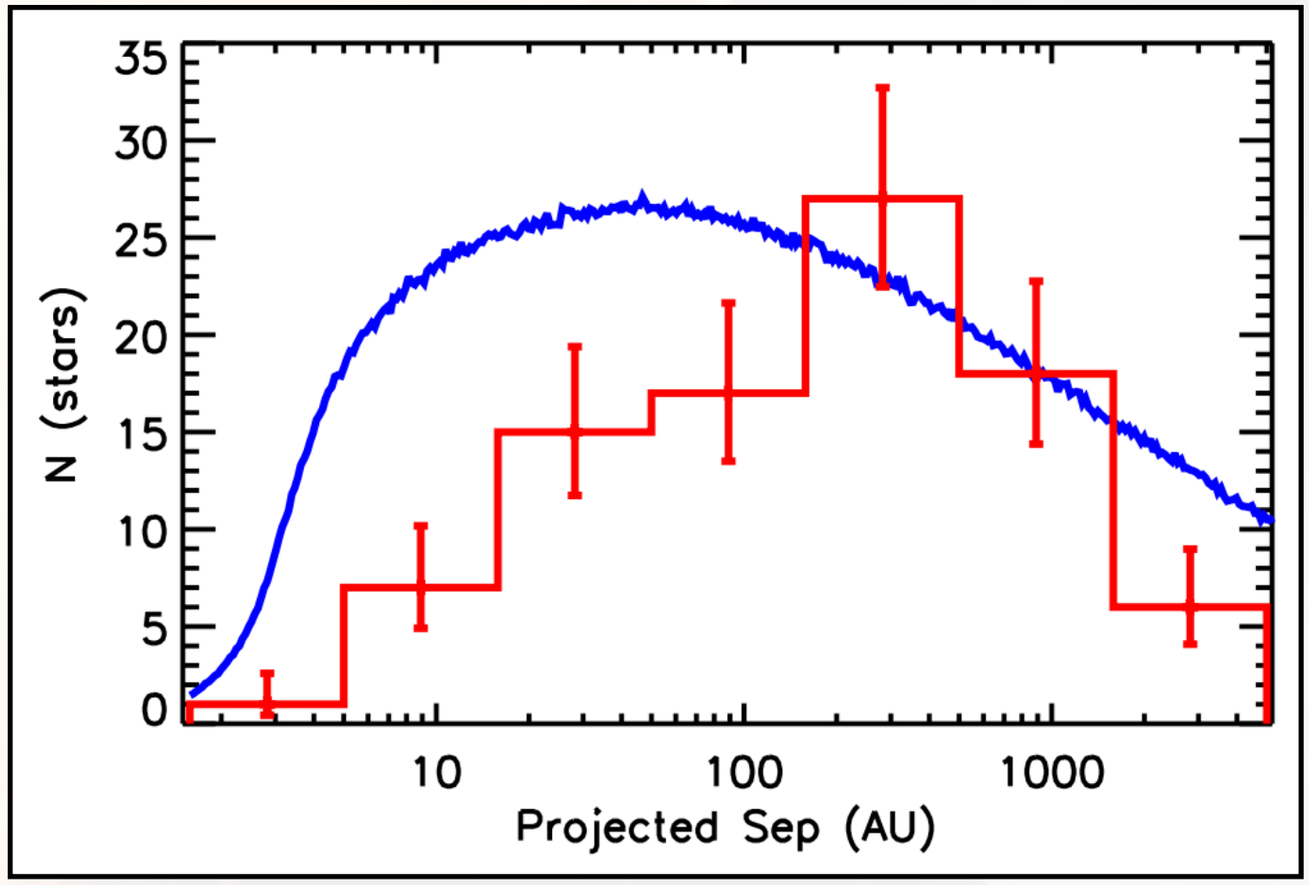
Berger+ 2018

What will we learn about Kepler/K2 stars over the next decade?

The Multiplicity of Kepler/K2 Stars



Schonhut-Stasik+ 2019

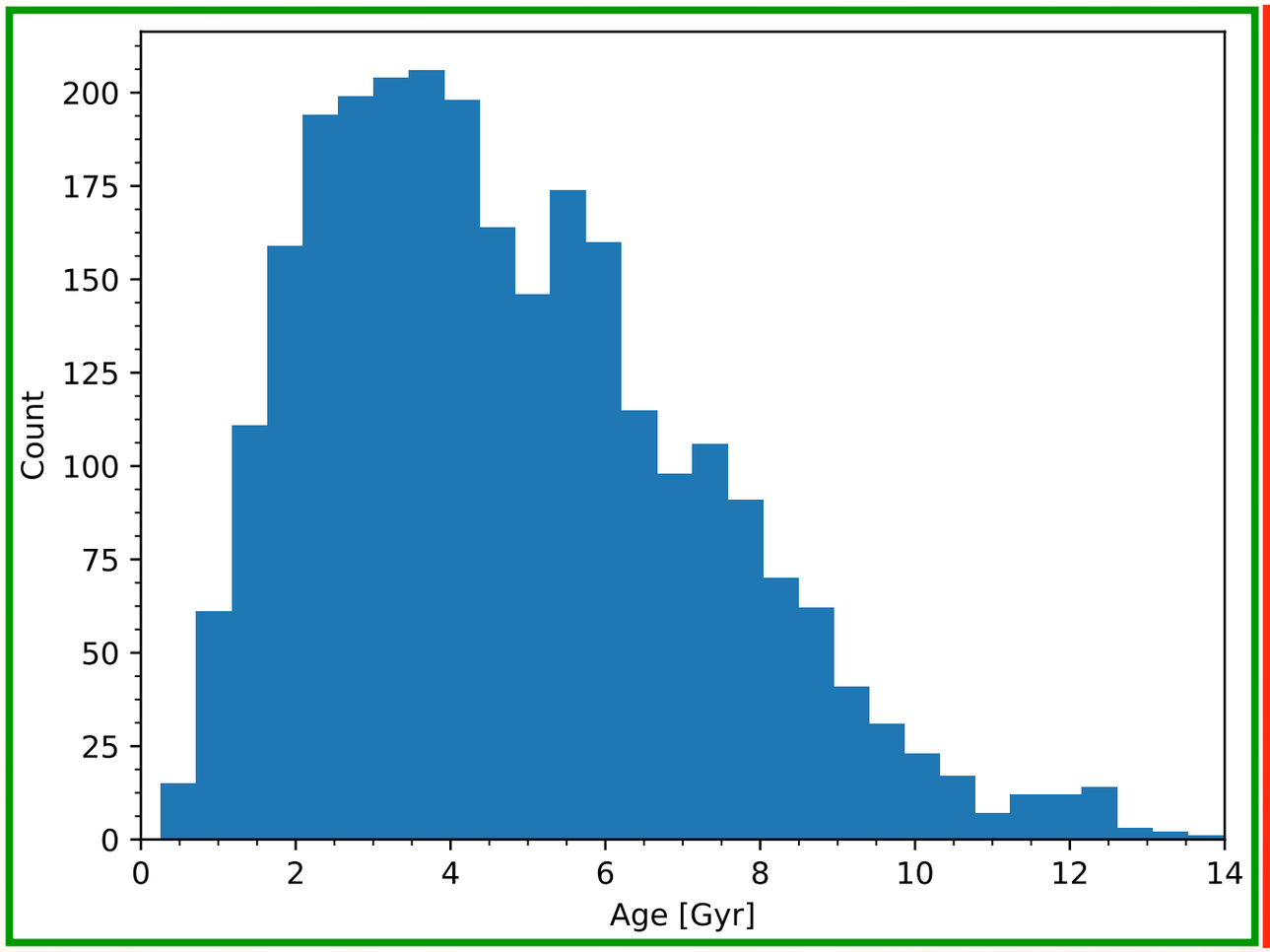


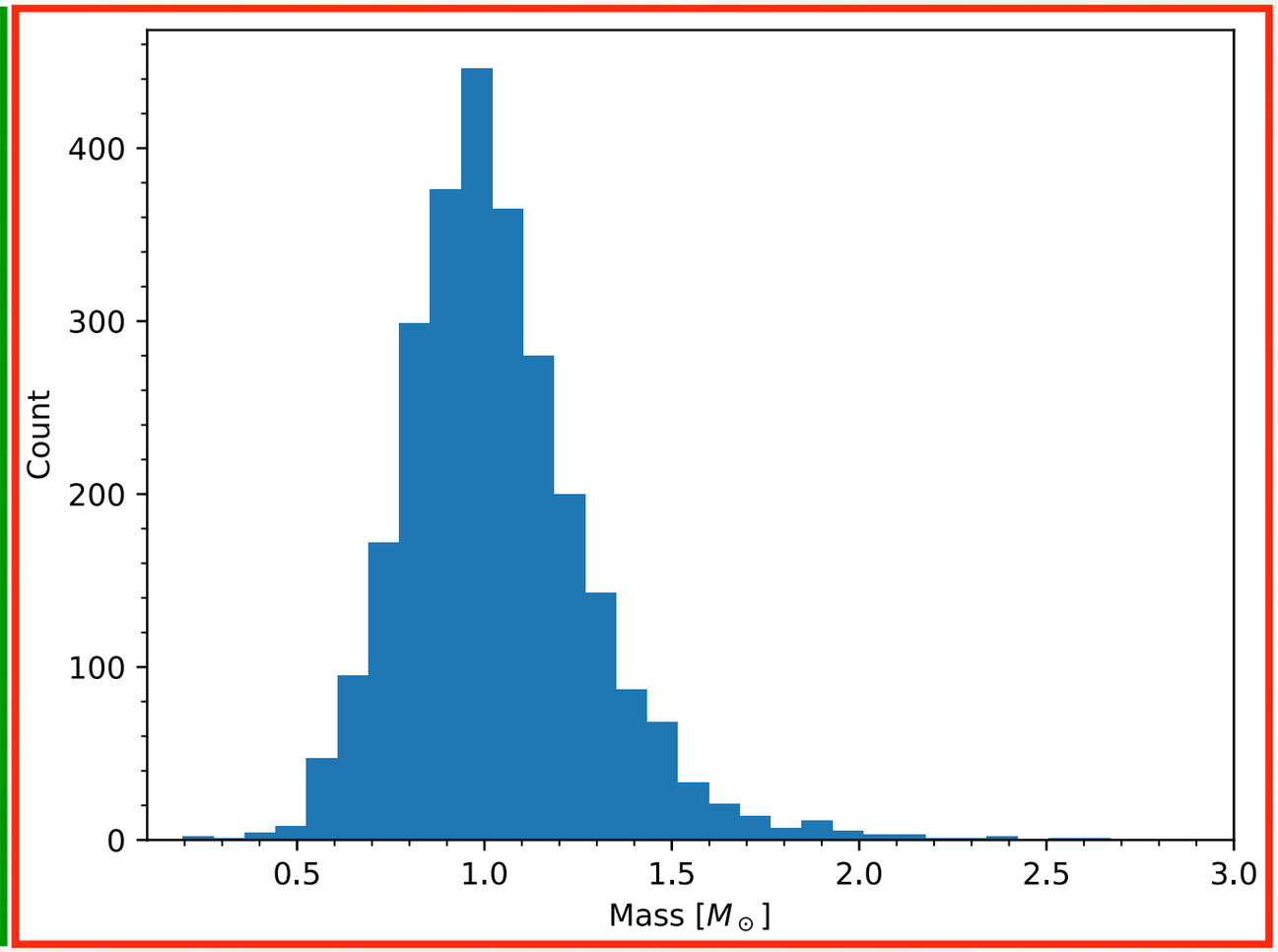
Kraus+ 2016

Multiplicity affects transits, *stellar parameters and oscillations*!
Critical to understand host star *and* parent population

Gaulme+14, AO (Adams+12, Dressing+14, Wang+14, Hirsch+17, Furlan+18, Teske+18), Robo-AO (Law+14, Baranec+16, Ziegler+17), Speckle (Howell+11, Horch+14)

Ages & Densities of Kepler Hosts





Stellar ages: mostly unexplored for Kepler exoplanets!

Masses, log(g) & densities: important for eccentricity constraints + occurrence rates!

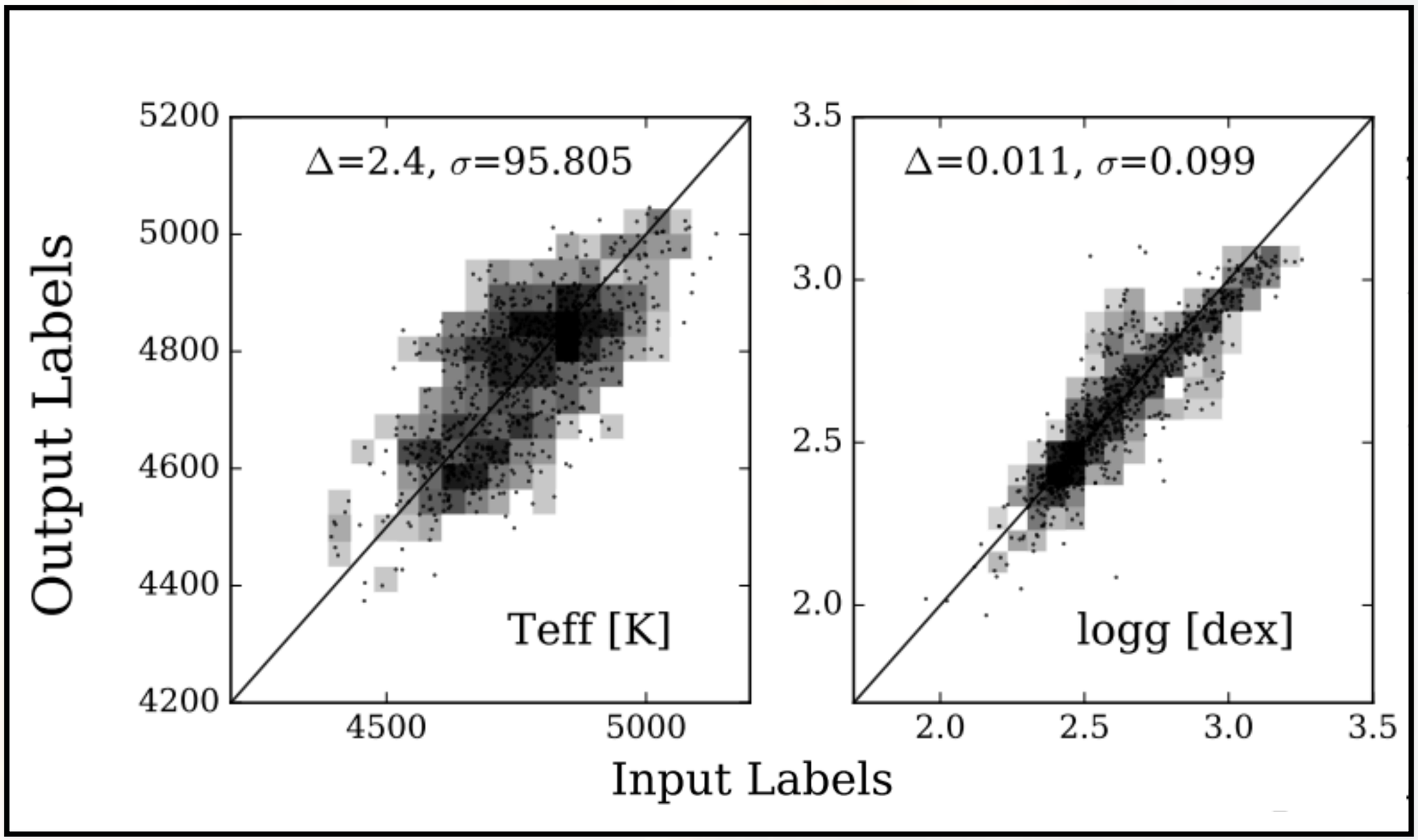
➔ ***Homogeneous stellar & exoplanet properties***

Berger+, in prep

Galactic Archeology of Stars & Planets

... requires homogeneous stellar parameters across Kepler, K2 + TESS!

New Tools: Data-Driven Models of Kepler/K2 Light Curves



Ness+ 2018

(see also Mathur+ 2011, Bastien+ 2013, Kallinger+ 2016)

Kepler/K2 (Planet Host) Stars

What have we learned?

- Evolutionary states of the Kepler/K2 population
- Connecting stellar & planet properties: photoevaporation of small planets, inflation, habitable zones, planet-metallicity correlations

What will we learn over the coming decade?

- Stellar multiplicity & its effects on planets and stars
- Ages of Kepler/K2 exoplanets!
- Galactic variations of stellar/exoplanet properties
- Stellar parameters from data-driven light curve models