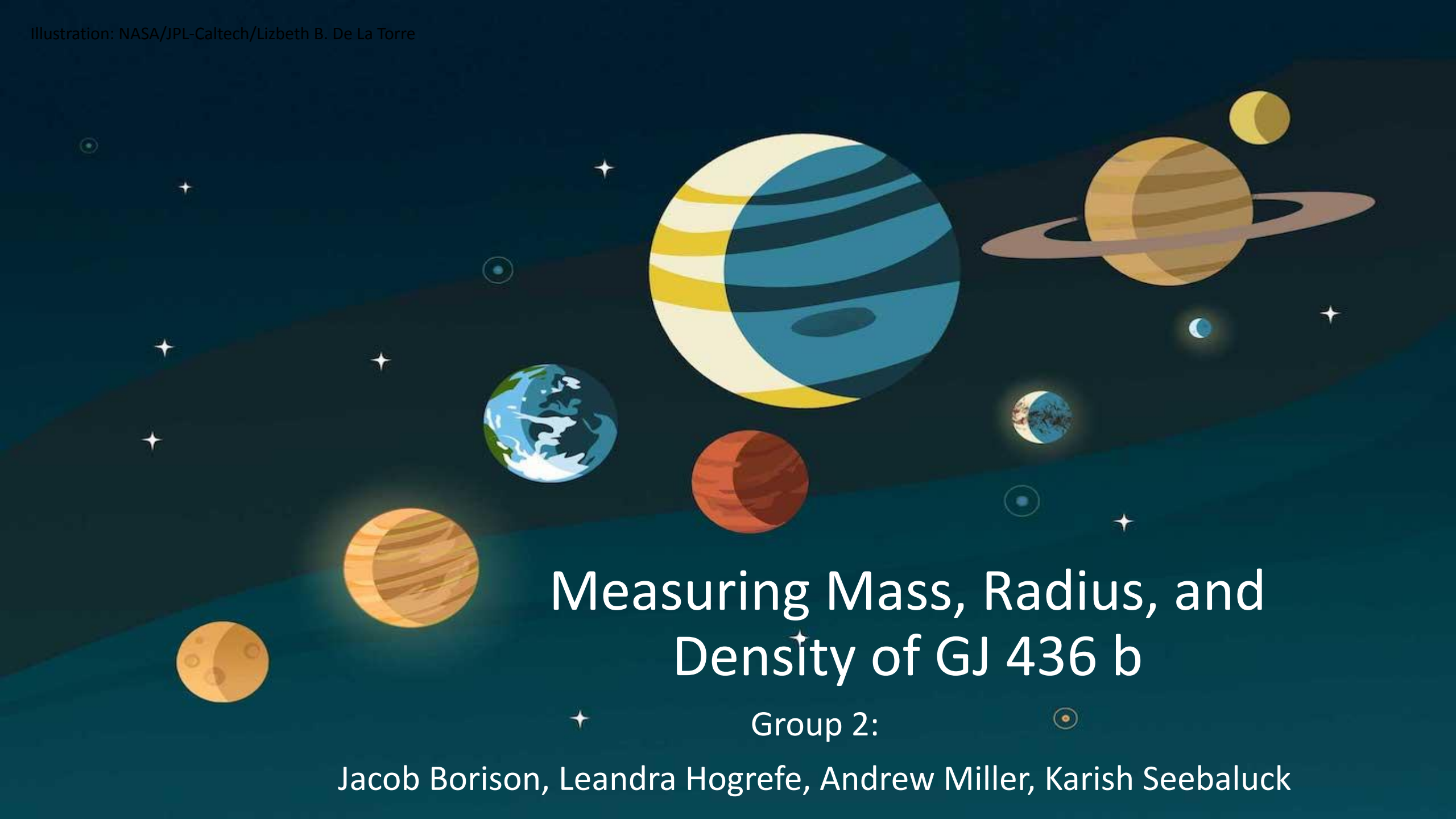


Illustration: NASA/JPL-Caltech/Lizbeth B. De La Torre

Measuring Mass, Radius, and Density of GJ 436 b

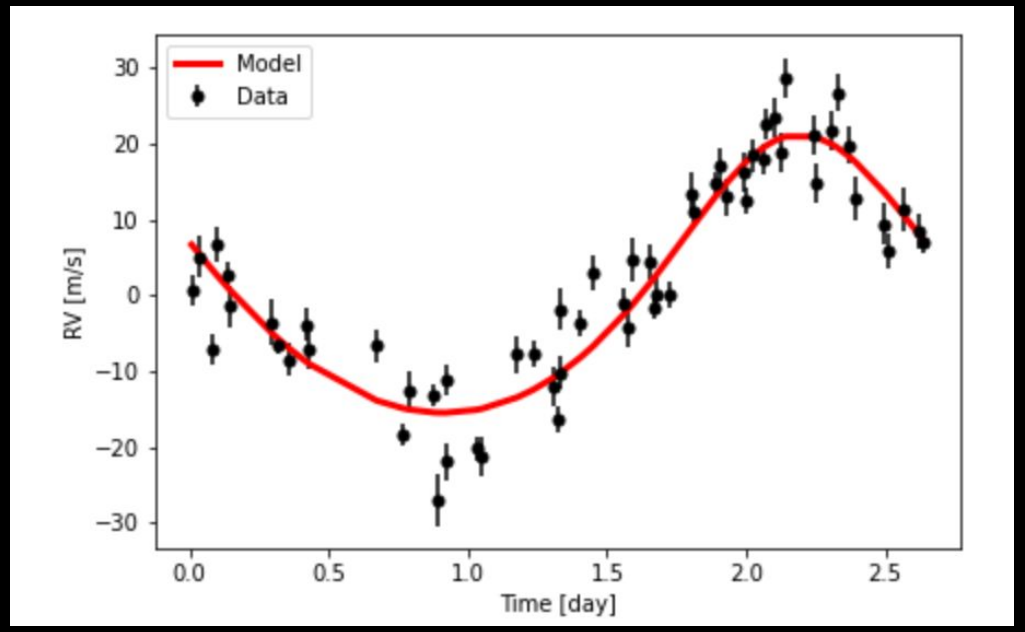
Group 2:

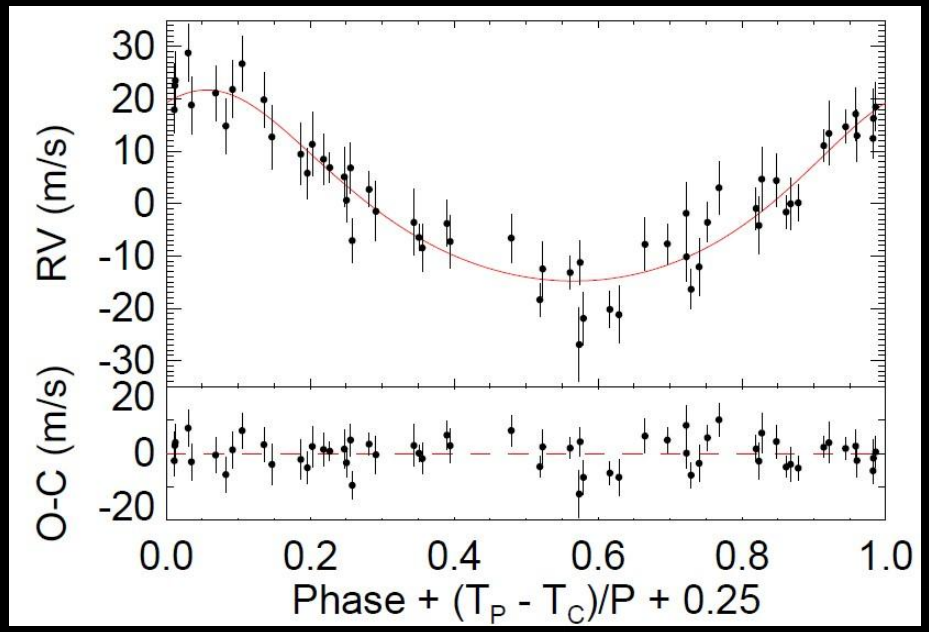
Jacob Borison, Leandra Hogrefe, Andrew Miller, Karish Seebaluck

Motivations:
Meet GJ 436b!

- Orbits a red dwarf with $M = 0.41\ M_{Sun}$
- Discovered in 2004 (Butler et al. 2004)
- Was the first Neptune-mass planet candidate discovered
- How can we determine the mass and radius of this planet?

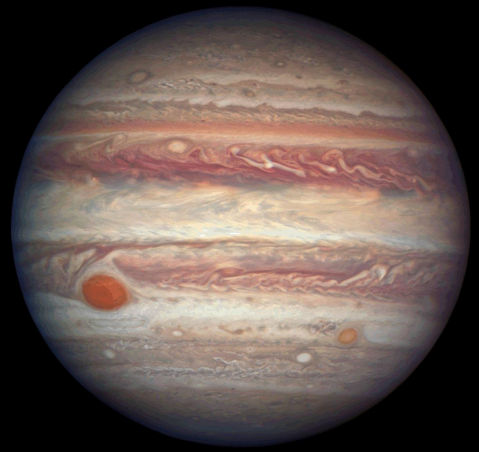
Methods: Measuring Planet Mass with RV





1 $M_{\oplus}$

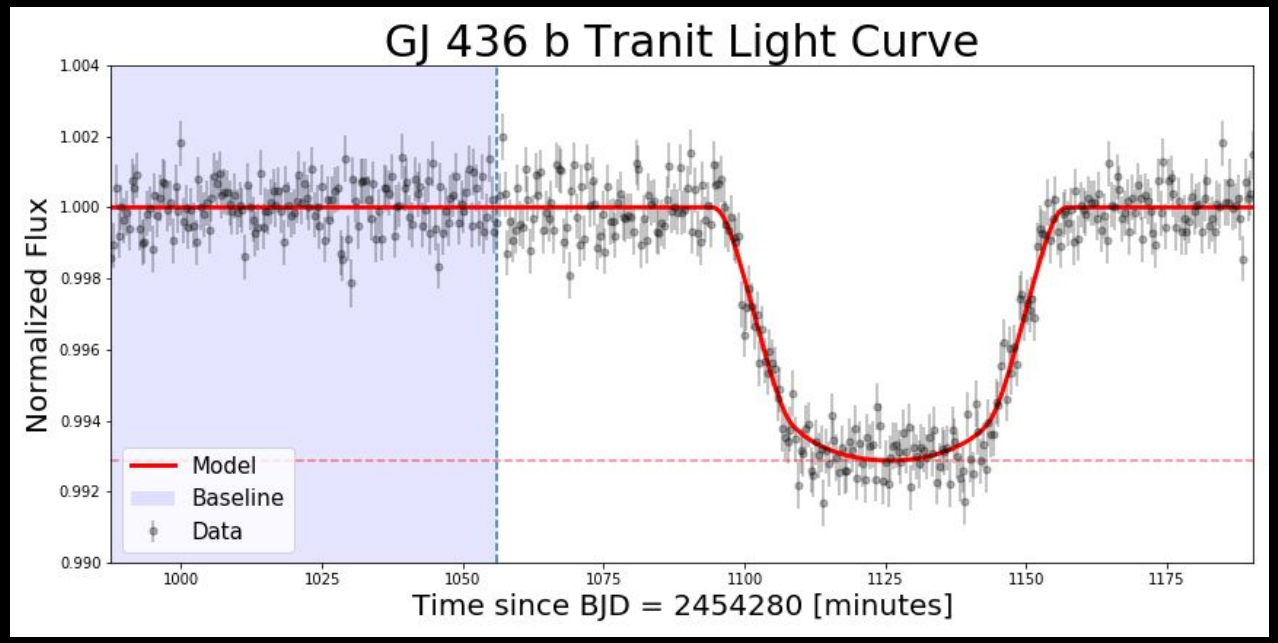
22.52 +/- 3.33 $M_{\oplus}$



318 $M_{\oplus}$

Solar system data from https://nssdc.gsfc.nasa.gov

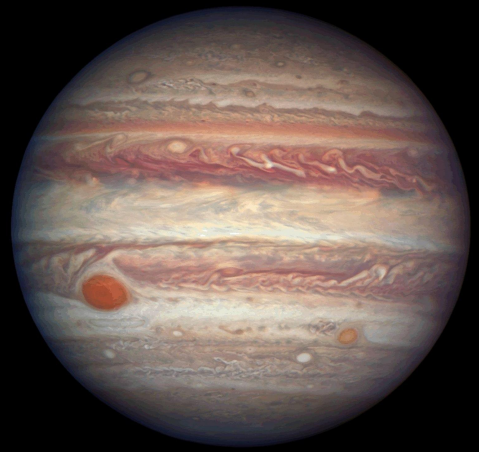
Methods: Measuring Planet Radius with Transits



- R = 24,979 ± 71km

1 R⊕

3.9 R⊕

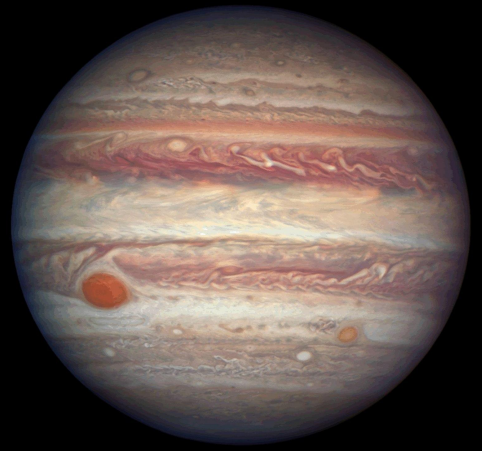


11 R⊕

Methods: Measuring Planet Density

$$\rho = \frac{3M_p}{4\pi R_p^3}$$

Fractional Uncertainty:
(Mass U/Mass) + 3(Radius U/Radius)

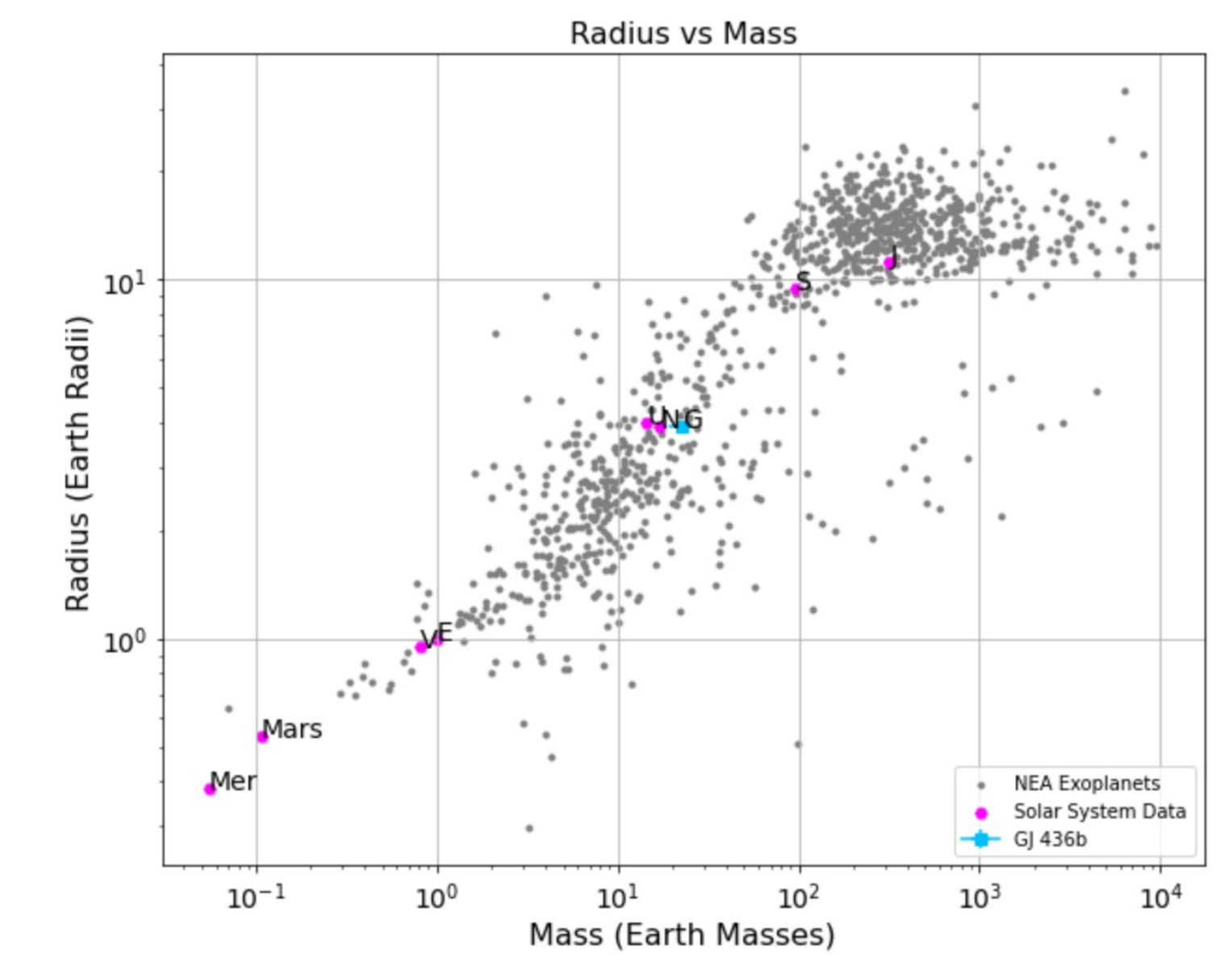


1326 kg/m^3

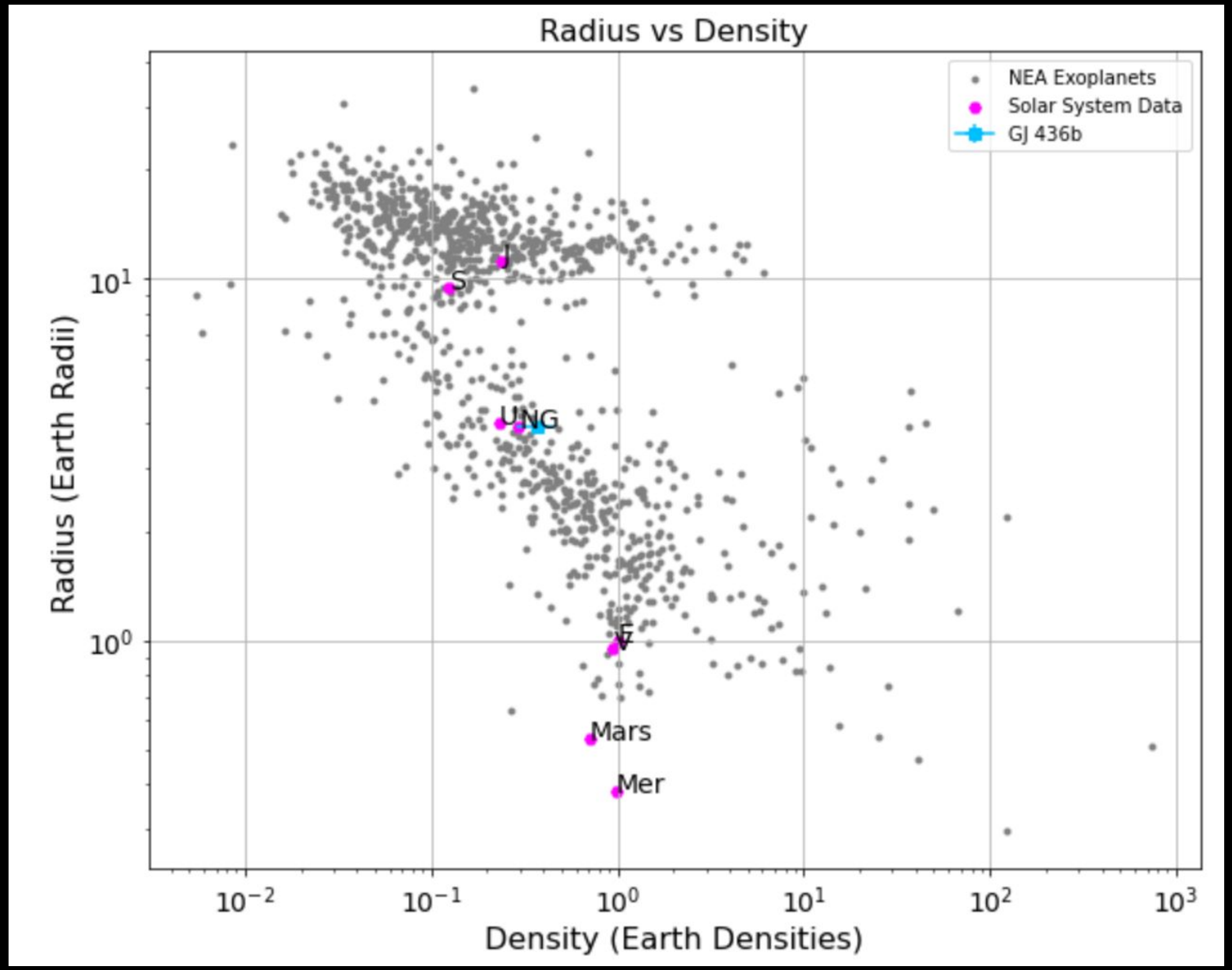
2061 +/- 479 kg/m^3

5513 kg/m^3

Results: How does GJ 436b compare to other planets?

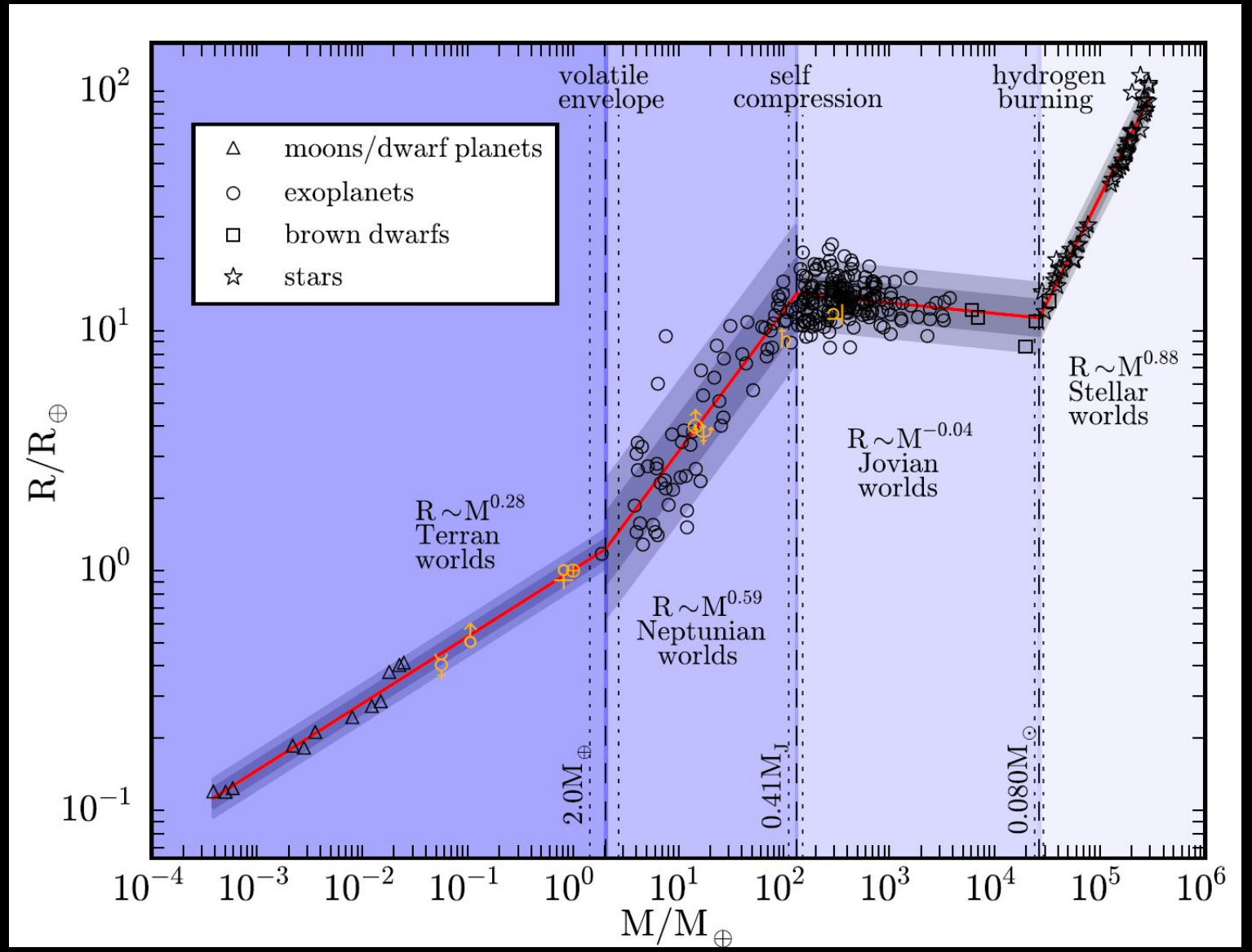


Results: How does GJ 436b compare to other planets?



Comparing with Chen & Kipping 2016

22.52^(0.59)=
6.2 Earth Radii



"Probabilistic Forecasting of the Masses and Radii of Other Worlds," Chen & Kipping 2016

Conclusions

- Constrained GJ 436b’s mass and radius.
- Compare our measurements with other similar exoplanets
- Exoplanets detected via both the transit and radial velocity methods are incredibly important