Exploring The Plurality of New Worlds

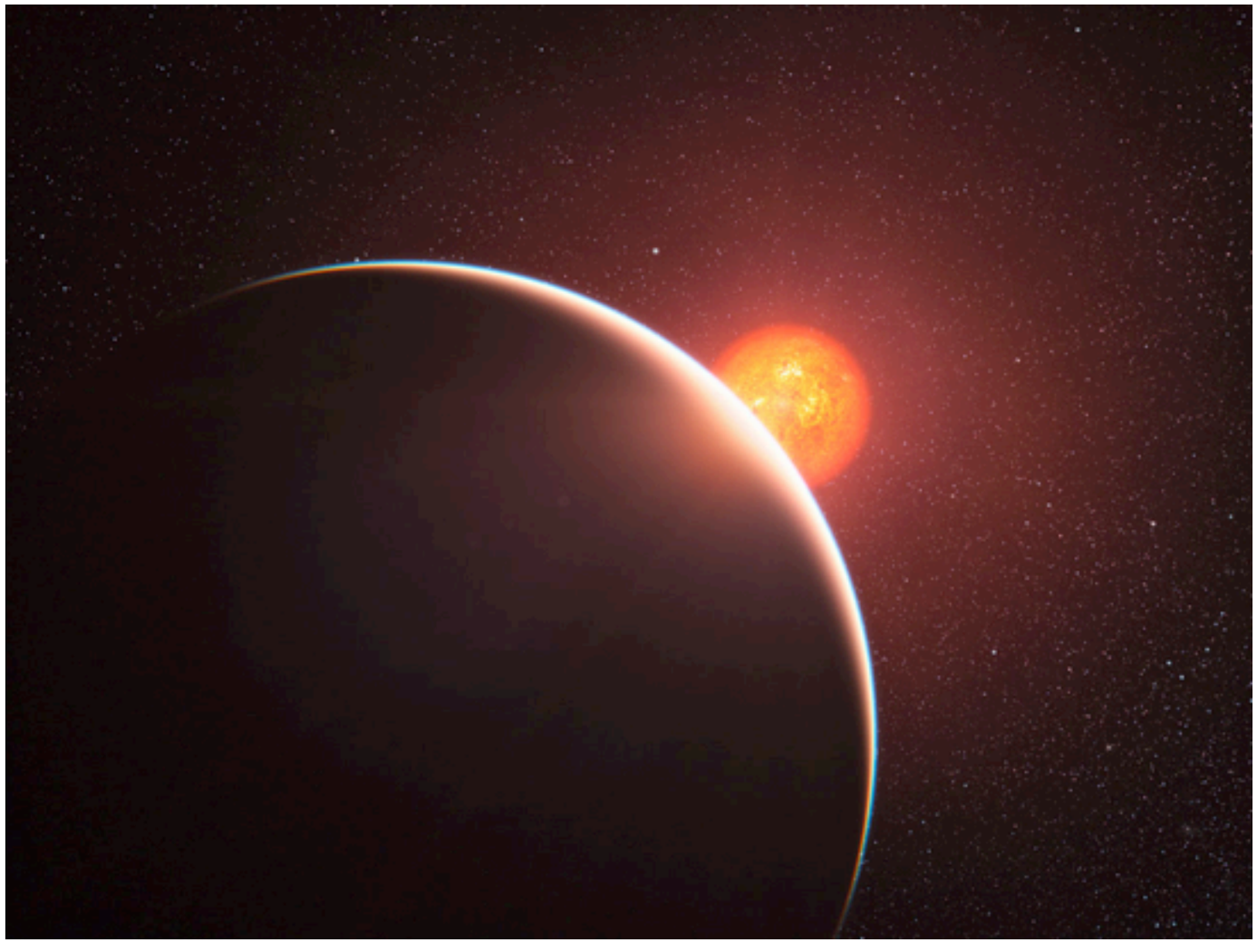


Image Credit: ESO

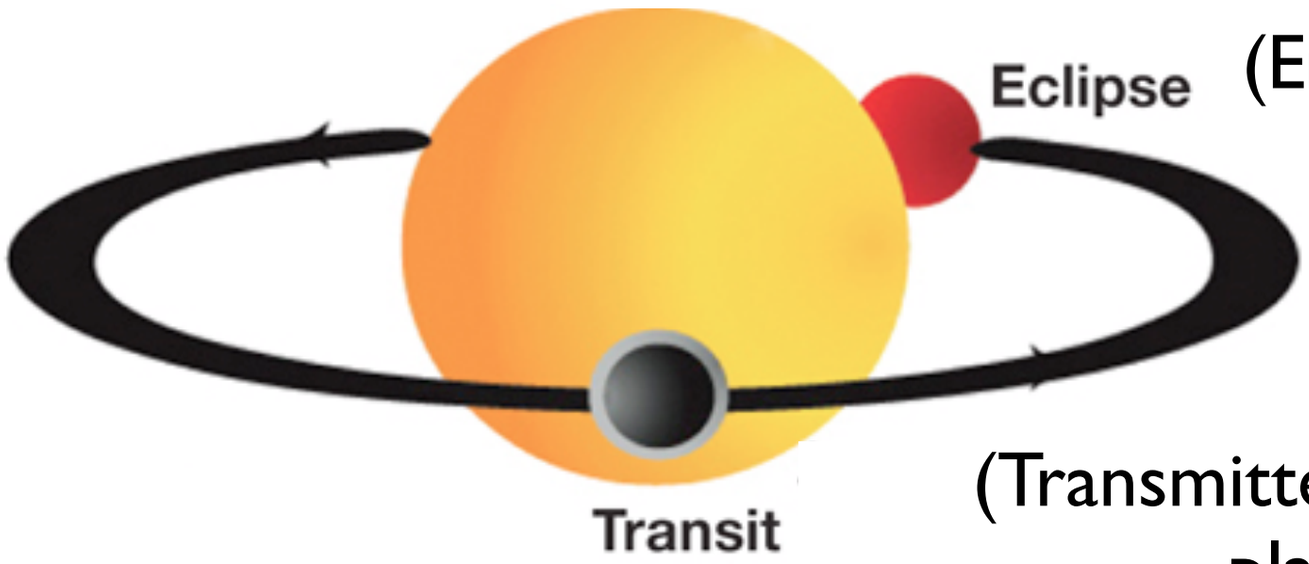
Jean-Michel Désert

Caltech

Sagan Fellowship

Transiting Exoplanets

Configuration That Allows Studies of Their Atmospheres



(Emitted and reflected light)

(Transmitted stellar light through the planet's atmosphere)

I will observe exoplanets during transits to probe their atmospheres.

The purpose of this project is to learn about the composition and the nature of exoplanets.

My research will help to understand planetary formation and evolution. It will also enhance our understanding of our Solar-System's orign.

Transmission Spectroscopy Technique to Determine the Atmospheric Composition of Exoplanets

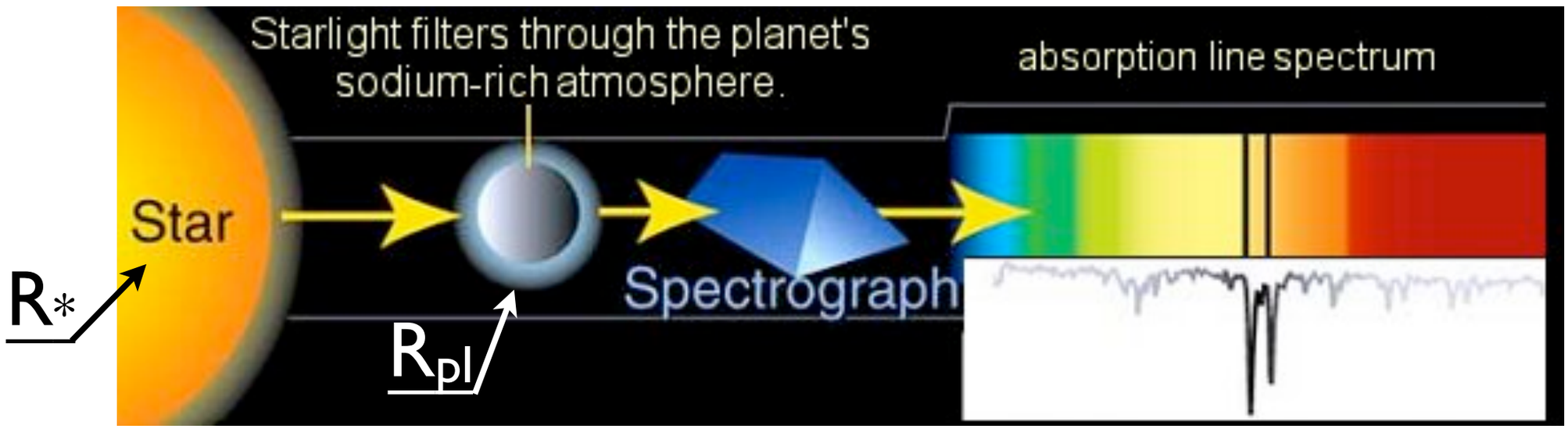


Image Credit: A. Feild, STScI and NASA website.

During transit, one measures the color-dependent transit depth : $(R_{pl}/R_*)^2$

Atmospheric contribution to the transit depth : $\Delta D \sim \frac{2 H R_{\rm pl}}{R_*^2}$

Atmospheric scale height : $H = \frac{kT}{\mu_m g}$

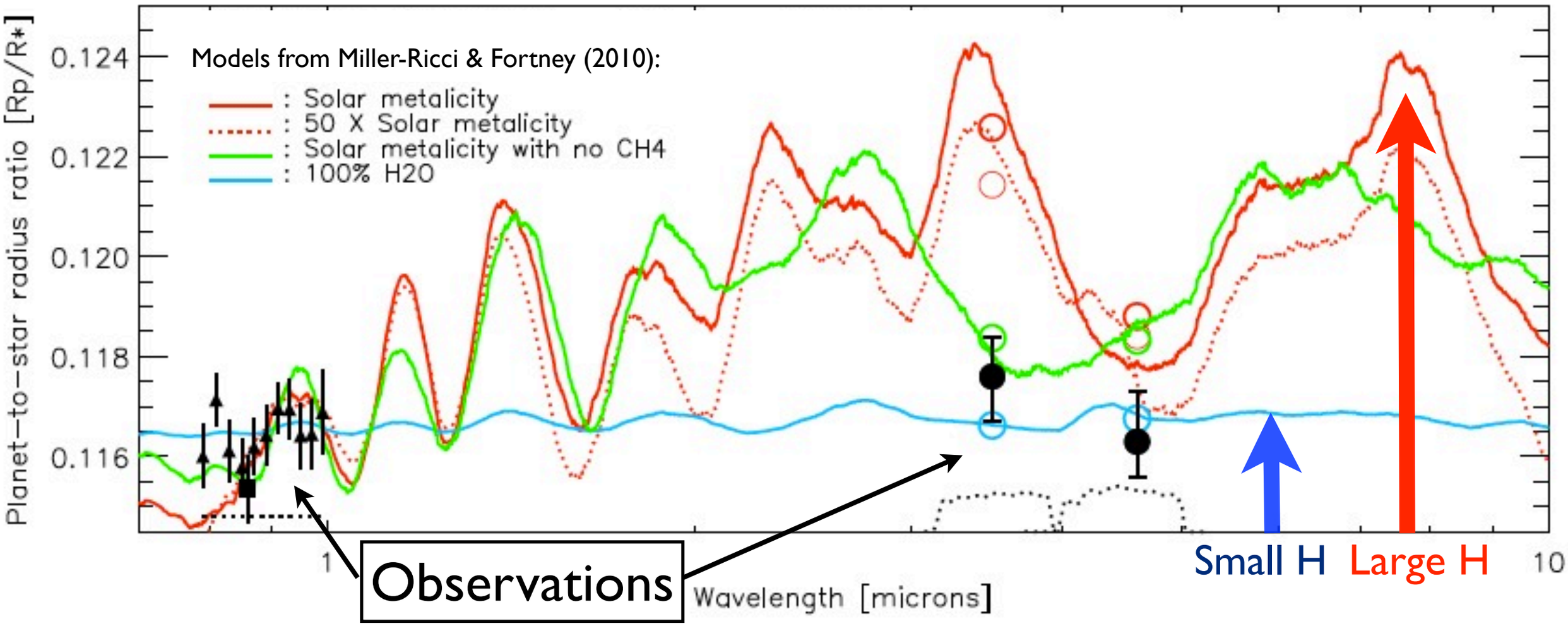
- Temperature
- Surface gravity
- Mean molecular weight

By measuring T, g, and H, we can infer remotely the chemical composition of an exoplanet's atmosphere ($\mu_{\rm m}$)

Application:

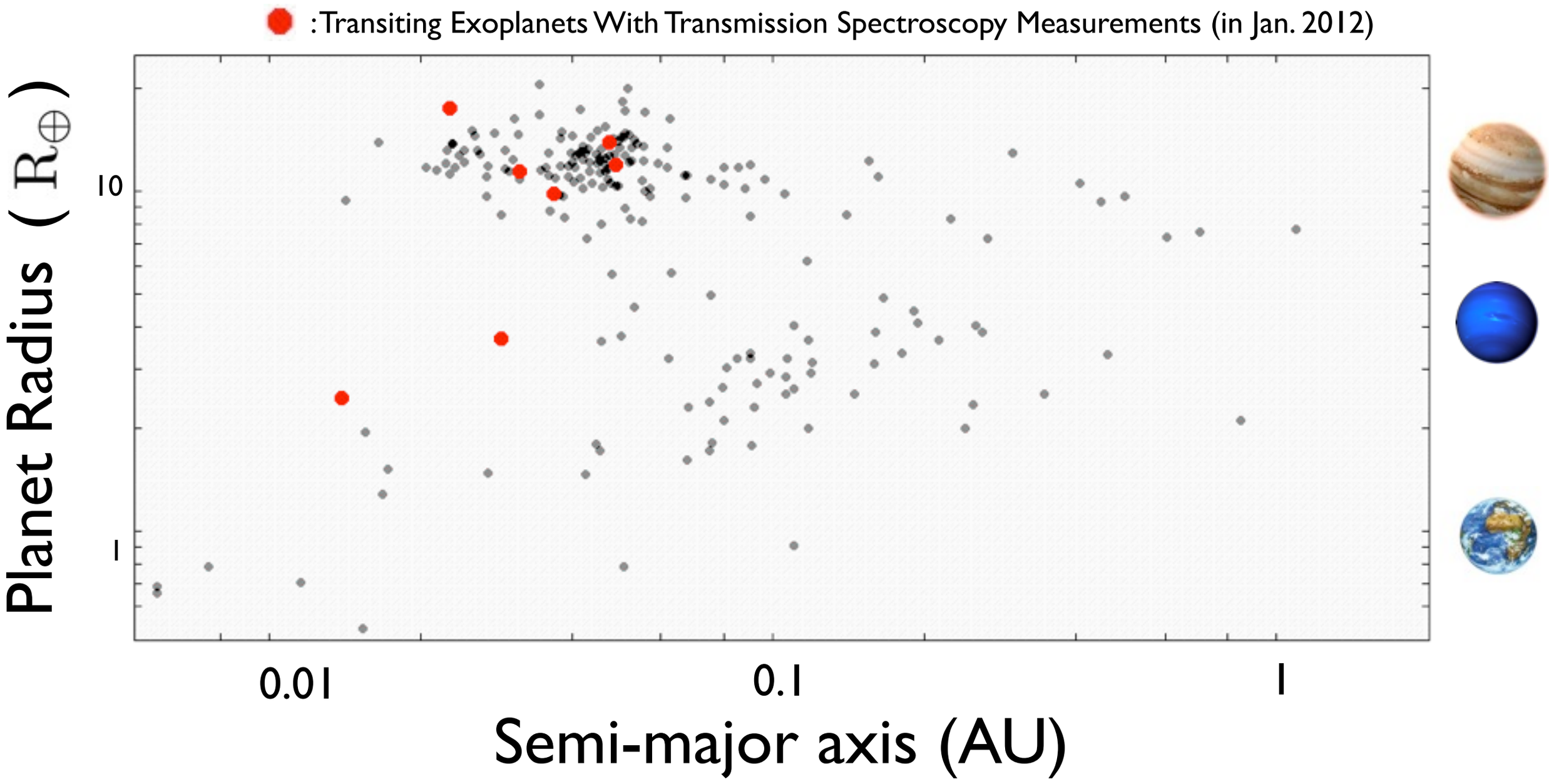
Distinguishing H-rich/H-poor atmospheres for GJ1214b

Désert et al. (2011)



These observations are consistent with a small H (large mean molecular weight) presumably due to a water-rich atmosphere

Project: Comparative Exoplanetology Survey



I will conduct an observational survey of a wide diversity of exoplanet atmospheres using the transmission spectroscopy technique in order to learn about their composition and nature.