New Tools for Understanding Exoplanet Atmospheres from Spectroscopy

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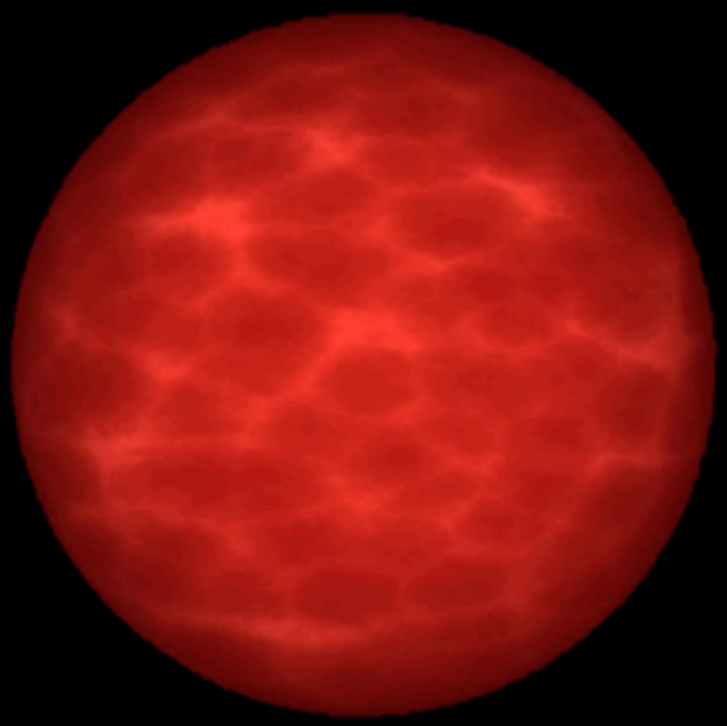
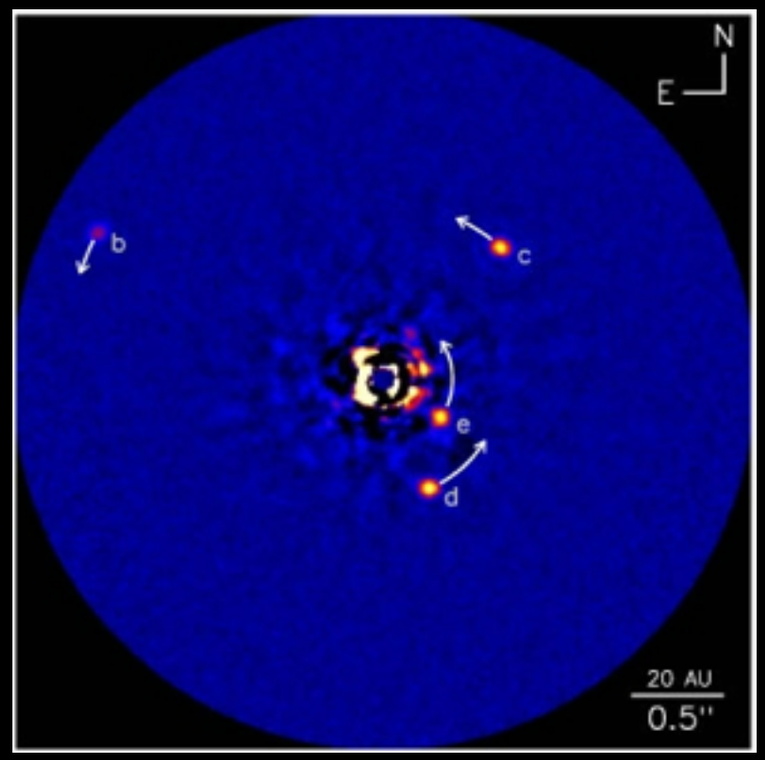
As a Sagan Fellow, I will use new techniques to retrieve planet compositions and cloud properties for 3 classes of objects:

young brown dwarfs



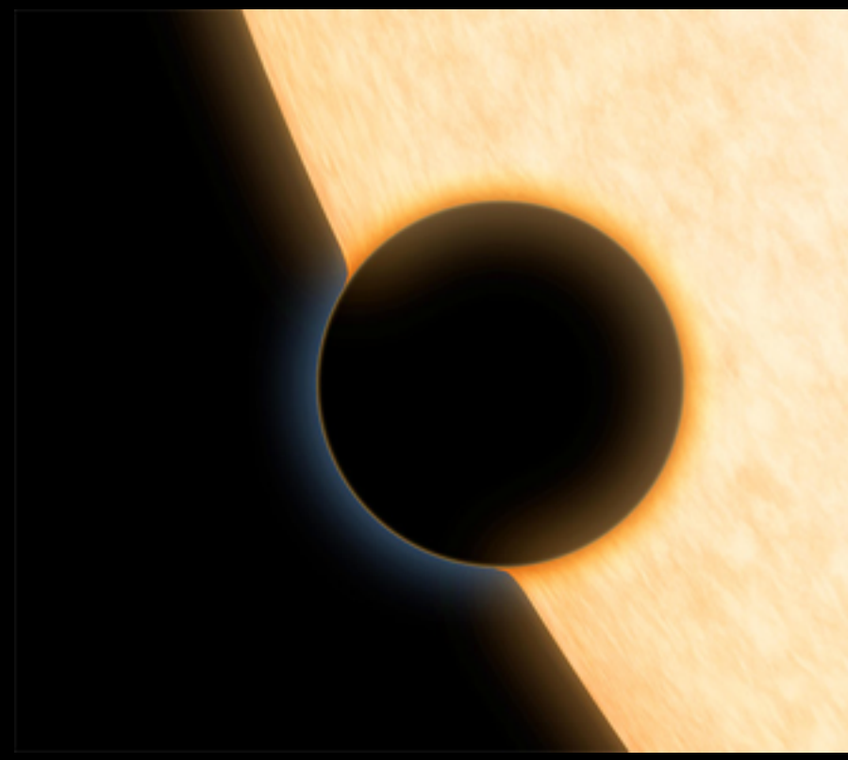
R. Hurt/NASA

directly imaged planets



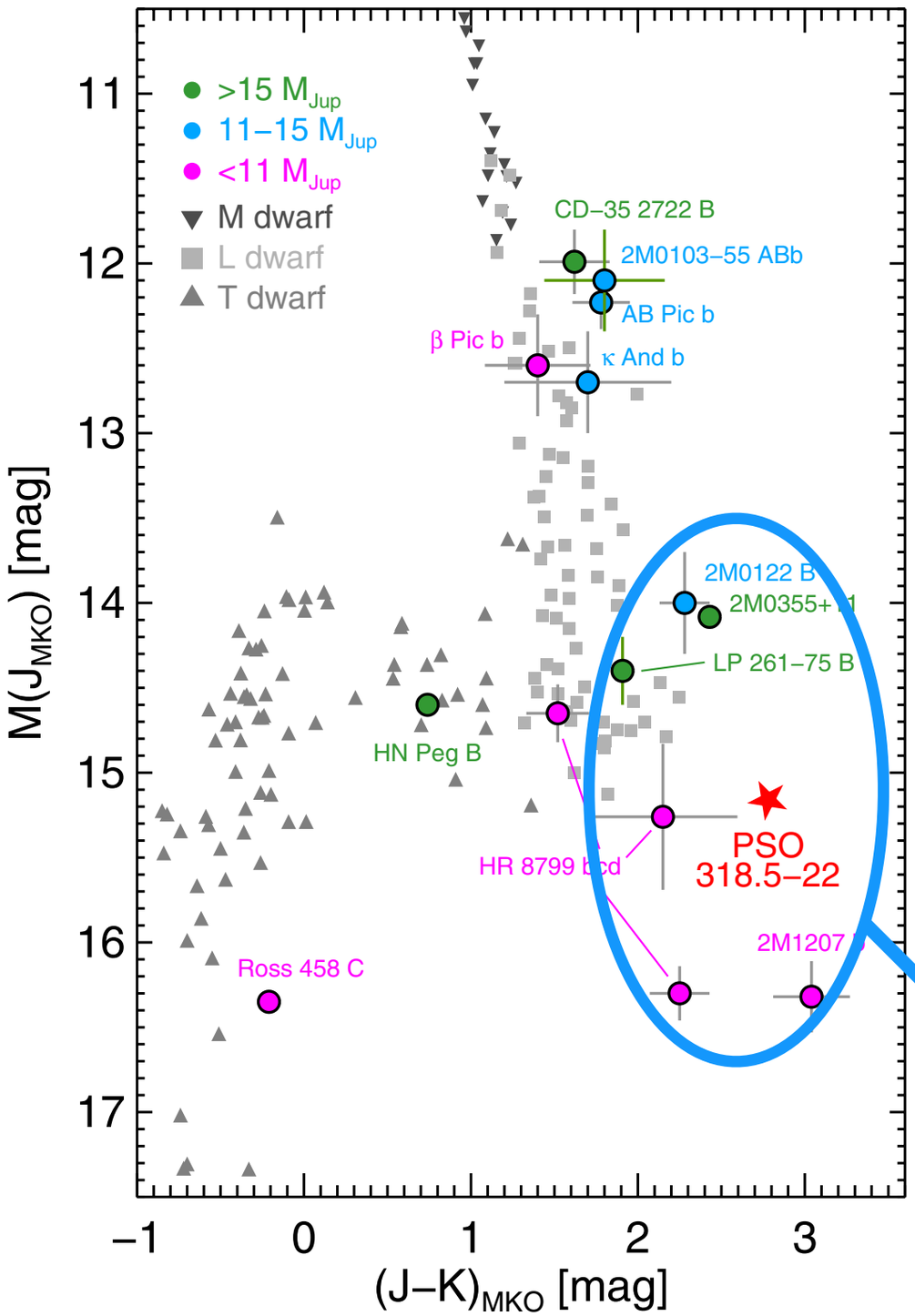
Marois et al. 2010

transiting small planets

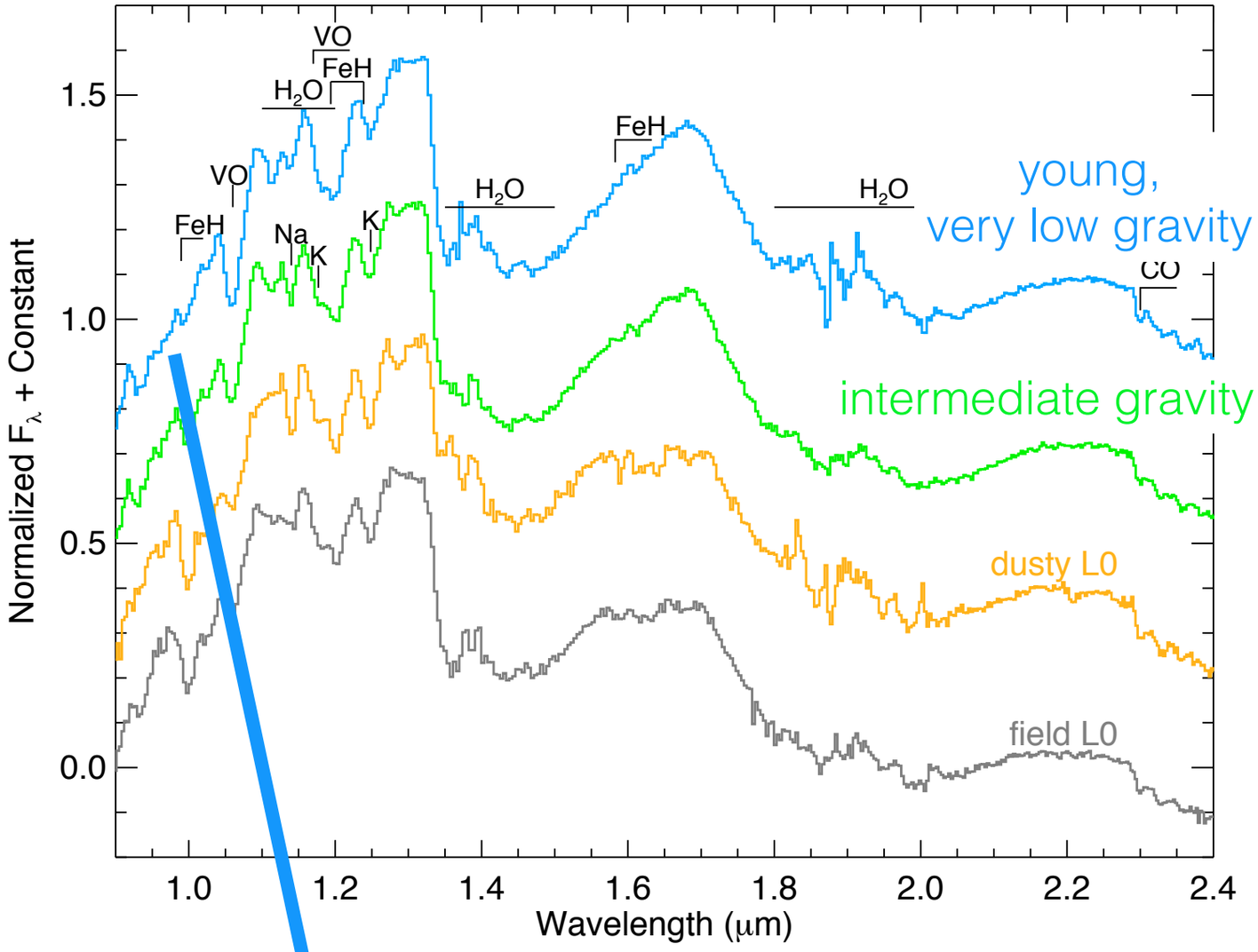


NASA/JPL-Caltech

Young brown dwarfs provide a testbed for understanding atmospheric chemistry and clouds.



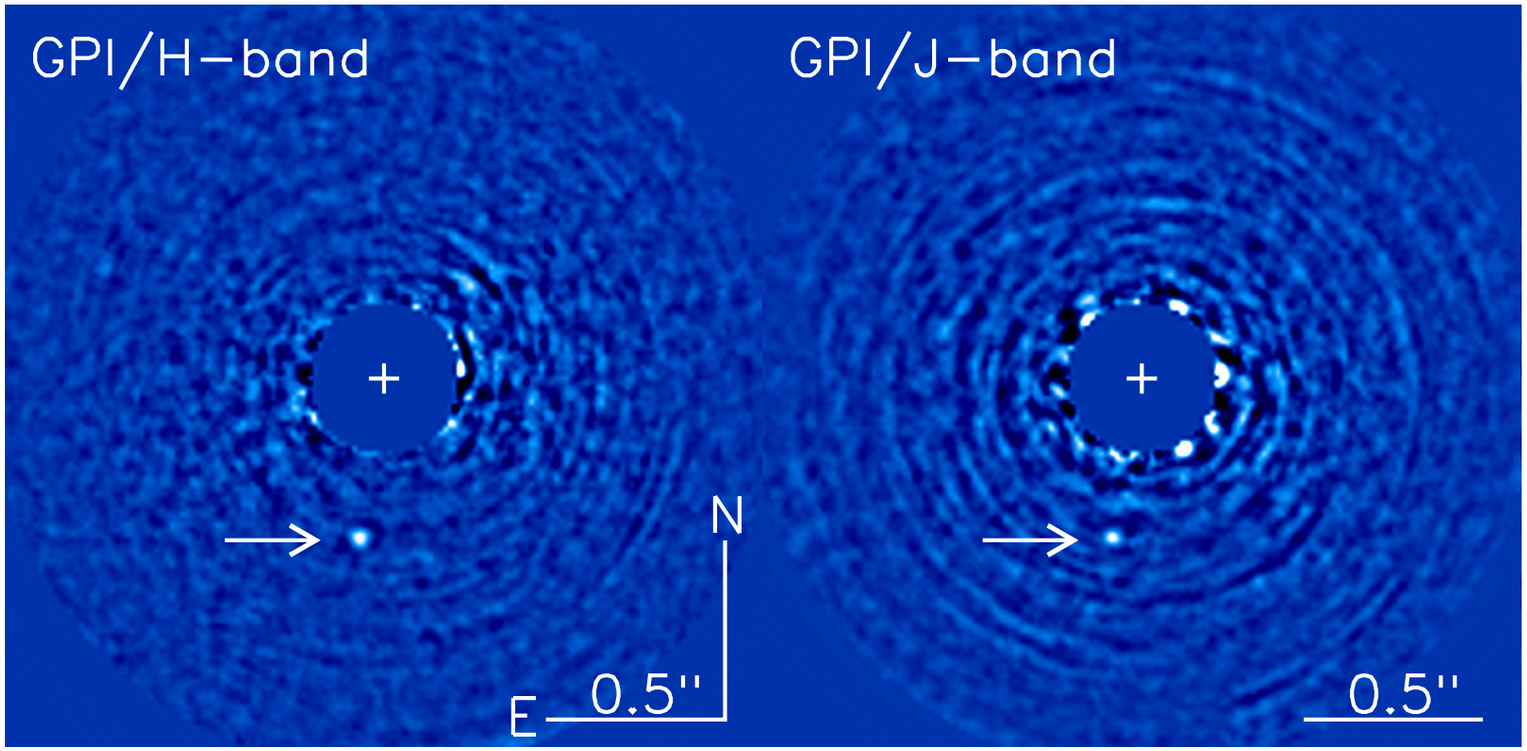
Liu et al. 2013

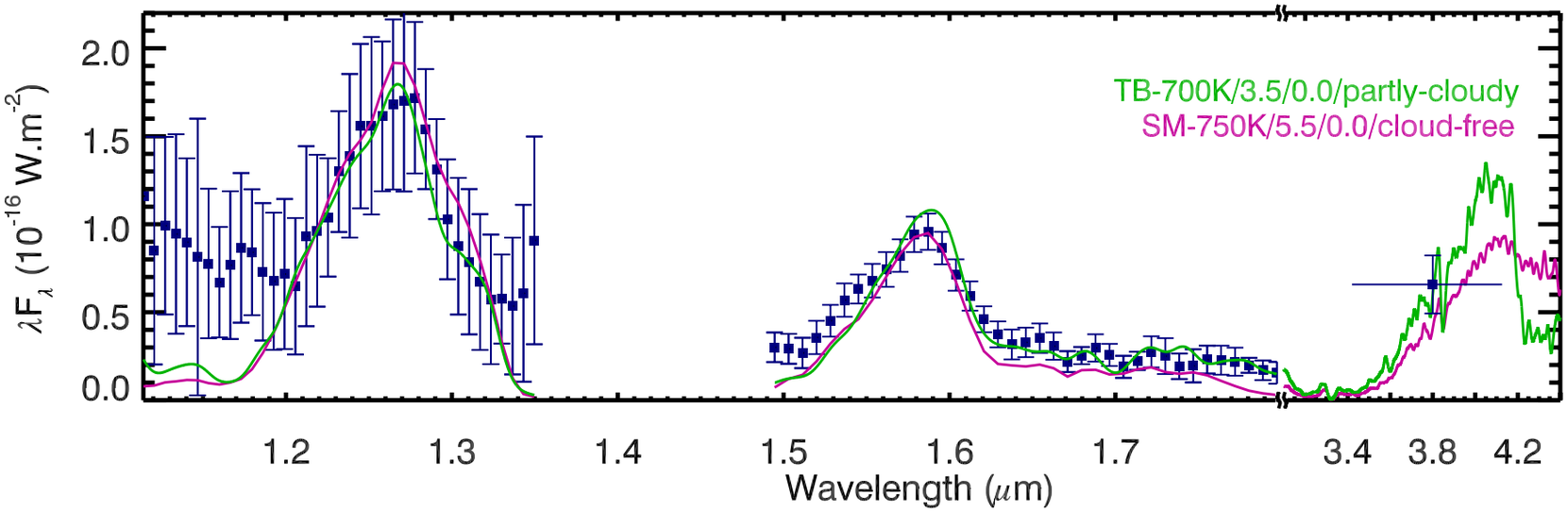


Allers & Liu 2014

free-floating low mass brown dwarfs have the masses/temperatures of exoplanets, but are **much easier to observe** spectroscopically.

New instruments like the Gemini Planet Imager will allow us to observe young proxies of the solar system.

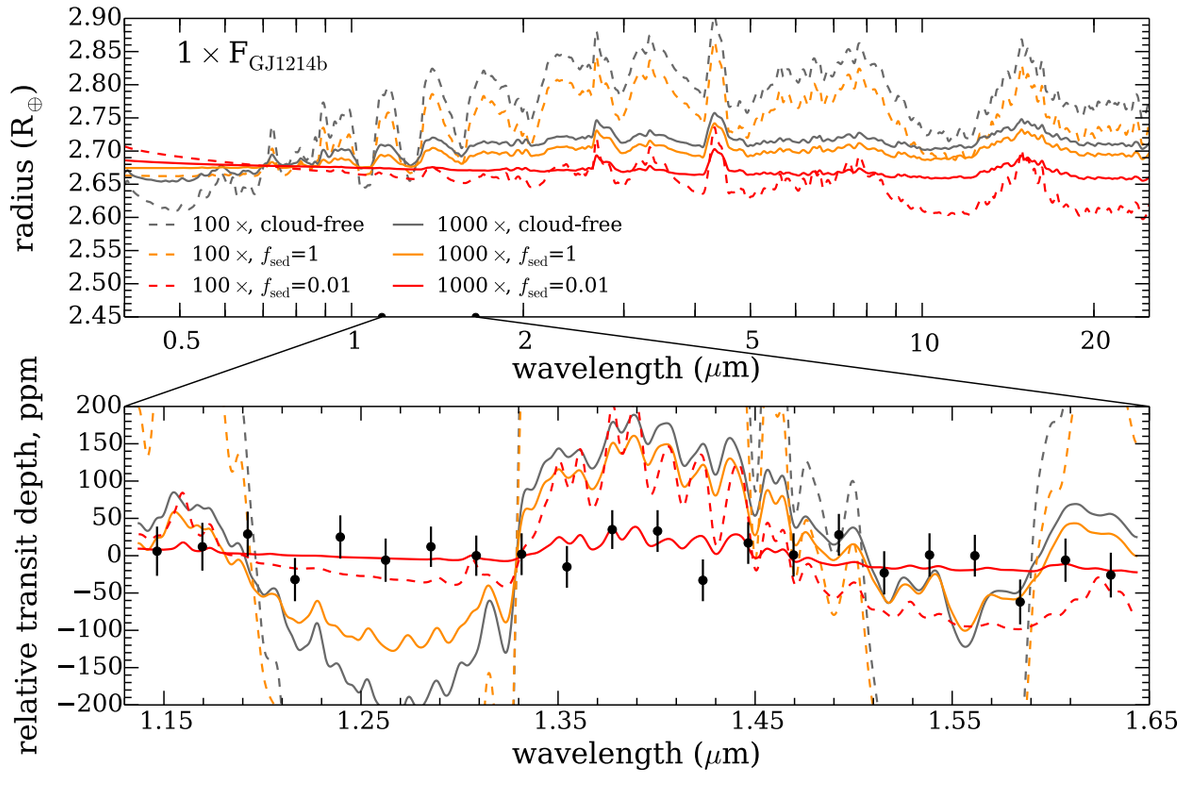




51 Eri b, the first newly-discovered planet from the GPIES survey, appears similar to a cool (700 K) brown dwarf with water and methane absorption features.

Macintosh et al. 2015

Small planets to date have shown featureless spectra, indicating the presence of clouds/hazes



Morley et al. 2015

As a postdoc, I will collaborate with observers to measure molecular features in a wider range of planets and quantify the importance of clouds and hazes.

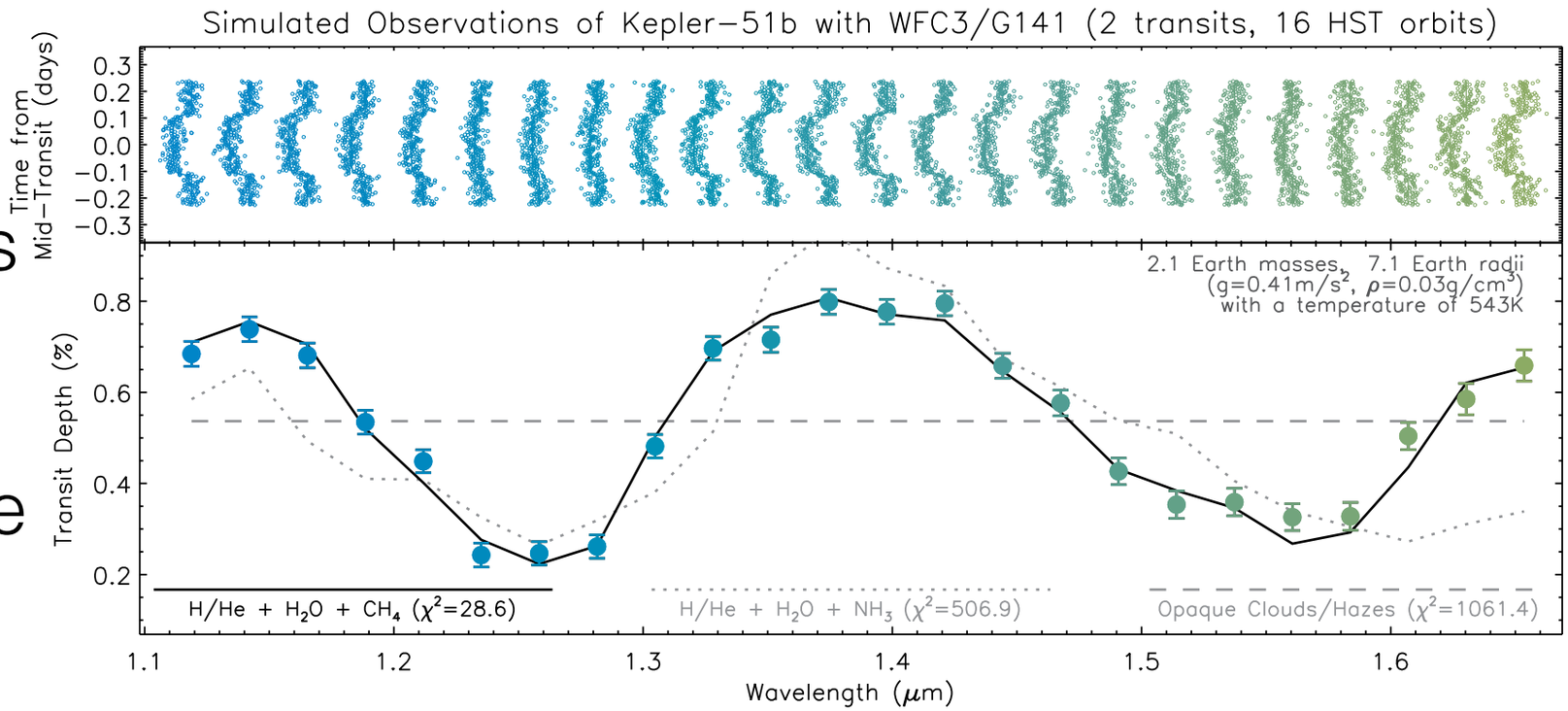


figure from Zach Berta-Thompson