Exoplanet characterization

Exoplanet characterization


Madhusudan et al. 2013
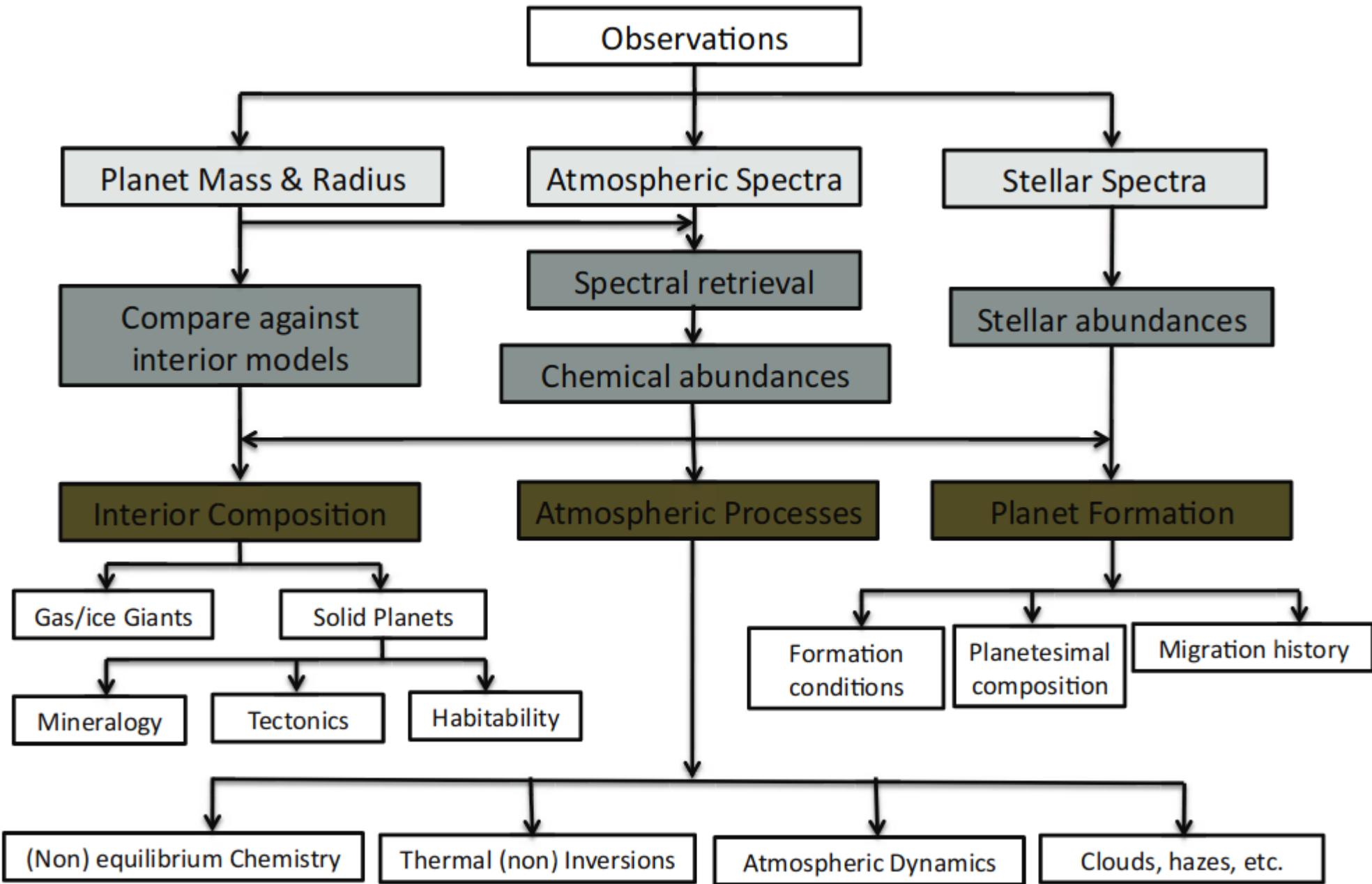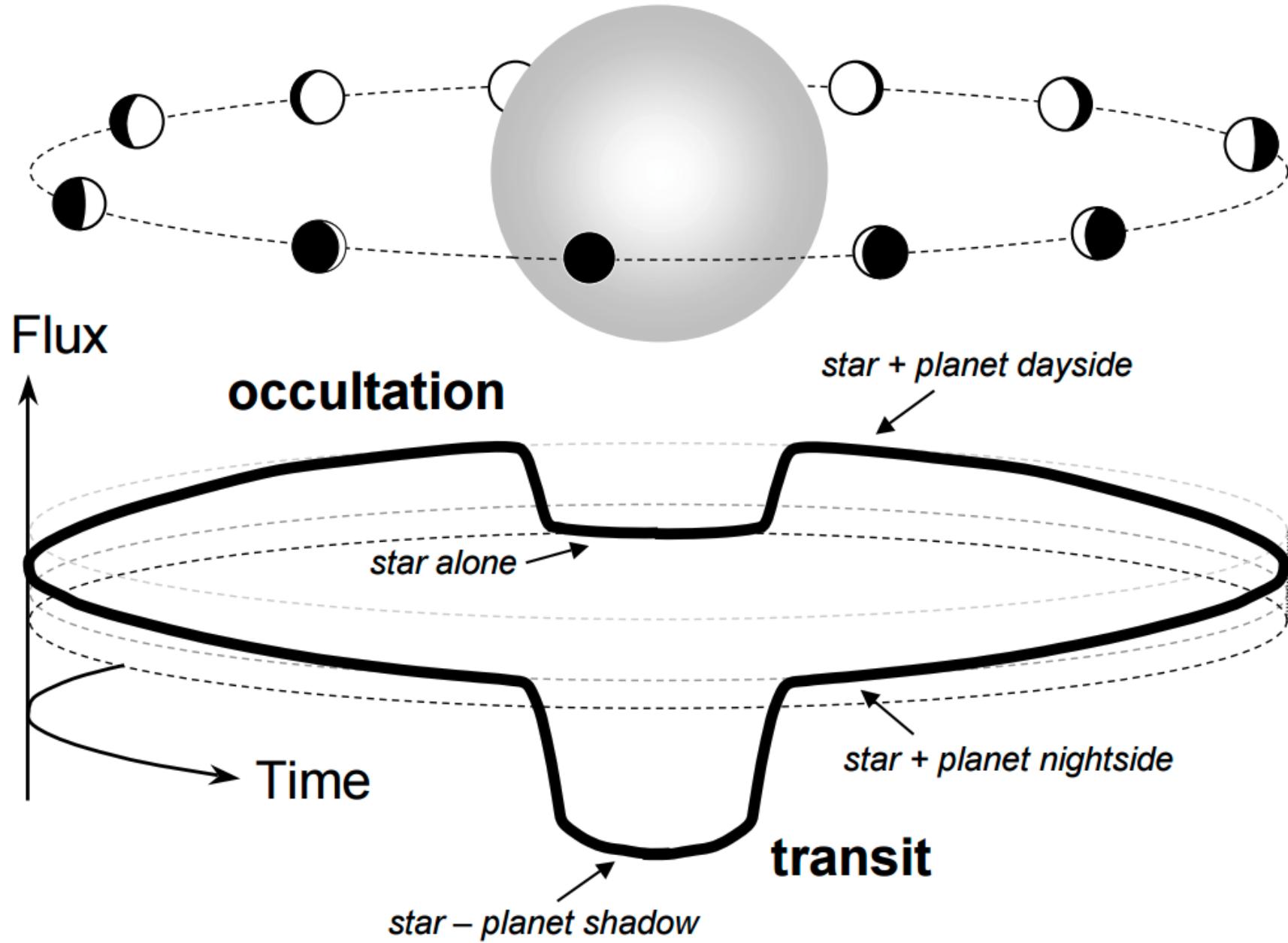
Exoplanet characterization

Earth atmosphere
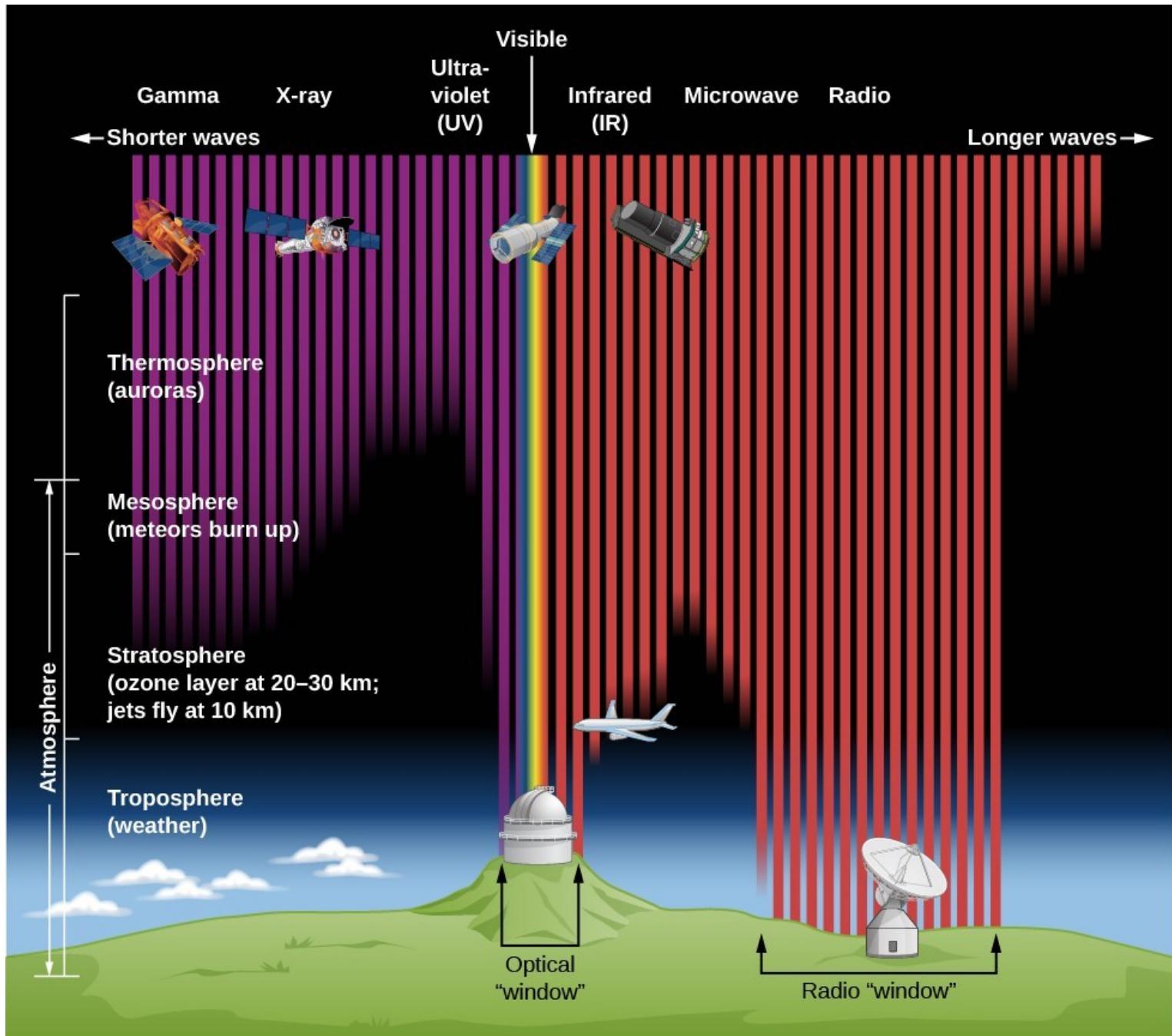
image credit STScI

Atmospheres: spectrophotometry

Atmospheres: spectrophotometry
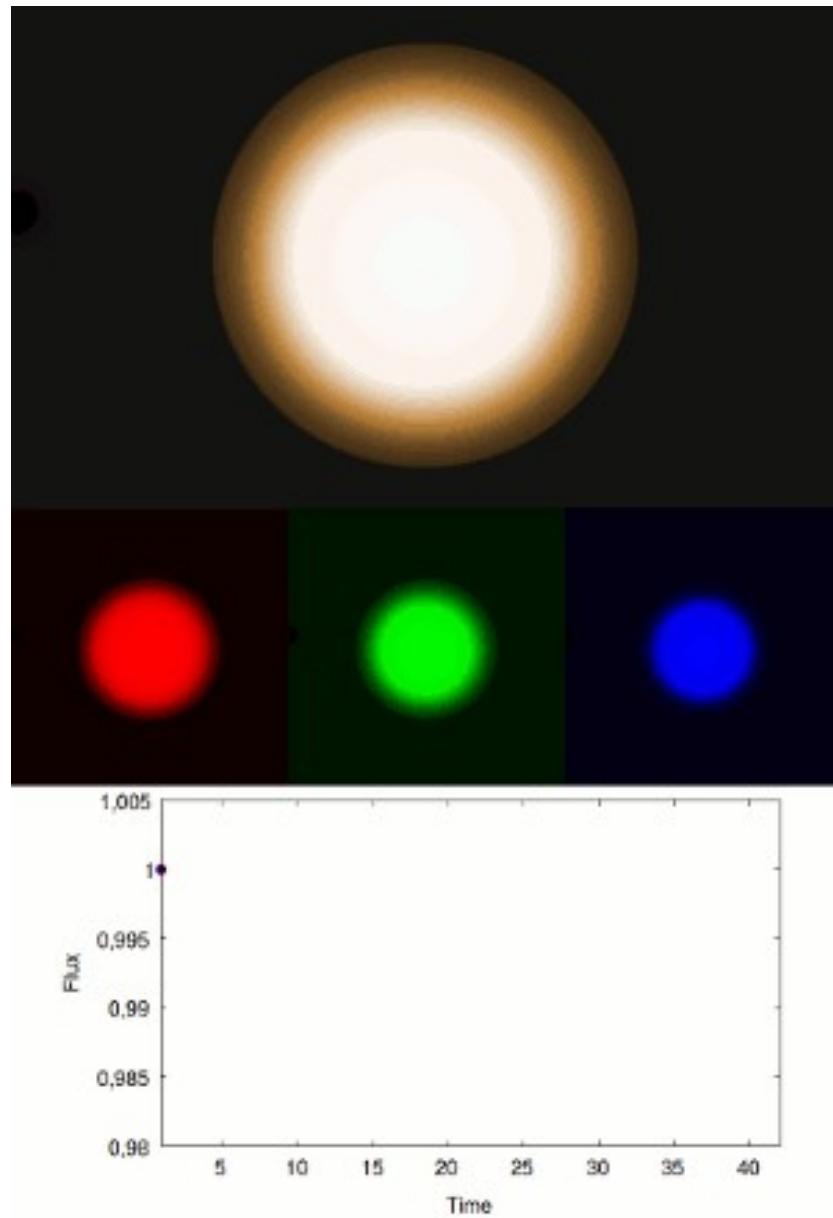
image credit Uppsala University
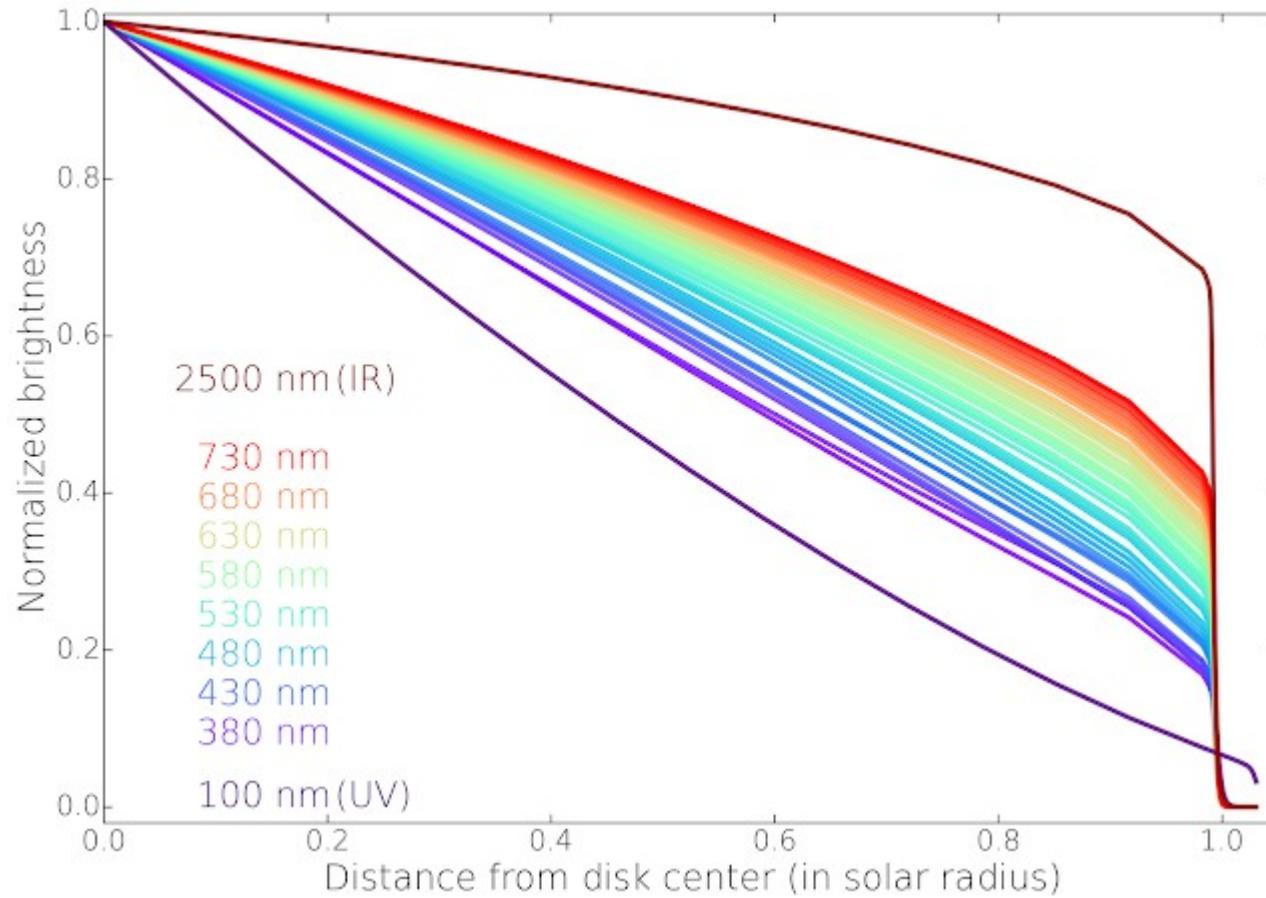
Know your star: limb darkening!

Super-earth GJ 1214
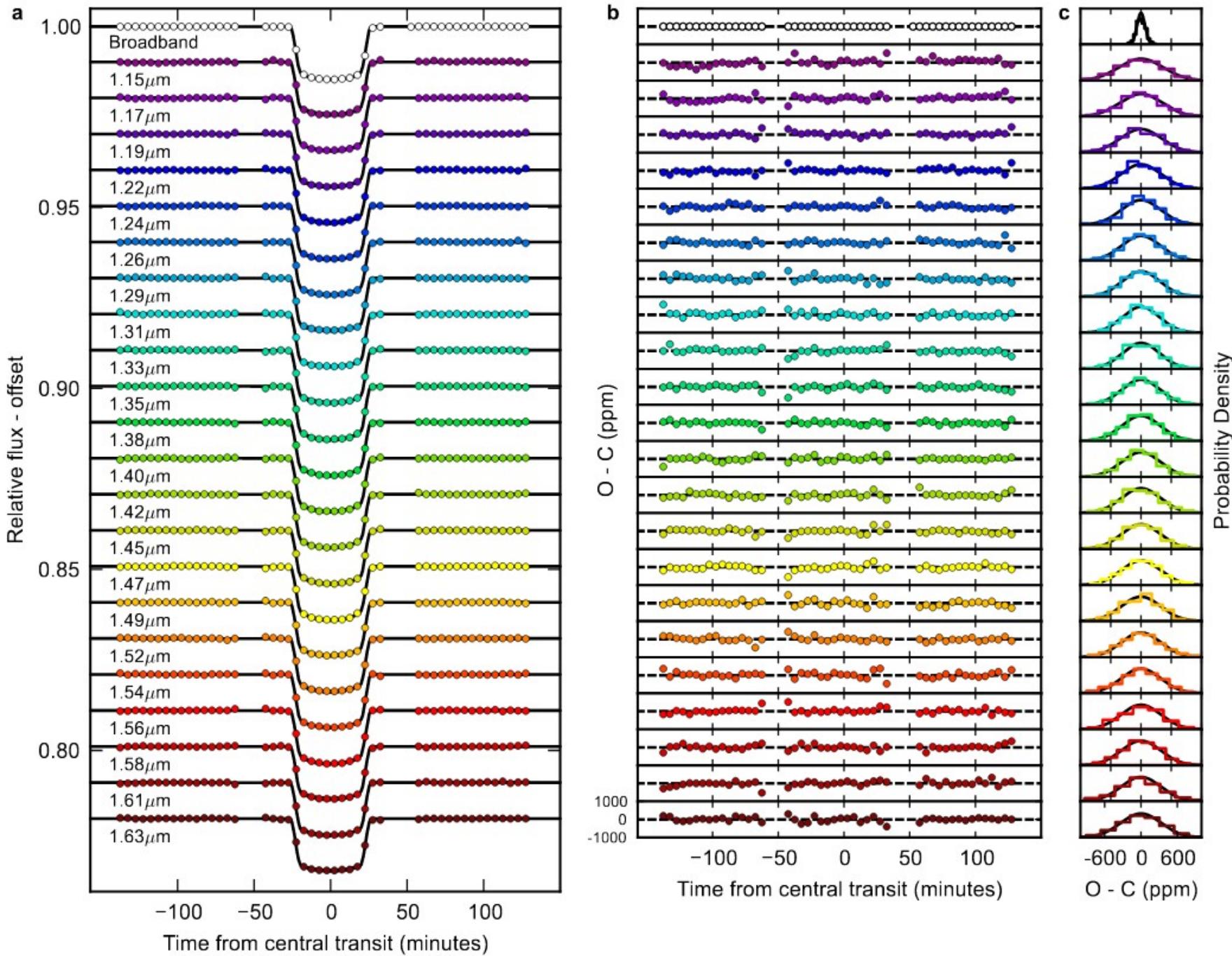
Kreidberg et al. 2014

Super-earth GJ 1214
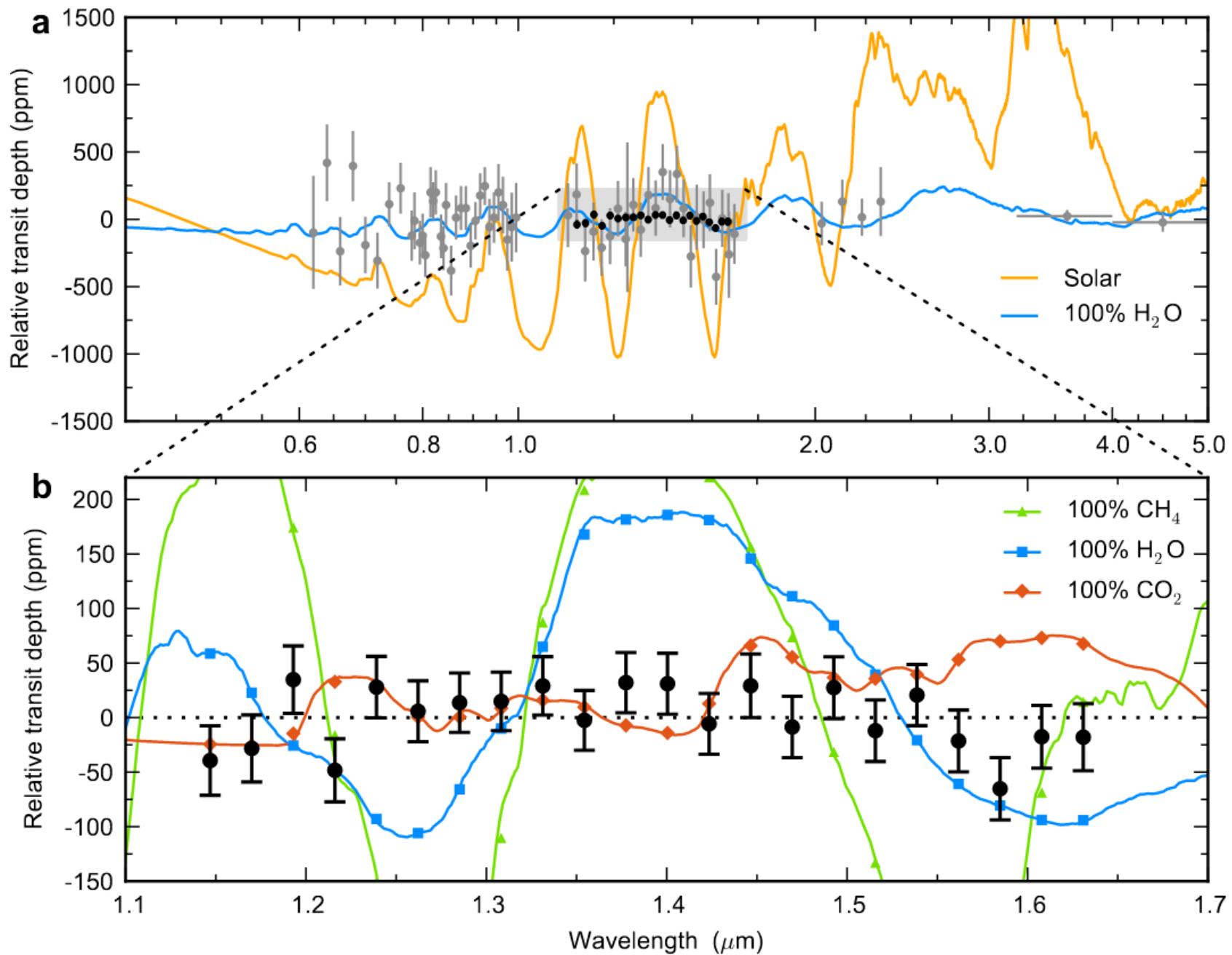
Kreidberg et al. 2014

Hot Jupiter WASP-19b

Sedaghati et al. 2017
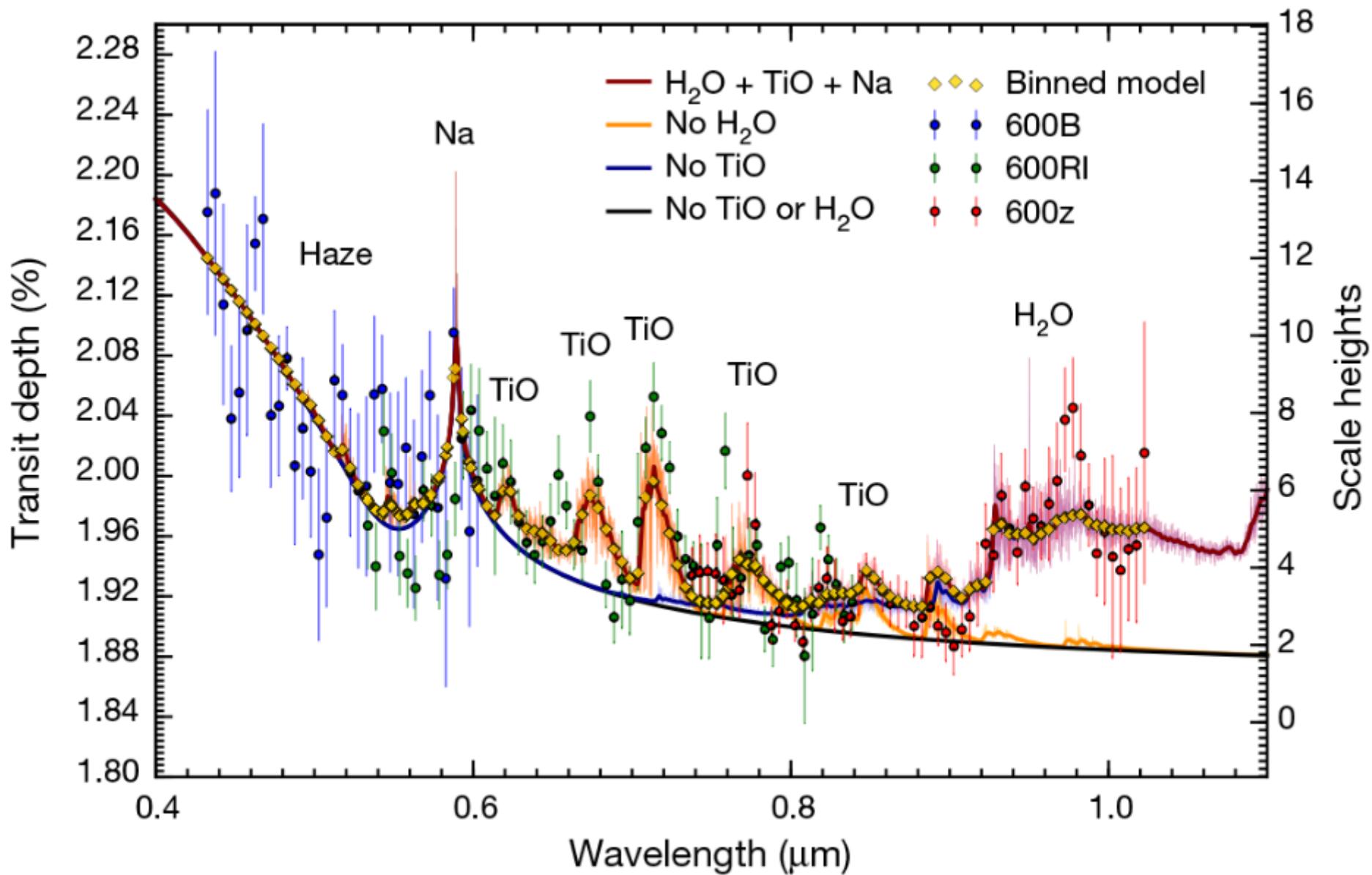
# Hot Jupiter theoretical model (petitRADTRANS)

image credit: S. Czesla
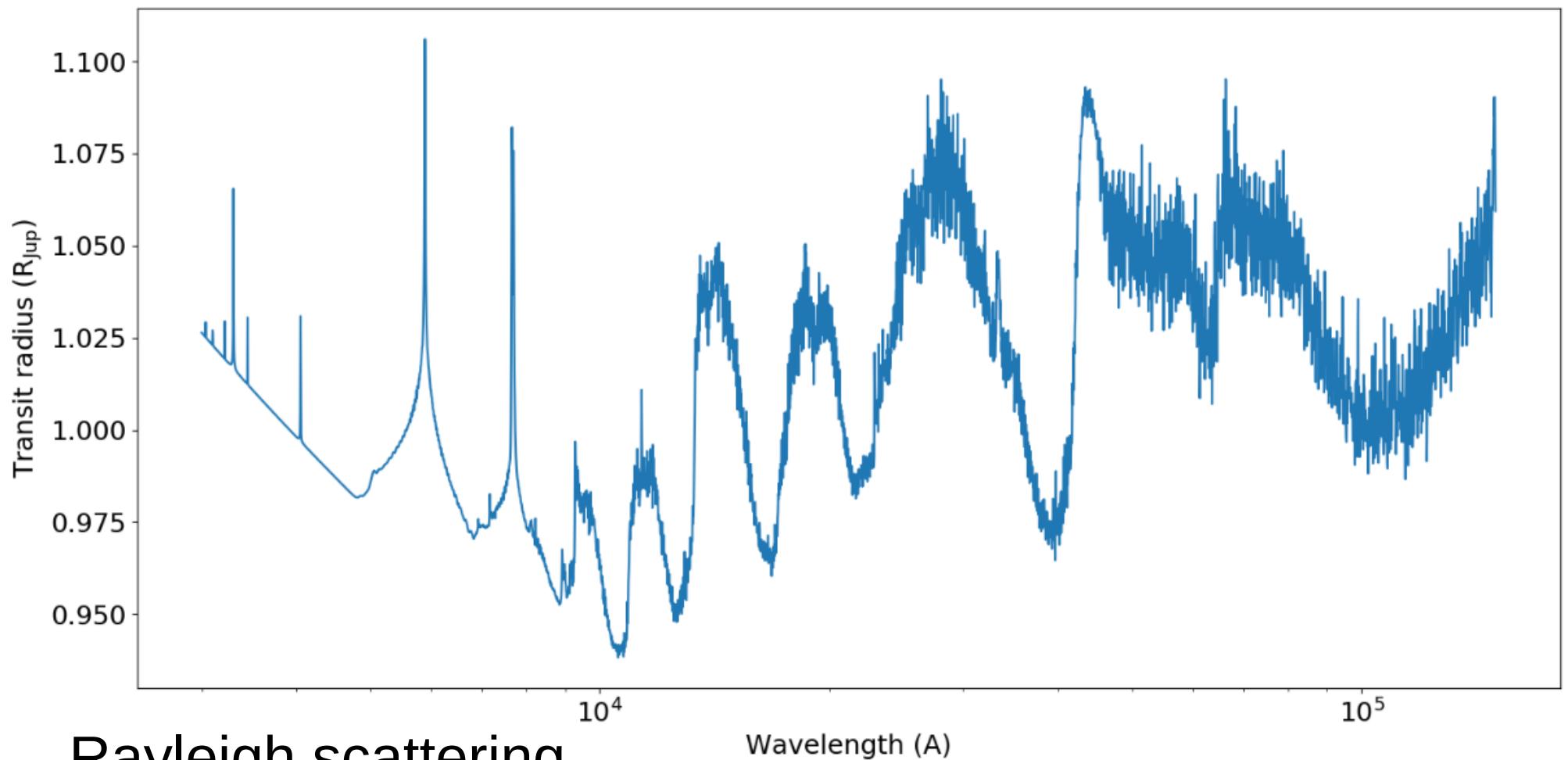
Rayleigh scattering
Strong features of alkali metals (Na, Ka)
Molecular bands (H2O, CO, CO2, CH4)

Caveat: starspots

$$\frac{R_p}{R_*} = \sqrt{\delta(1-\epsilon)}$$

image credit Helen Giles
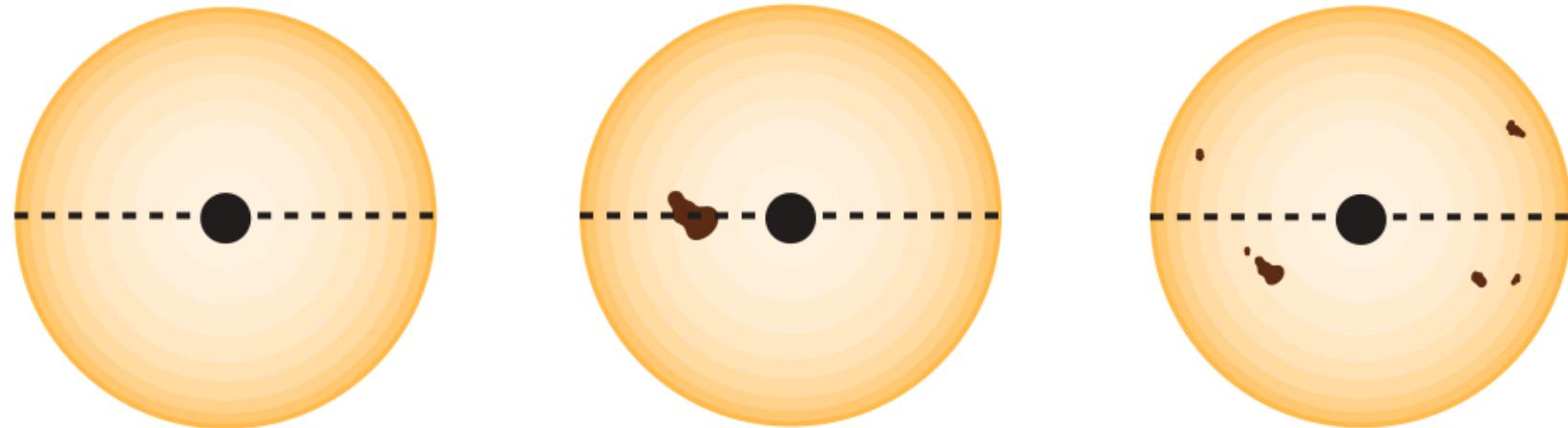
Spot crossing effect and Out Of Transit effect

Caveat: starspots
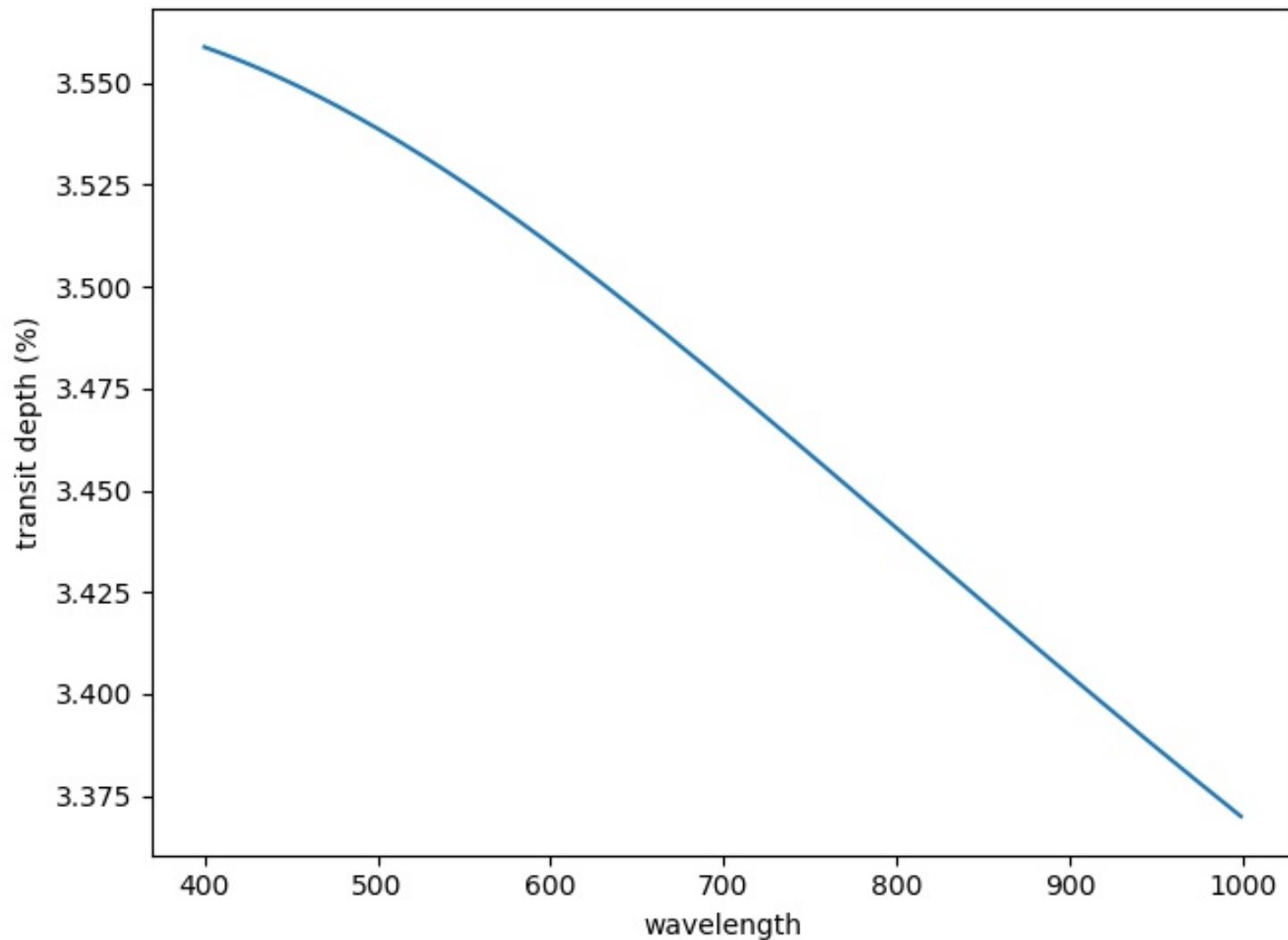
Atmospheres:
# transmission spectroscopy

Calculate from data:

Spectrum during transit / spectrum out of transit

Relative measurement, no absolute flux measurement. But spectral lines corresponding to absorbers in the planet's atmosphere will be deeper.

Atmospheres:
transmission spectroscopy

Charbonneau et al. 2002

Atmospheres:
transmission spectroscopy

Wyttenbach et al. 2015
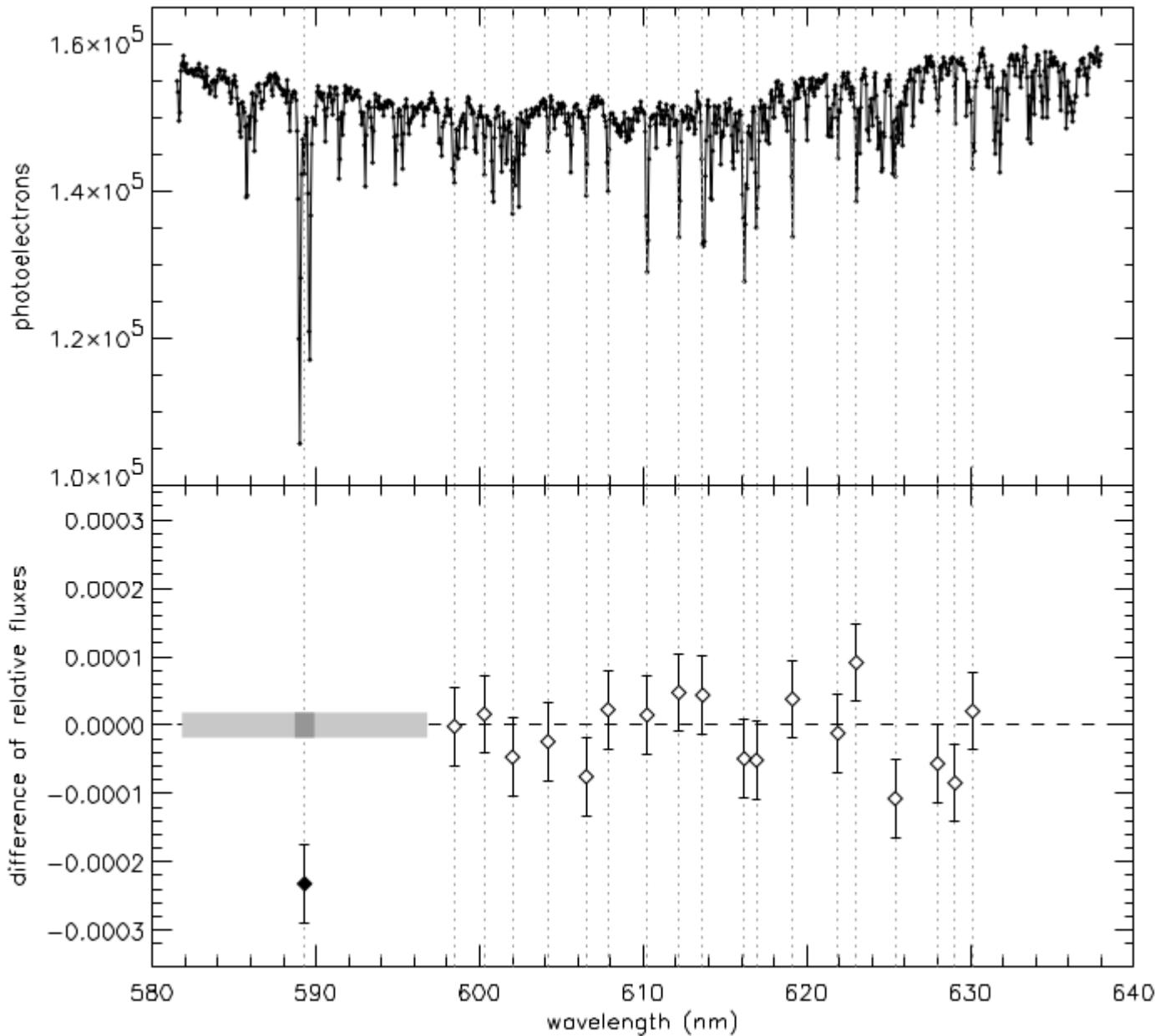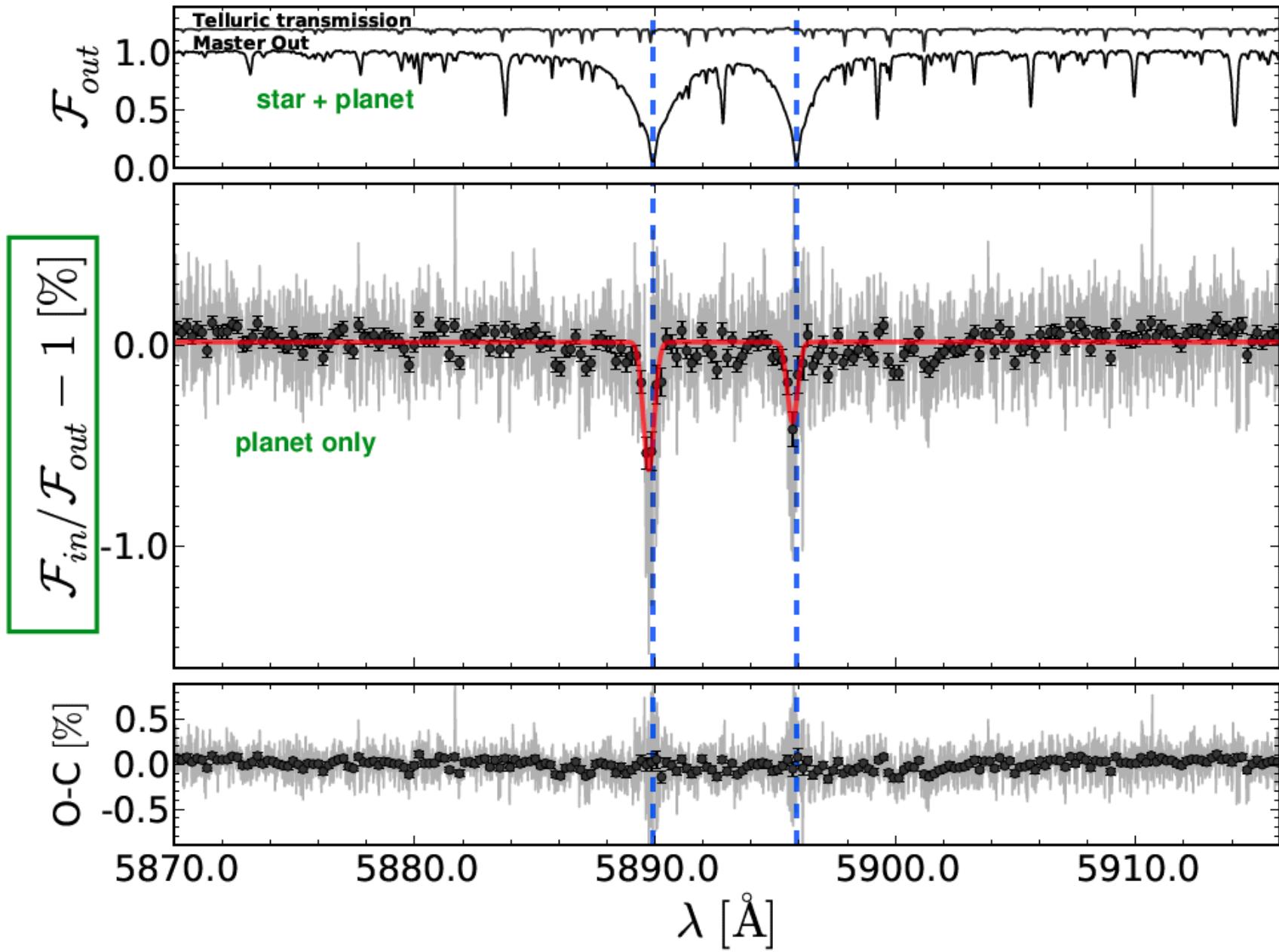
Atmospheres: transmission spectroscopy

Measures **excess absorption** compared to a spectrally flat ("grey") transit that reduces the flux by the same fraction everywhere in the spectrum.

Nortmann et al. 2018