Characterizing Transiting Hot Jupiter Atmospheres with Emission Spectroscopy

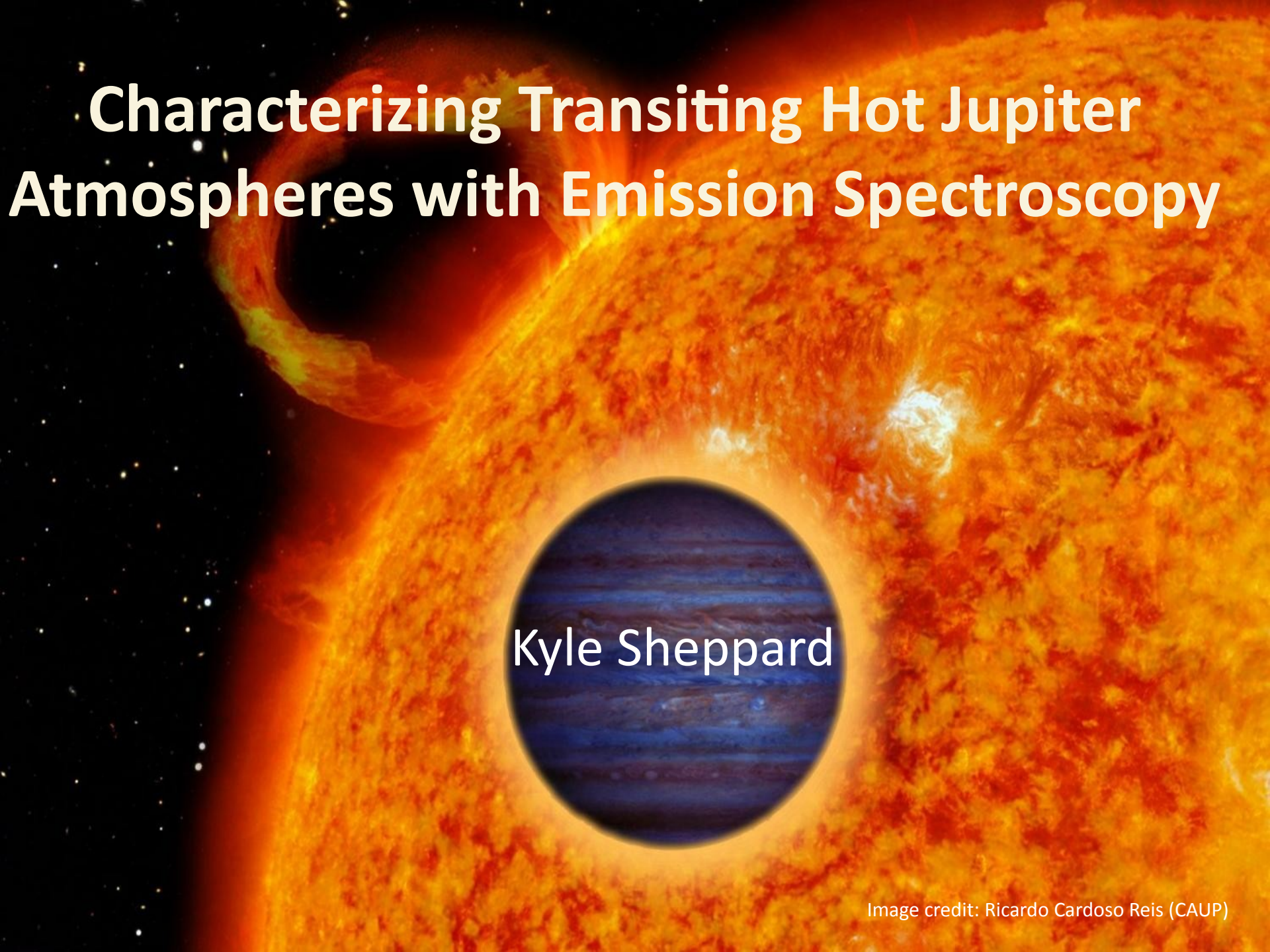

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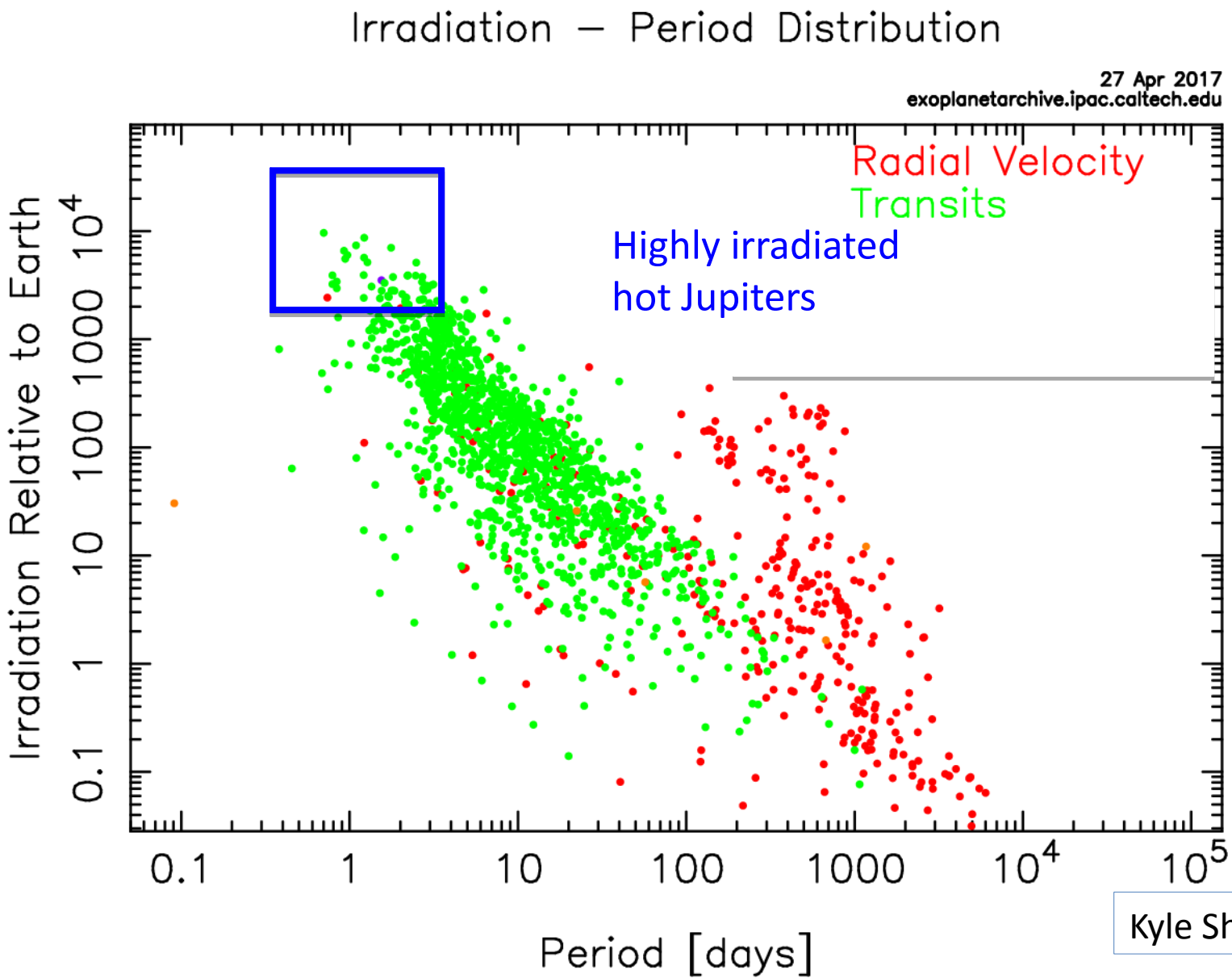
Image credit: Ricardo Cardoso Reis (CAUP)

Hot Jupiters are subject to extreme conditions not seen in our solar system



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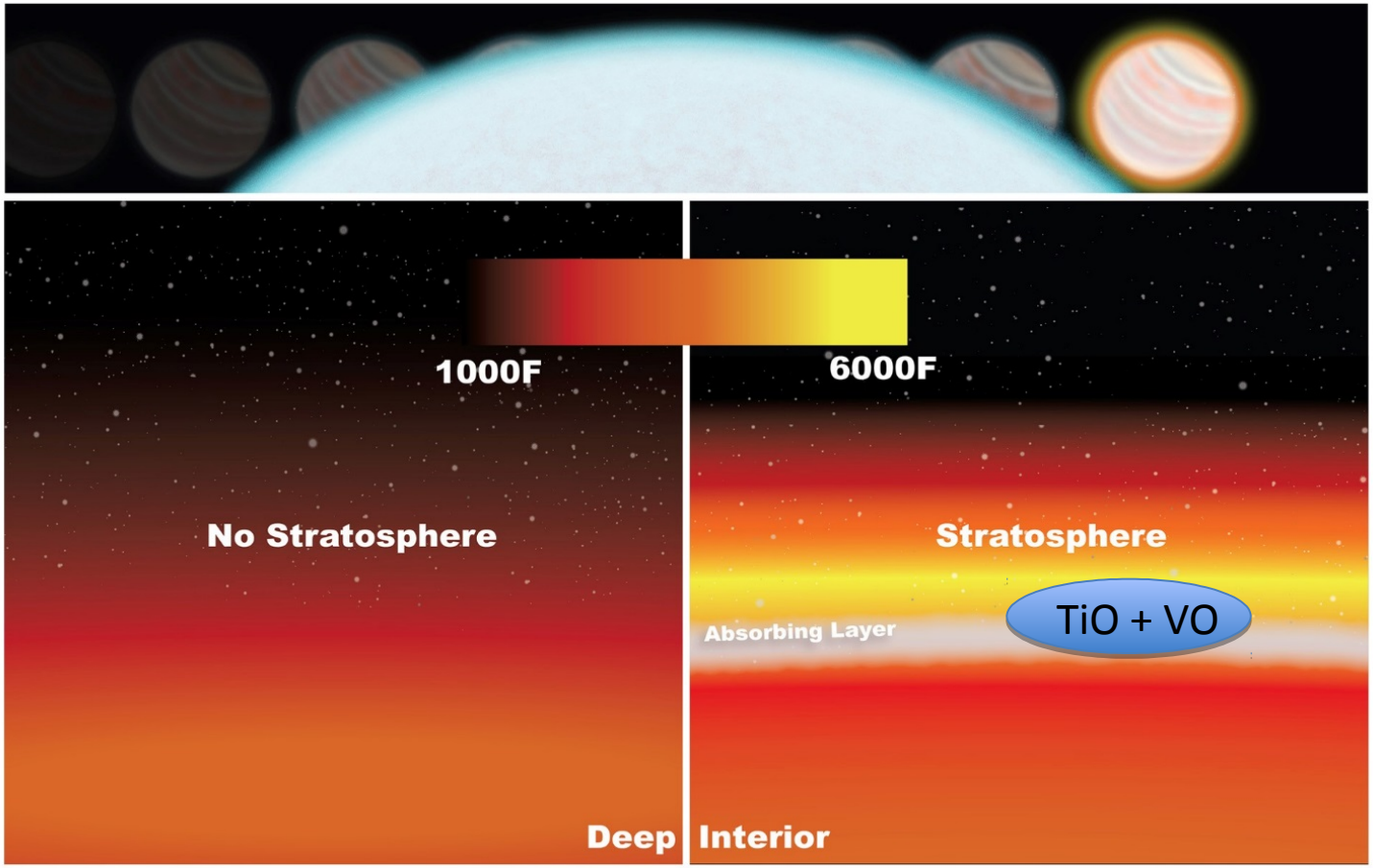
The thermal structure of an atmosphere contains information about its composition and dynamics



Credit: NASA/Goddard

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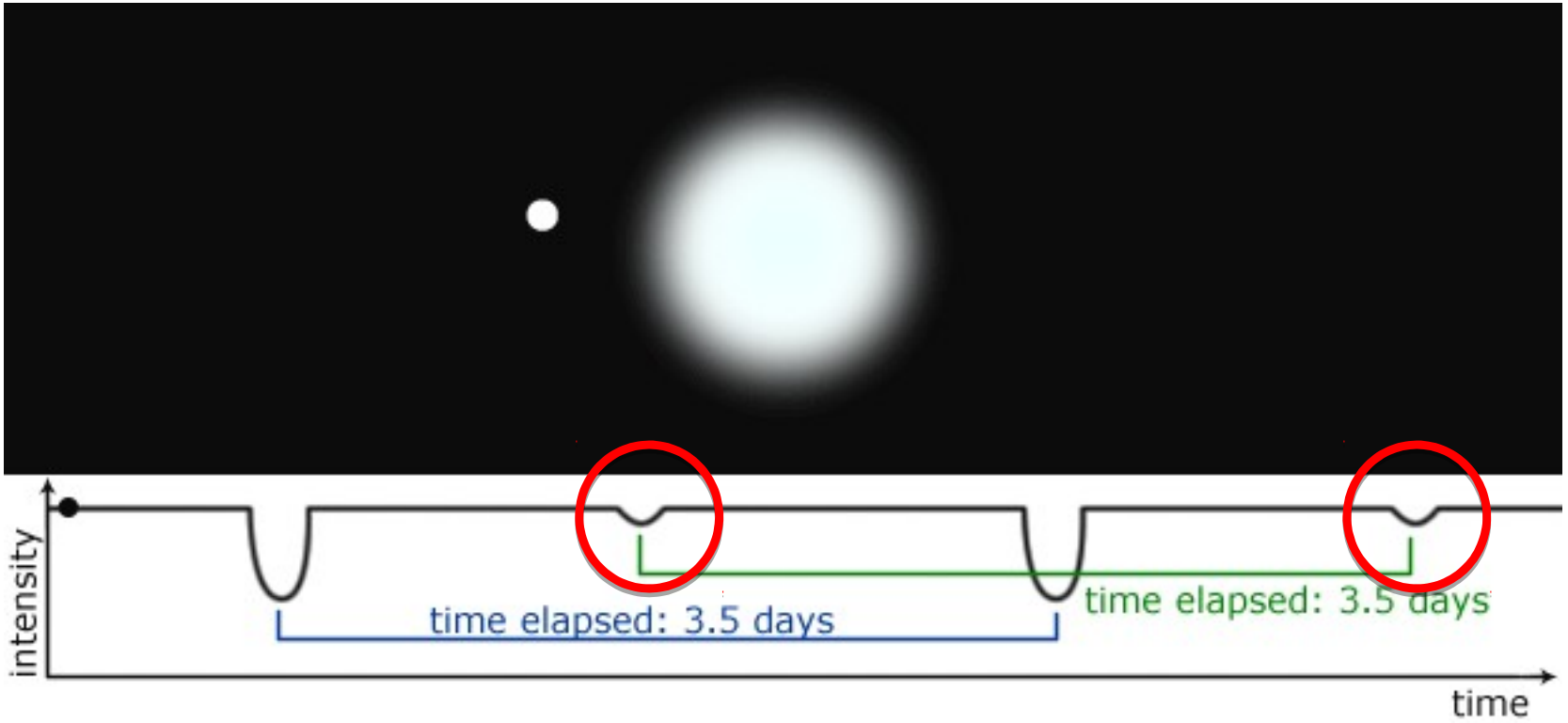
Secondary eclipses allow us to directly probe temperature structure and emission features of atmospheres



Eclipse depth = (planet flux / star flux) α B(Planet Temp)

Credit:
http://exoplanets.cofc.edu/transitsAndLightcurves.html

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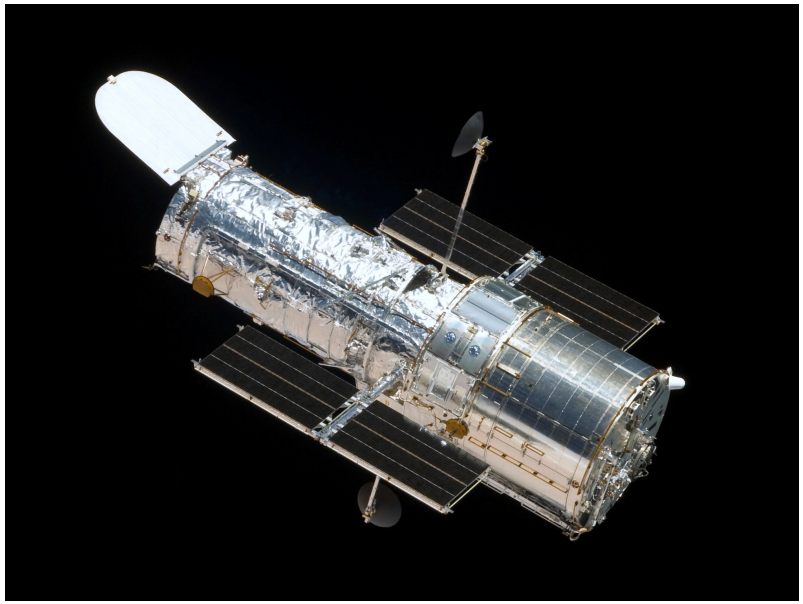
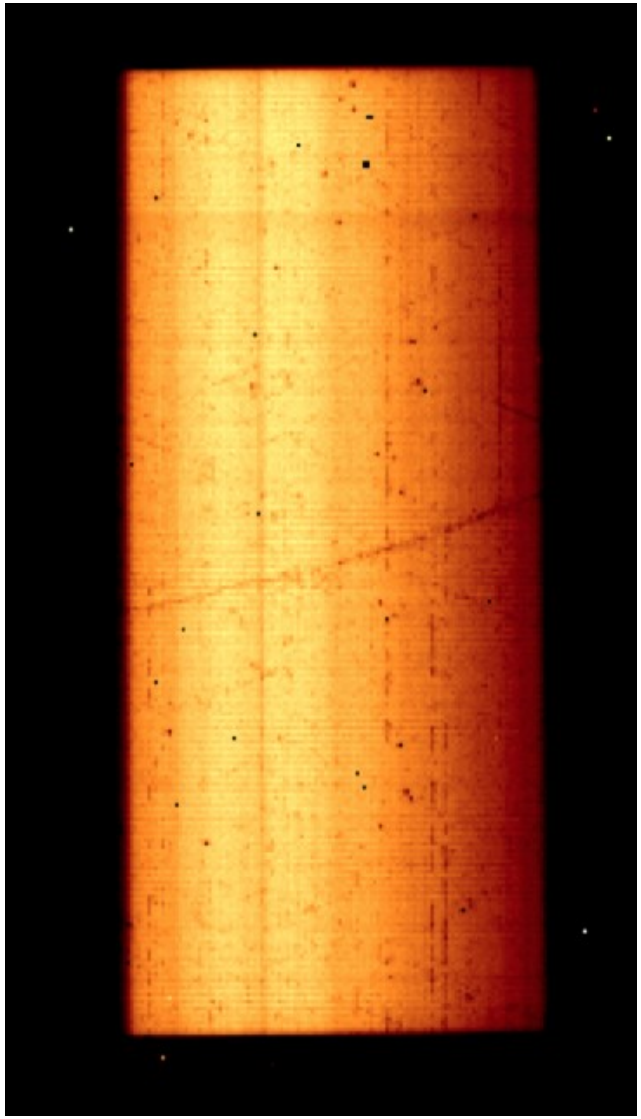
Wide Field Camera-3 on *HST* probes the prominent 1.4 micron water band



Hubble Space Telescope
(Credit: NASA)

Scan direction



Wavelength

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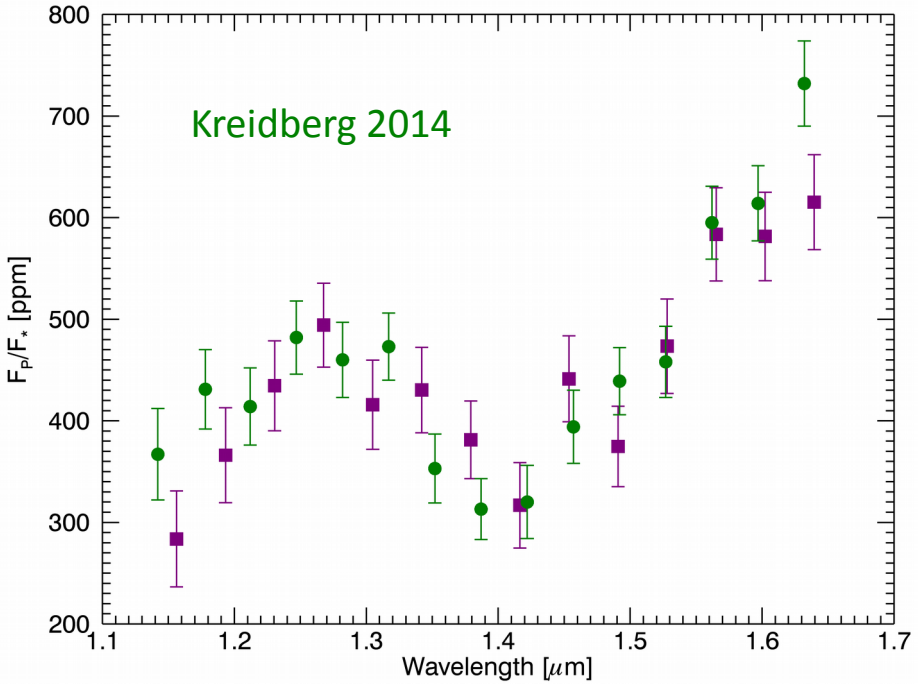
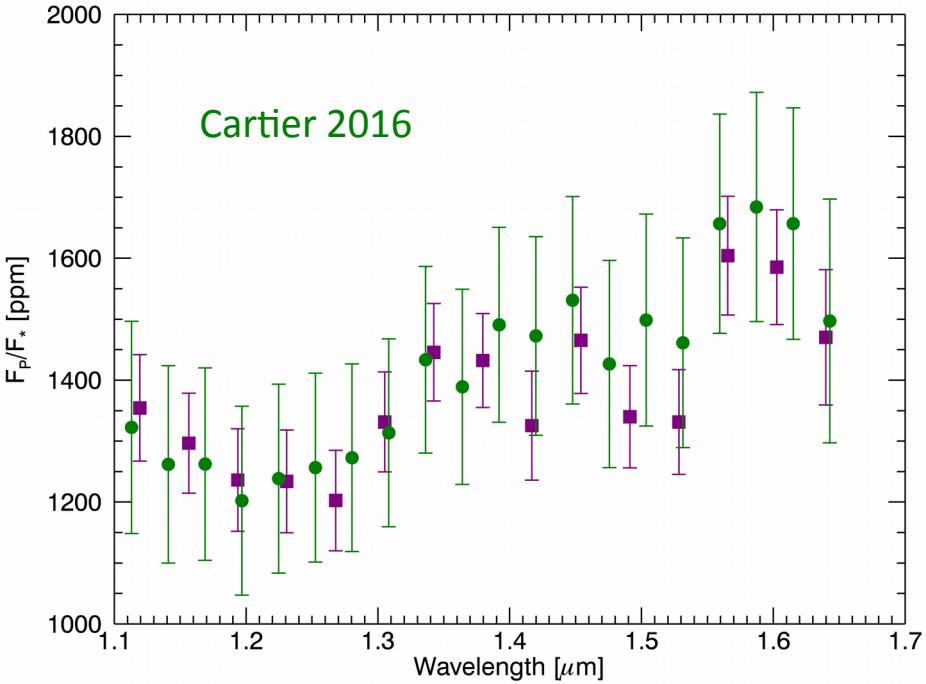
We are able to reproduce spectra from two very different analysis methods

WASP-43b (water absorption)



WASP-103b (flat)



Our spectra

Published spectra

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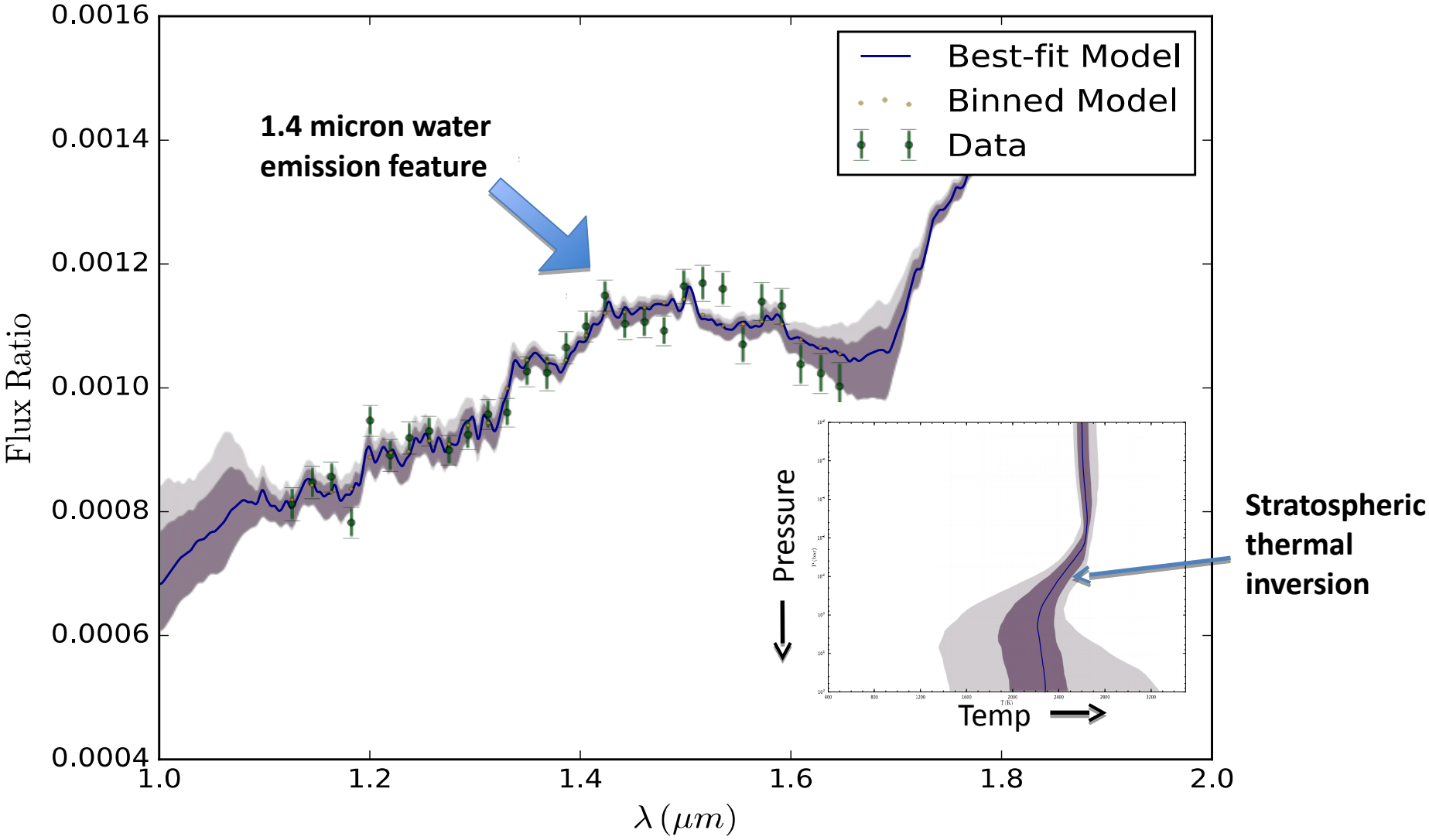
Emission spectrum and T-P profile of WASP-18b give evidence of H_2O and optical absorbers (TiO, VO)



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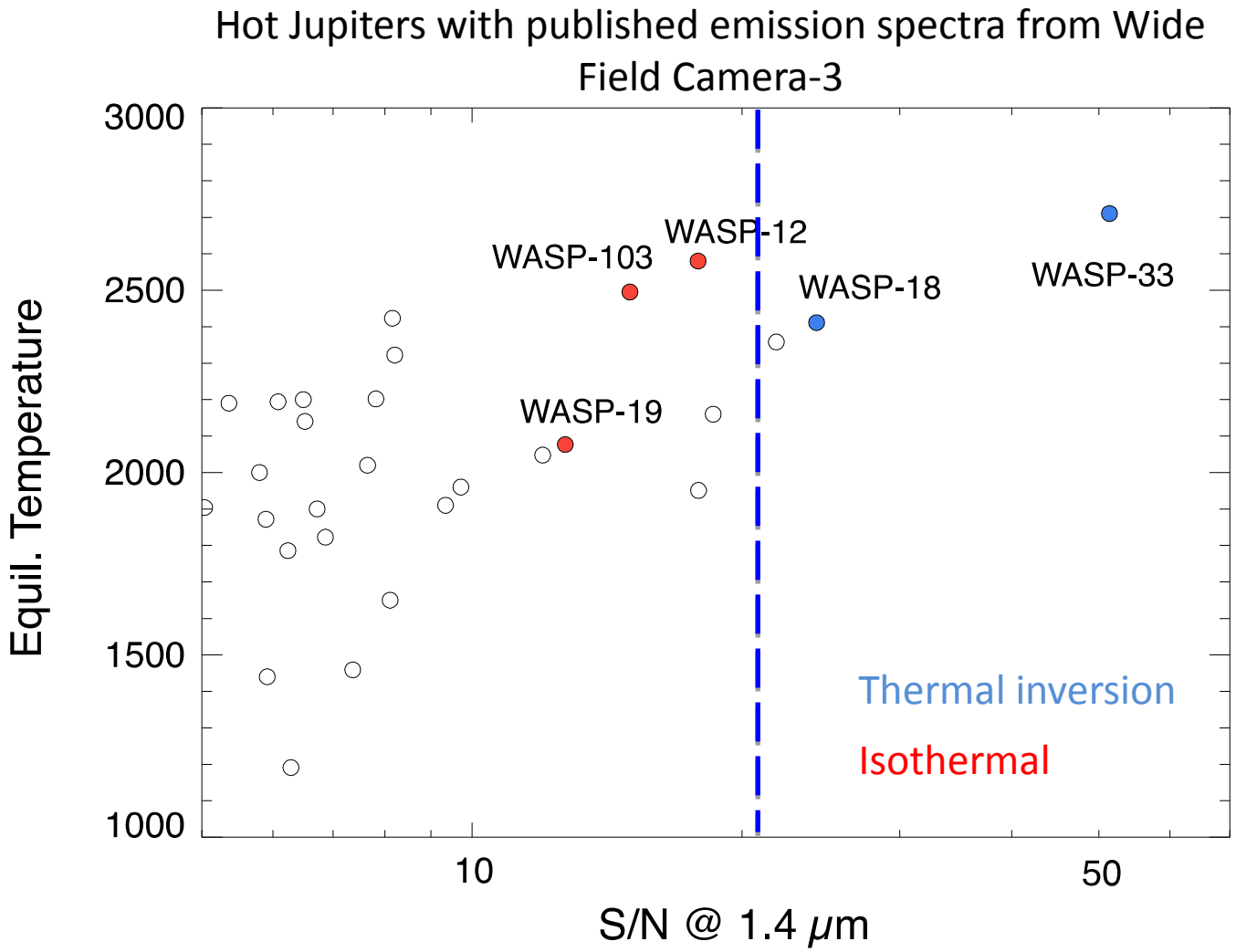

Higher S/N observations needed to appropriately investigate the nature of thermal inversions

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Summary and Implications

- WASP-18b is the 2nd hot Jupiter with spectroscopic evidence of a thermal inversion
- Secondary eclipse observations of WASP-18b show strongest evidence of a water emission feature to date

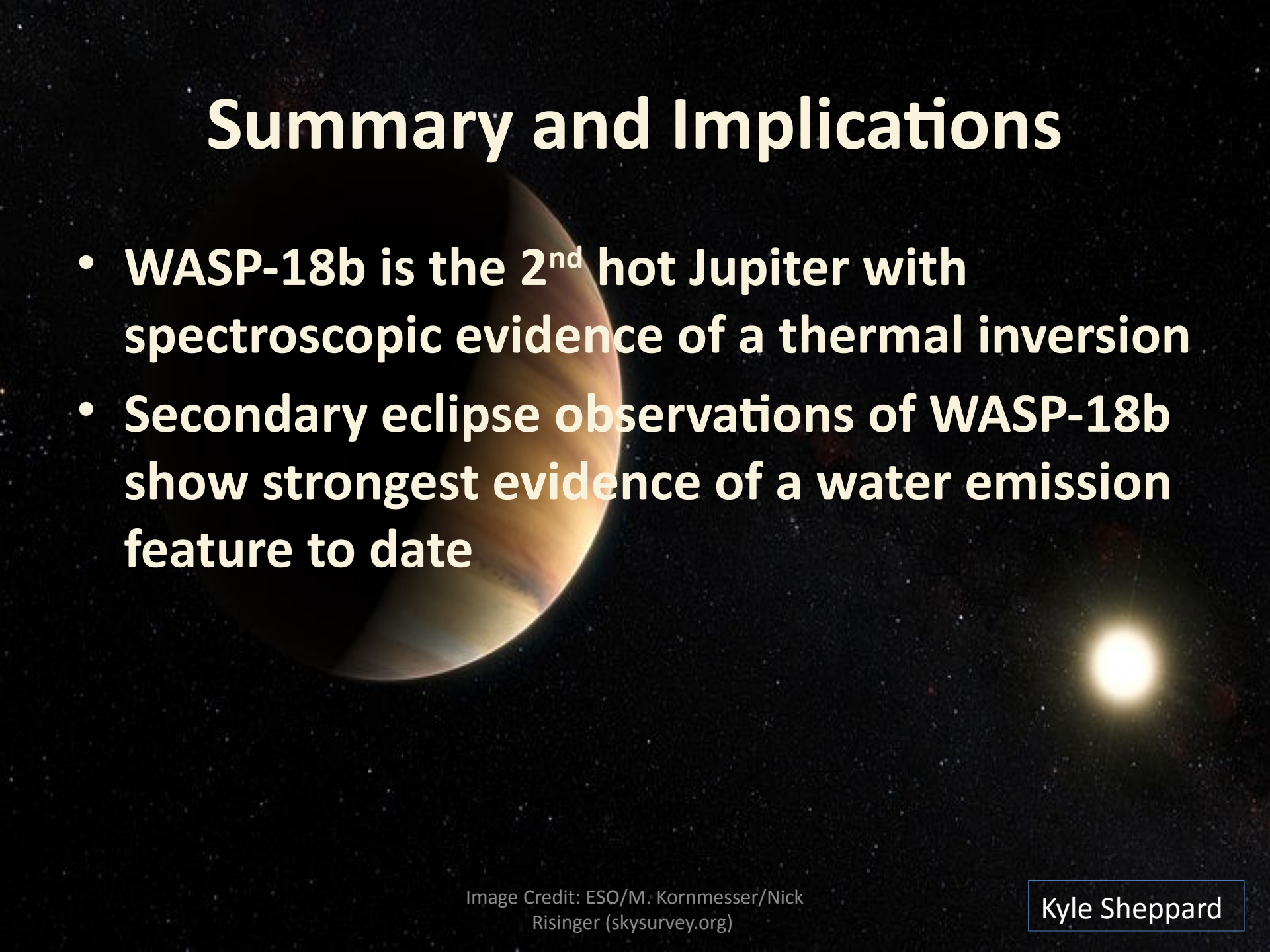

Image Credit: ESO/M. Kornmesser/Nick Risinger (skysurvey.org)

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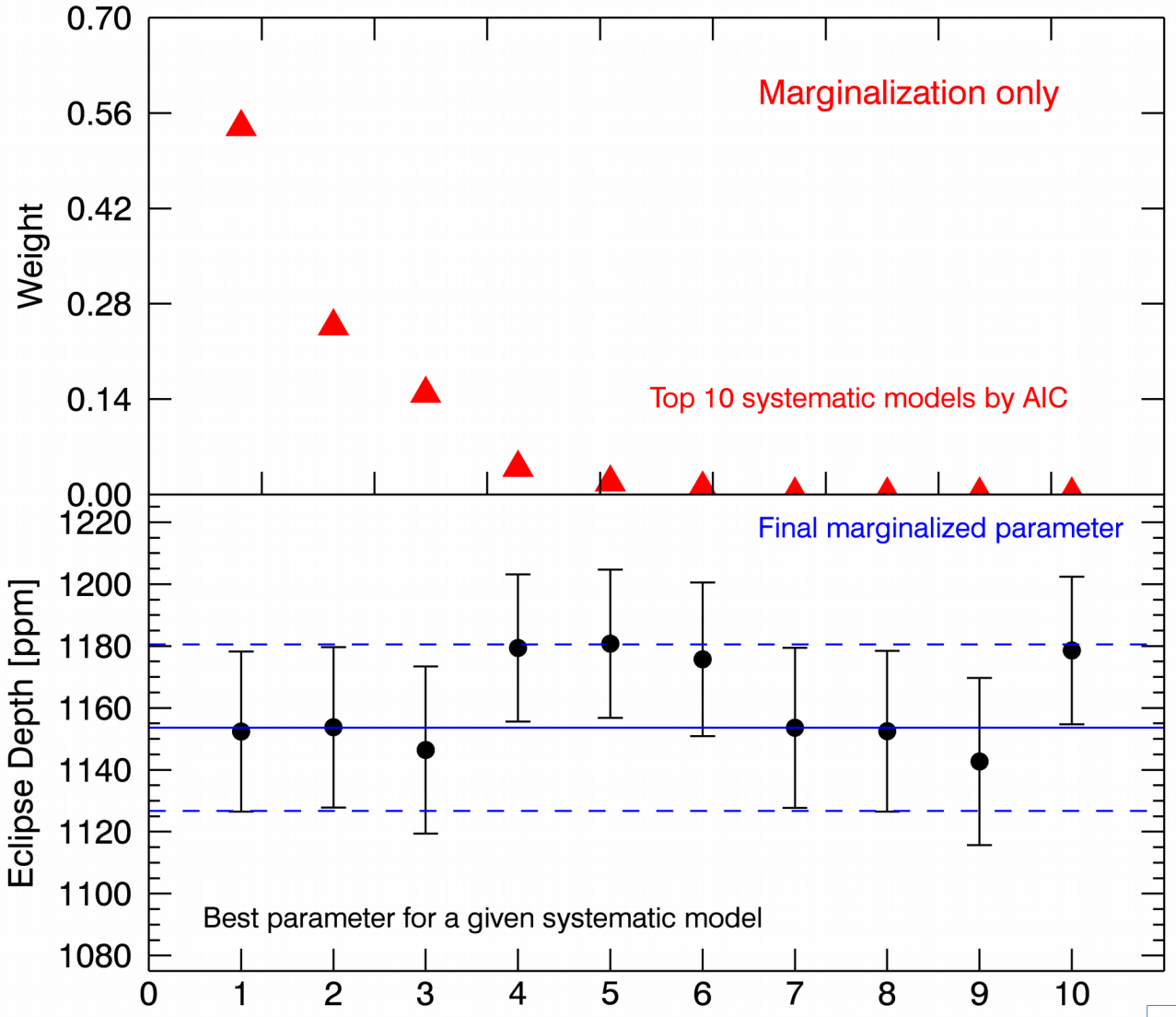
Marginalization removes the need for model selection



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