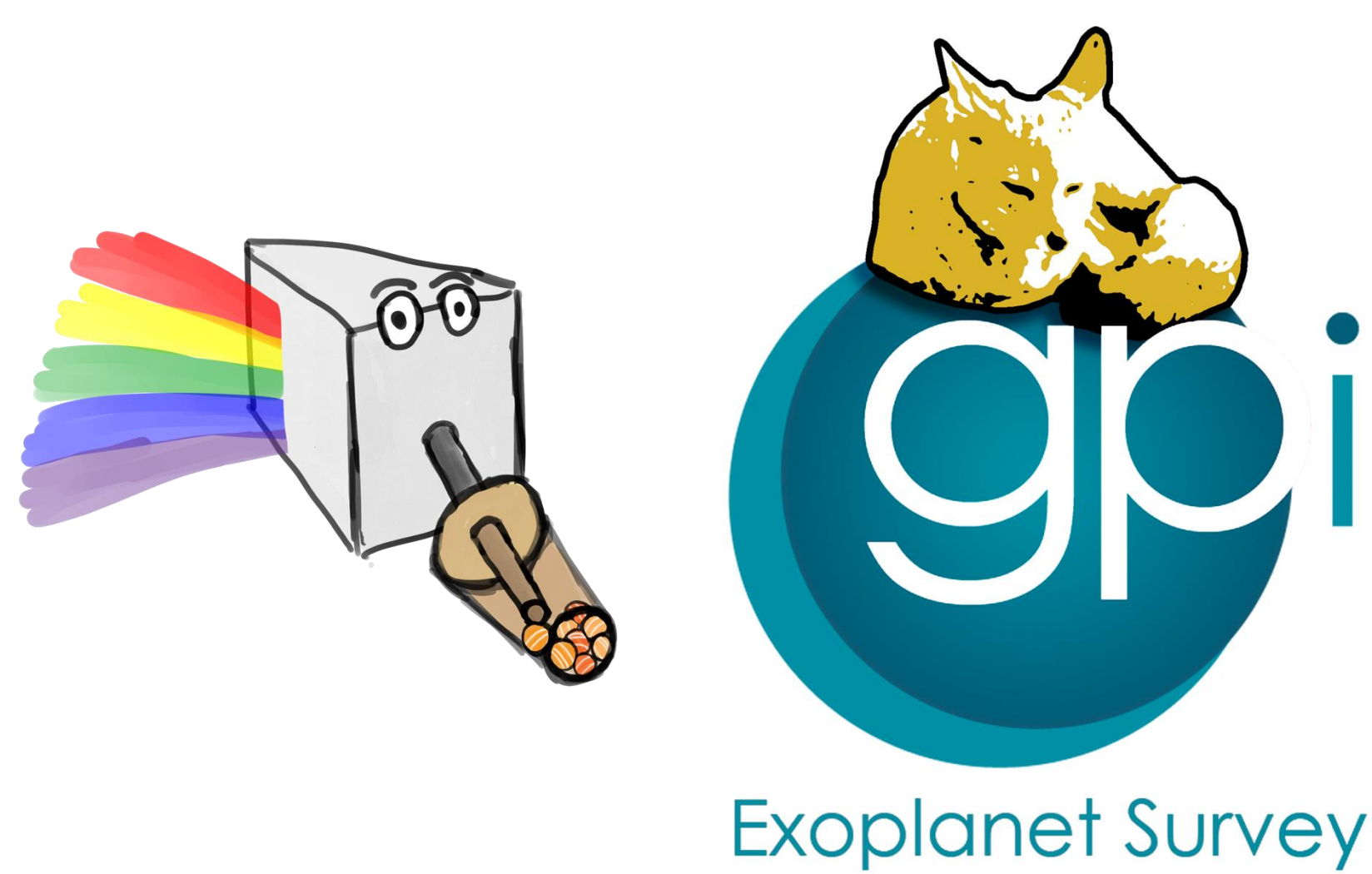




The Gemini Planet Imager Exoplanet Survey: New Planets in Old Data

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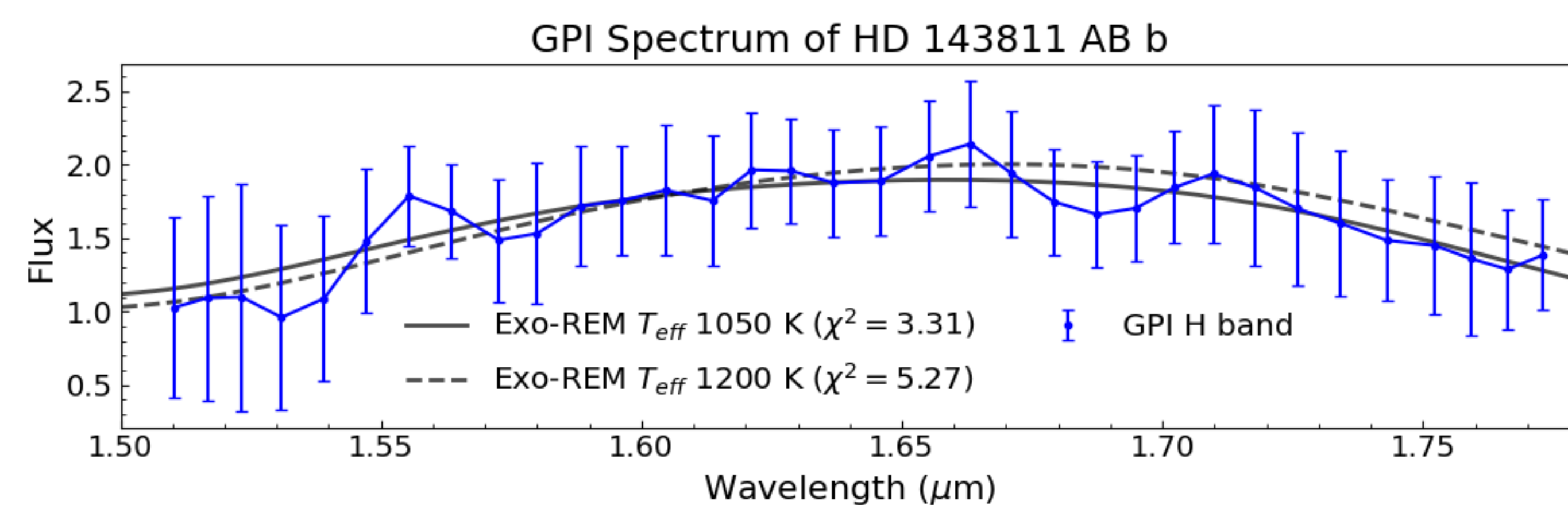


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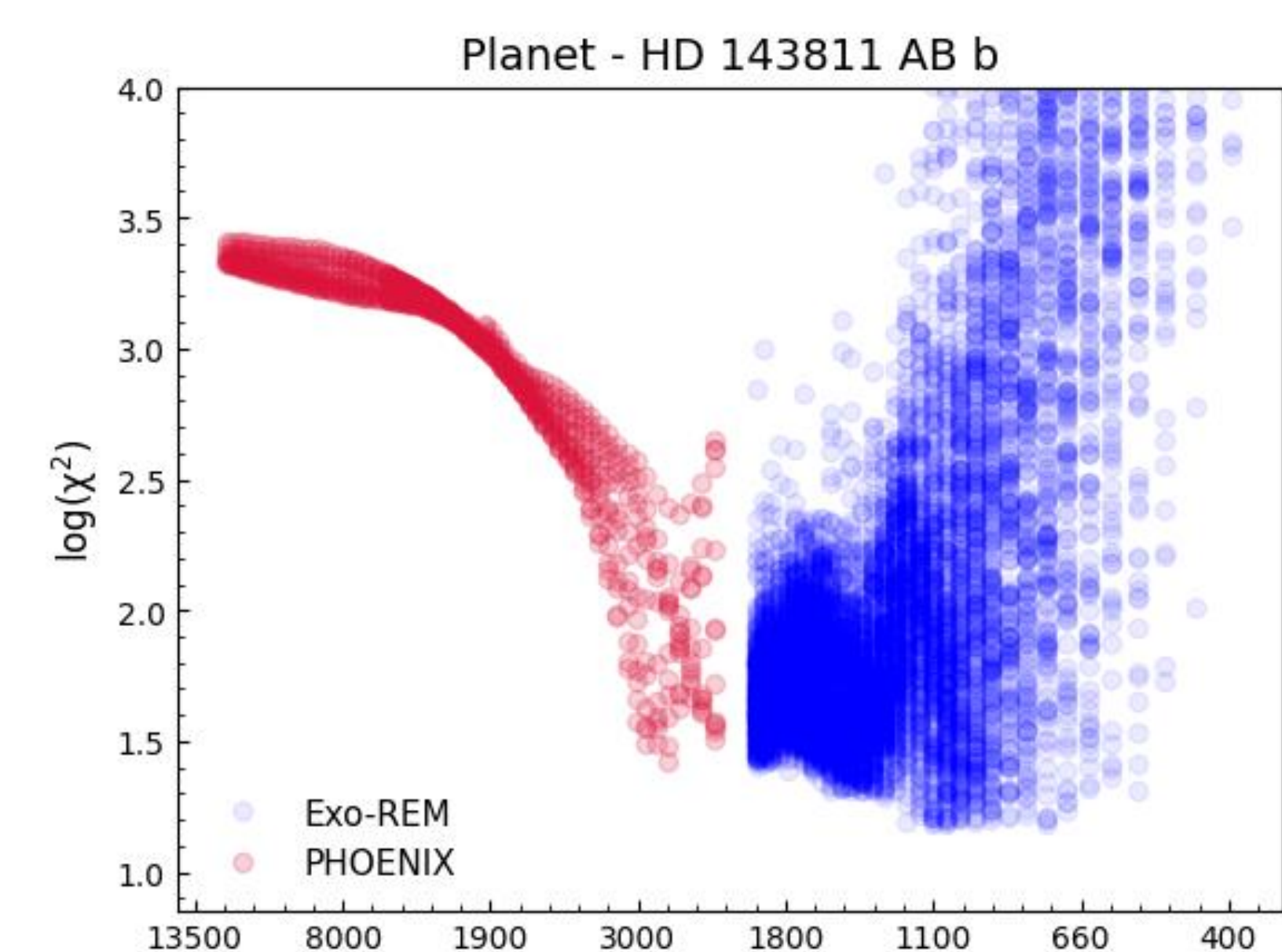
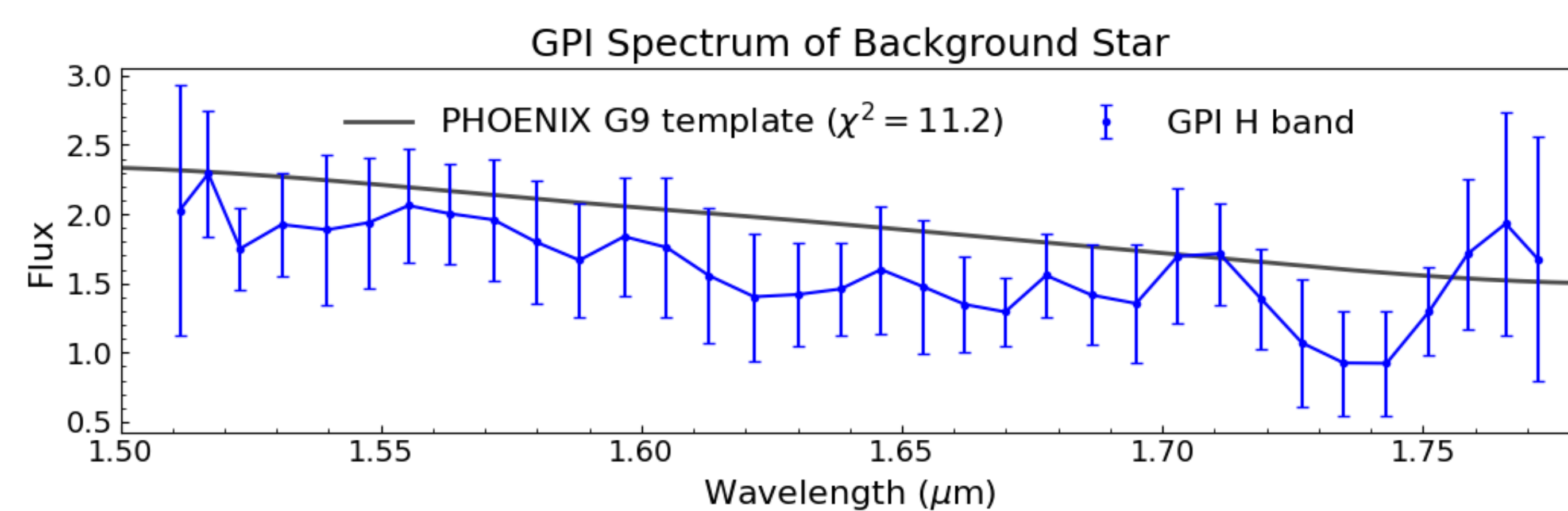


The GPI Exoplanet Survey:

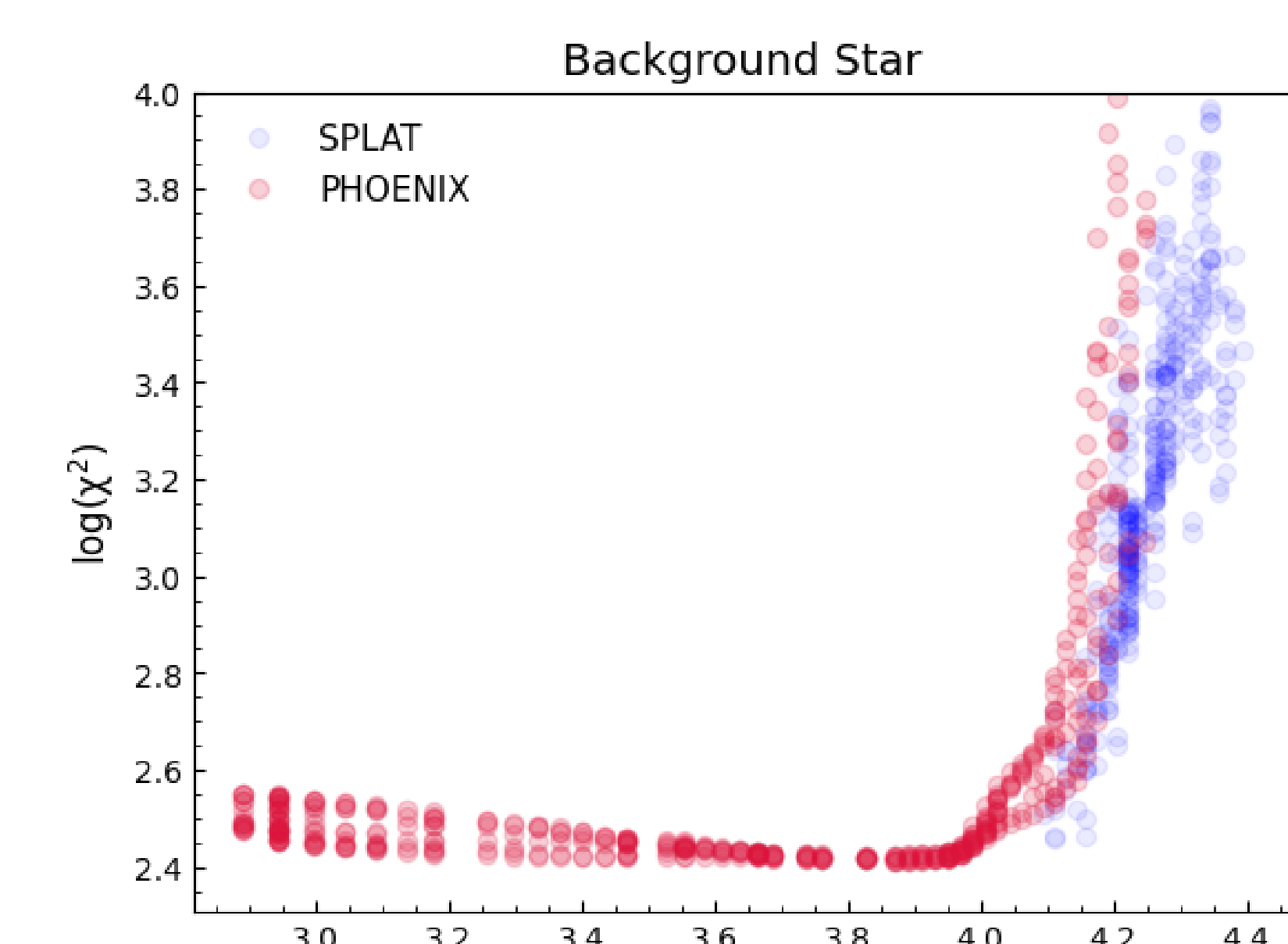
- The Gemini Planet Imager (GPI) was a high-contrast imaging instrument to directly detect exoplanets and obtain spectra of their atmospheres (Macintosh+2014).
- GPI was at Gemini South in Cerro Pachón, Chile before being moved for planned upgrades. GPI 2.0 will move to Gemini North, Mauna a Wakea, Hawai'i next year (Chilcote+2024, Marois+2024).
- The survey targeted 600 young, nearby stars in a systematic search for giant planets between 2014 – 2019.
- GPI was sensitive to self-luminous planets in IR, 10-100 au from their host star along with debris disks.
- The first half of the survey showed that giant planets are relatively rare beyond 10 au and their occurrence rate is related to host star mass (Nielsen+2019).



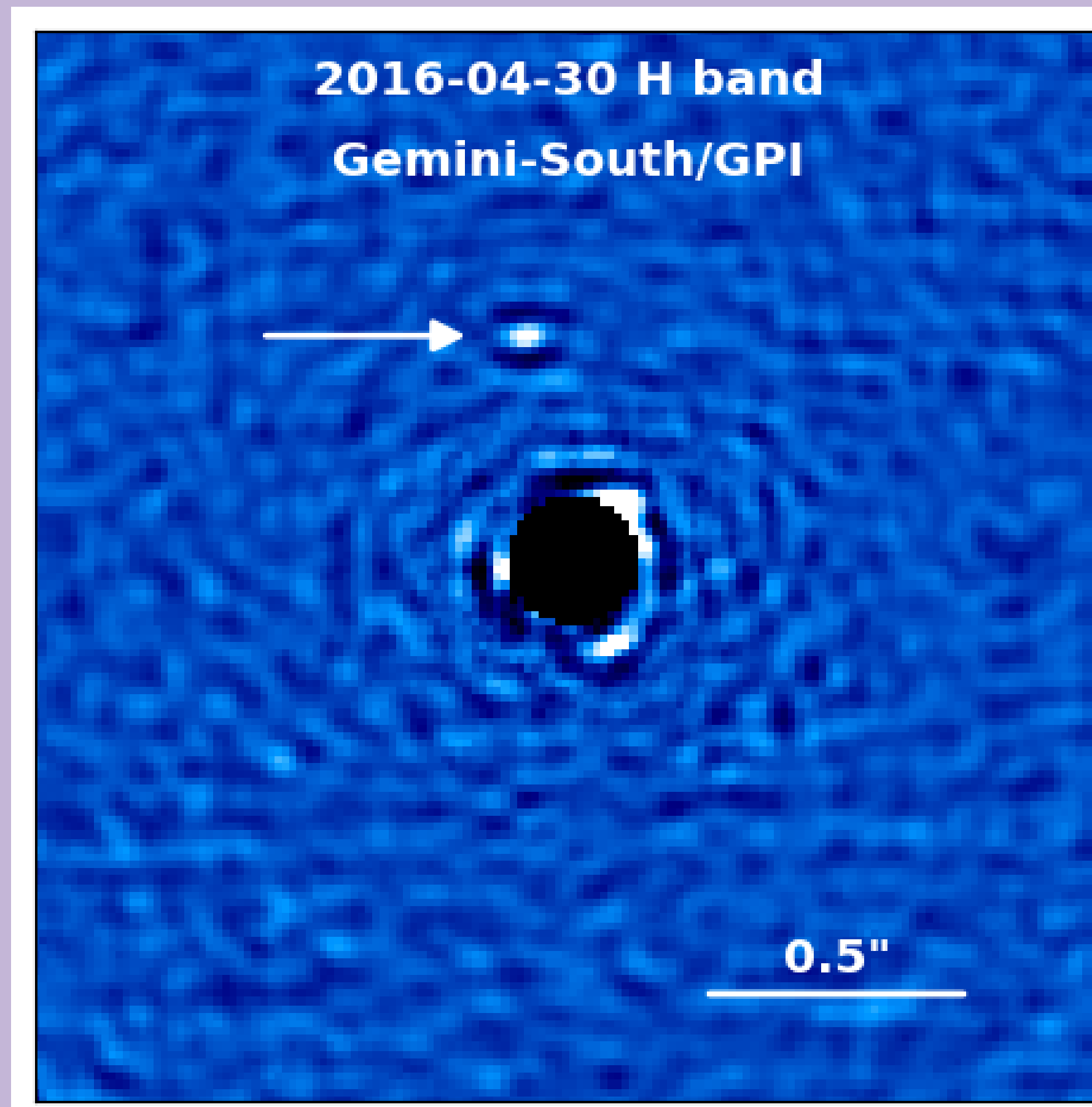
The GPI spectrum of a real planet (above) versus the spectrum of a background star (below). Exo-REM planet atmosphere models fit the planet well while PHOENIX stellar models match the star.



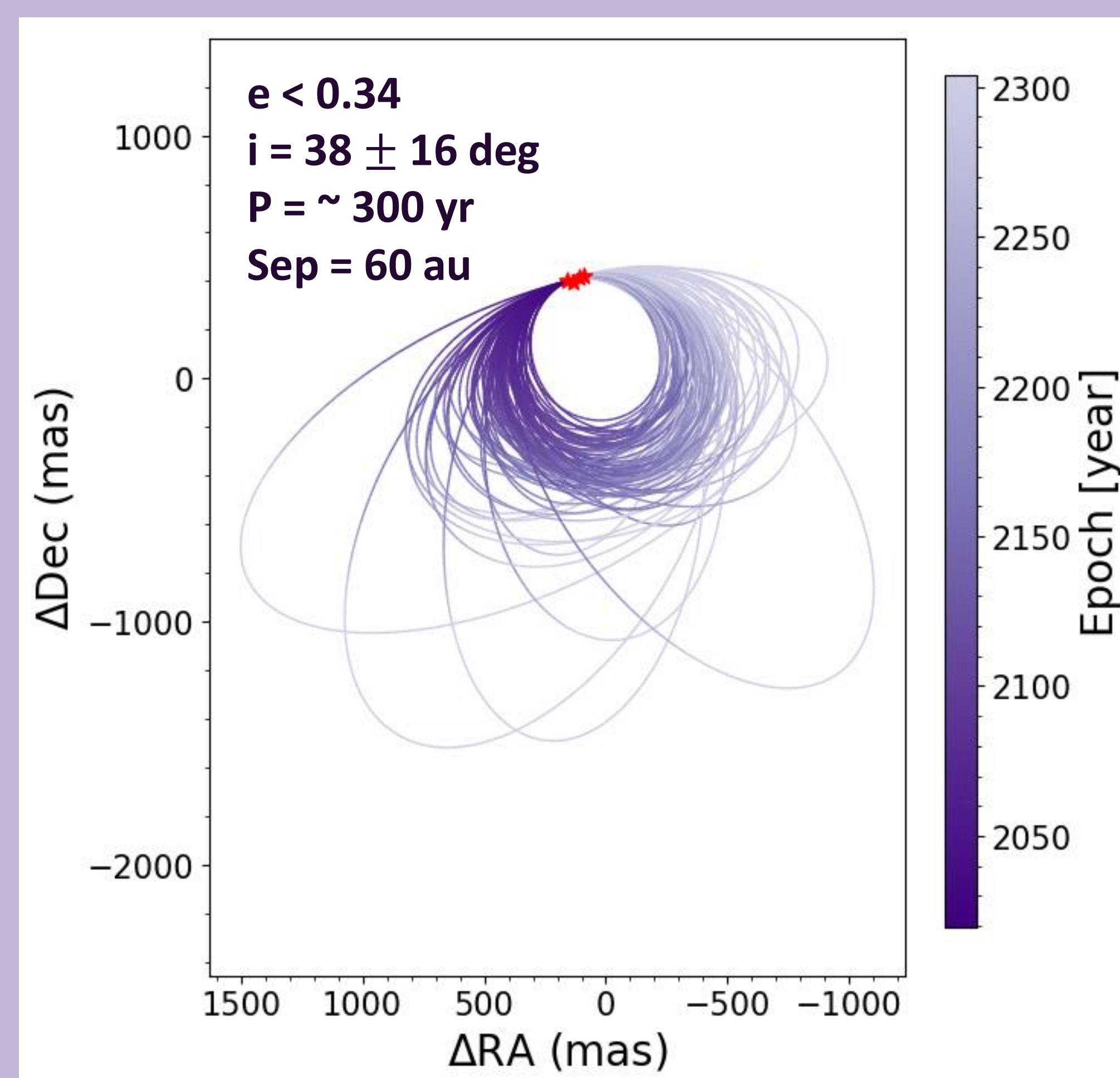
Examples of spectral comparisons to GPI spectra of a real planet (above) and a background star (below). We utilize PHOENIX (Husser+2013) and ExoREM (Charnay+2018) models. Additionally, empirical spectra from SPLAT (Burgasser+2017).



HD 143811 AB b:

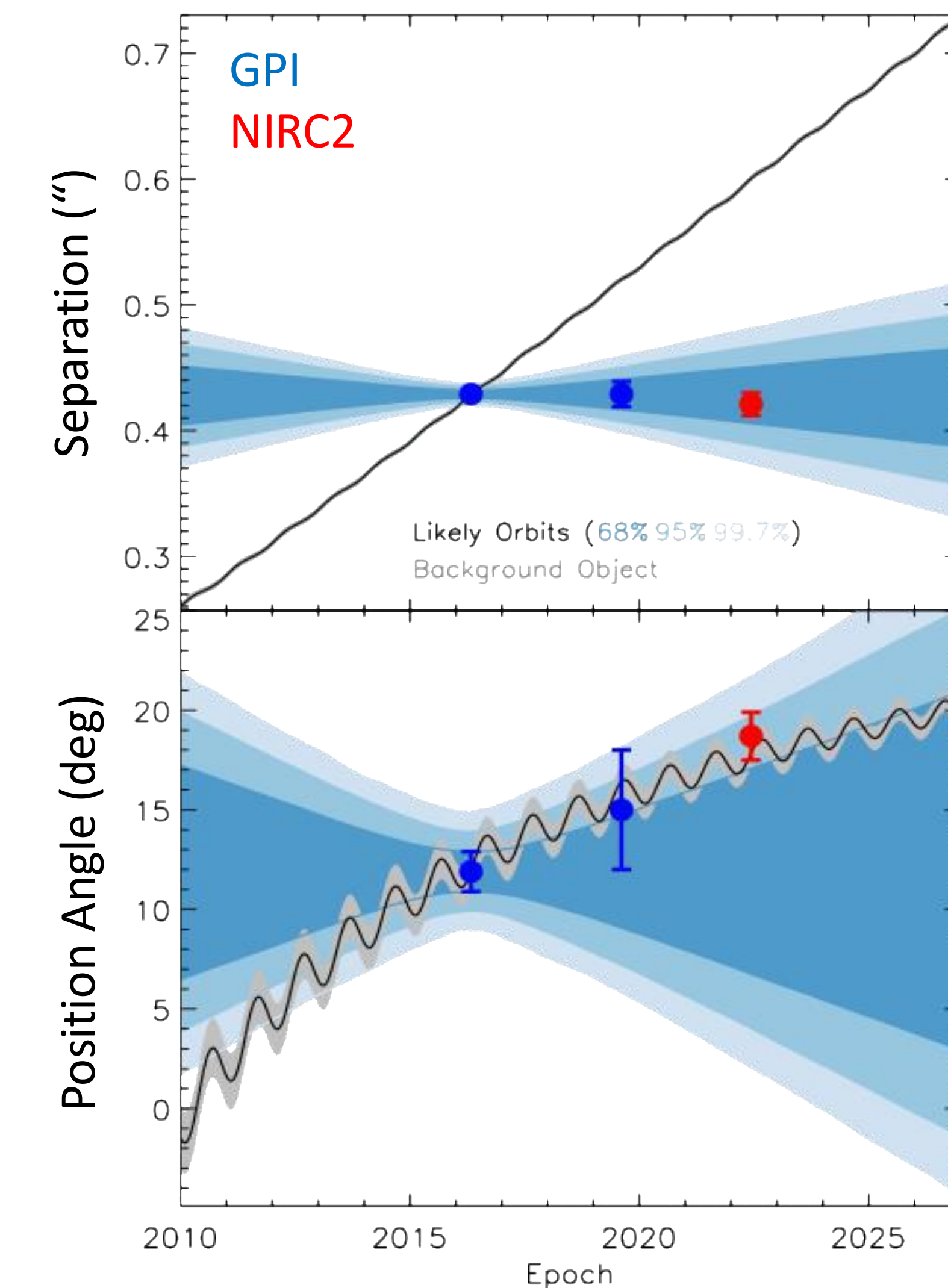
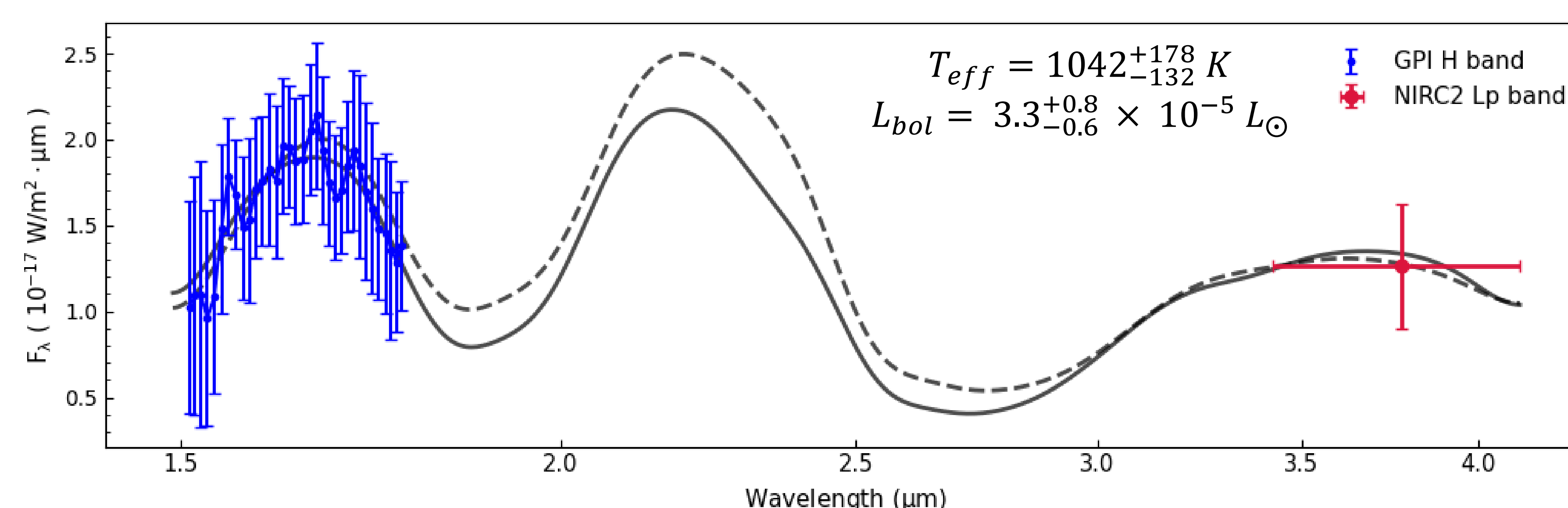


- We utilize 2 epochs of GPI *H* band data (above) and an additional epoch from Keck NIRC2 in *L'*.
- Using hot-start evolutionary models, we derive a planet mass of $5.6 \pm 1.1 M_{Jup}$.
- The planet orbits a spectroscopic binary and is one of only a few directly imaged planets orbiting binary stars.



Fit with Orbitize! (Blunt+2019, Blunt+2024)

GPI spectrum plus NIRC2 photometry (below).



Astrometric measurements of HD 143811 AB b allow us to use common proper motion to confirm it as a planet (De Rosa+2015). Positions oriented along the grey line indicate a background object. Data points within the blue region indicate it is a bound planet.

Survey Results:

- Final vetting and re-analysis of GPI data yielded about 12 candidate companions.
- Using spectral comparisons ruled out 5 as background stars.
- Confirmed HD 143811 AB b as a real planet.

Current and Future Work:

- Complete vetting of remaining candidates in GPI data.
- Produce contrast curves for GPIES using final false-positive rate.
- Continue monitoring the orbit of HD 143811 AB b and obtain further spectral coverage.

Mahalo Nui (Acknowledgements):

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