The first mid-IR emission spectrum of an ultra-hot Jupiter

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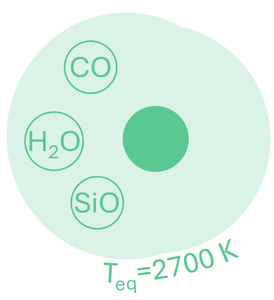
Introduction: WASP-121 b



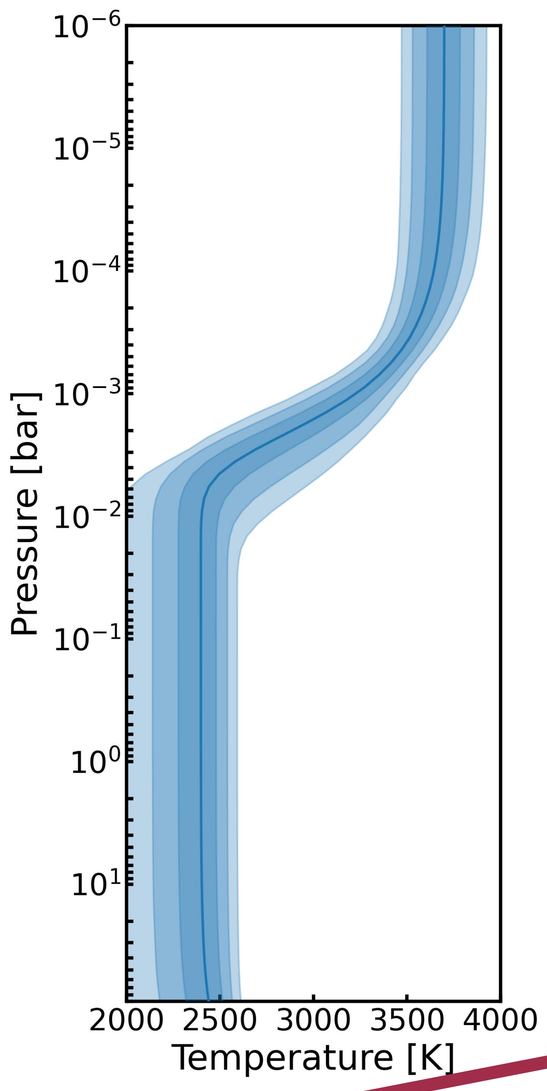
WASP-121b is an **ultra-hot Jupiter** that orbits an F star. Such extreme dayside temperatures vaporize **refractory species**, giving us a unique opportunity to measure the refractory-to-volatile ratio. This provides an important benchmark for planet formation models.

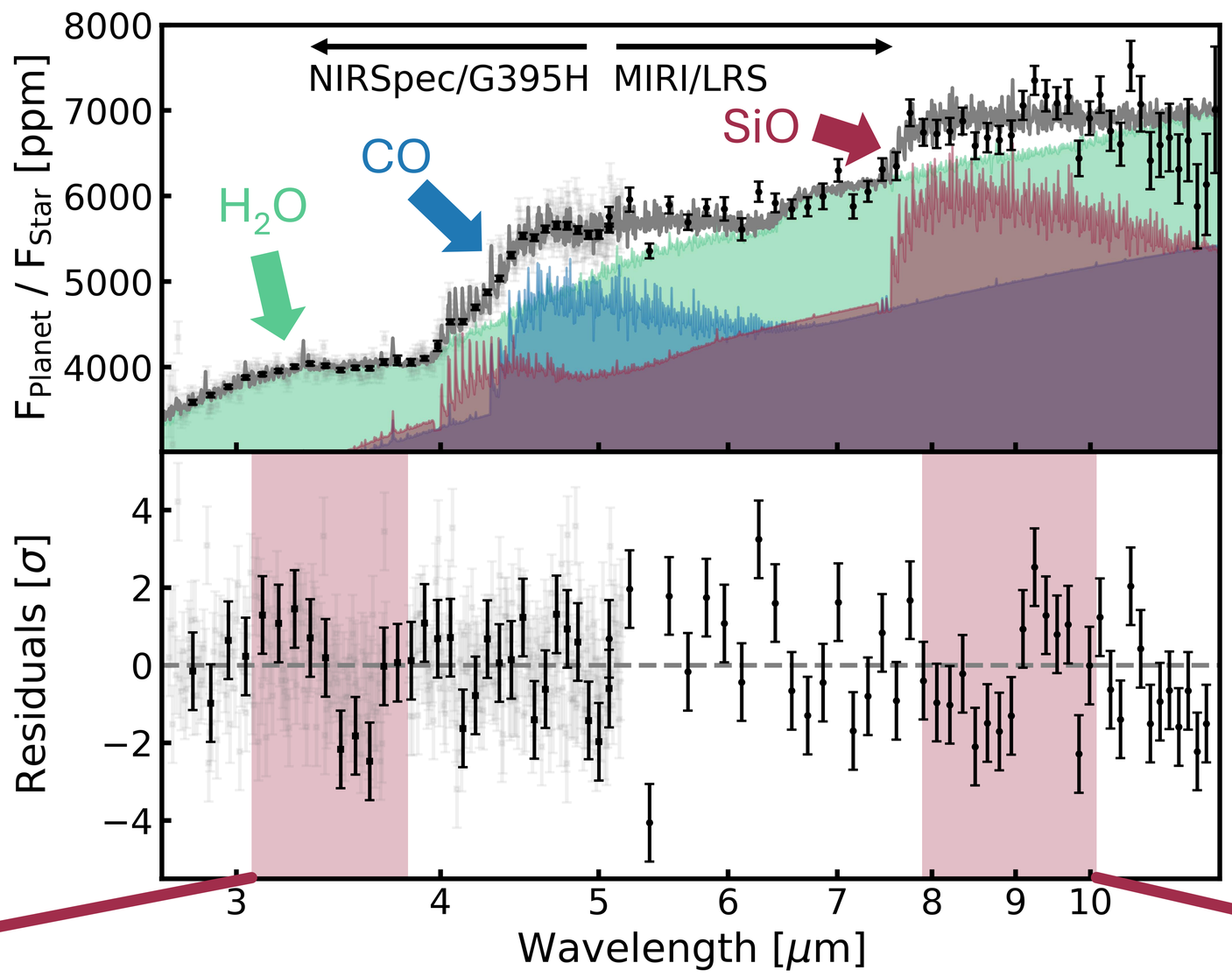
Observations with JWST MIRI/LRS

The refractory species **SiO** was detected with JWST NIRSpec/G395H on the planet's dayside (Evans-Soma et al. 2025; Gapp et al. 2025). We analyze **one secondary eclipse** observed with **JWST MIRI/LRS**, which contains another strong SiO band at 8-10 μm.

These data will refine the SiO constraints – but what else will they reveal?

SiO is detected on the dayside of WASP-121 b - [Si/O] is under construction





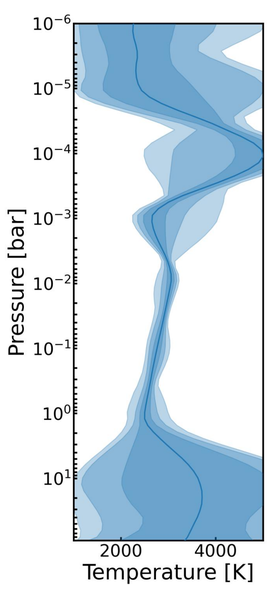
We model the spectrum using **petitRADTRANS** (Mollière et al. 2019) and **detect CO**, **H_2O**, and **SiO** signatures in the gas phase.

The displayed model shows a cloud-free atmosphere in chemical equilibrium. We use scaled solar abundances and a Guillot T-P profile.

While this model fits the data reasonably well, we see some mismatches at 3.5 μm and 9 μm. **We need to understand these deviations to measure the refractory-to-volatile ratio accurately!**

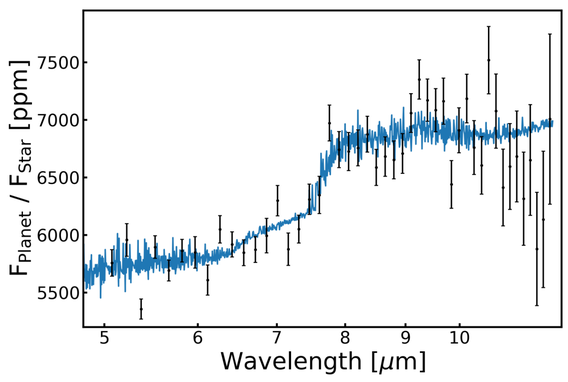
But what causes these residuals? Place your bets now!

Temperature profile



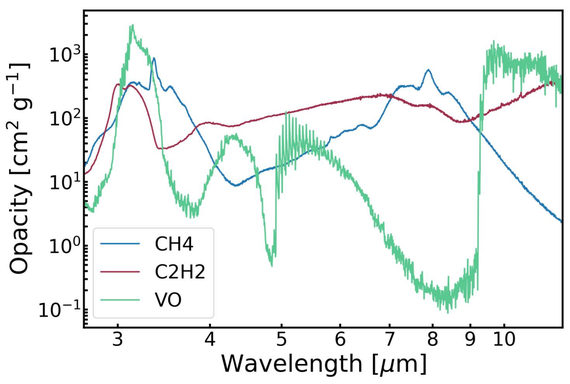
A Guillot T-P profile might be too simple for JWST data. A flexible profile fits the data better but requires some regularization.

Nightside clouds on the dayside



Silicate clouds can reproduce the MIRI/LRS data. But could those clouds even exist on the hot dayside of WASP-121b?

Different gas phase species



Our models could miss a relevant gas-phase emitter. If you have an obvious candidate in mind, please add it to the idea box!

Nothing, maybe it's just noise

Of course, this is an option. More observations could clarify this.

Add your ideas:

Bets:

Bets:

Bets:

Bets:

References

- **Mollière, et al. 2019**, *A&A*, 627, A67
- **Evans-Soma, et al. 2025**, *Nat. Astron.* 9, 845-861
- **Gapp, et al. 2025**, AJ, 169 341

Contact me!

No time to chat?

My e-mail is:
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