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

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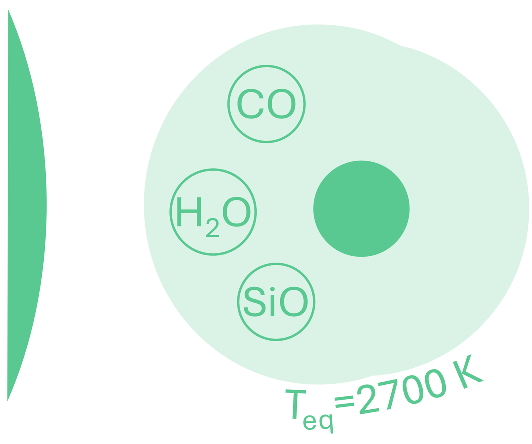
Introduction: WASP-121 b



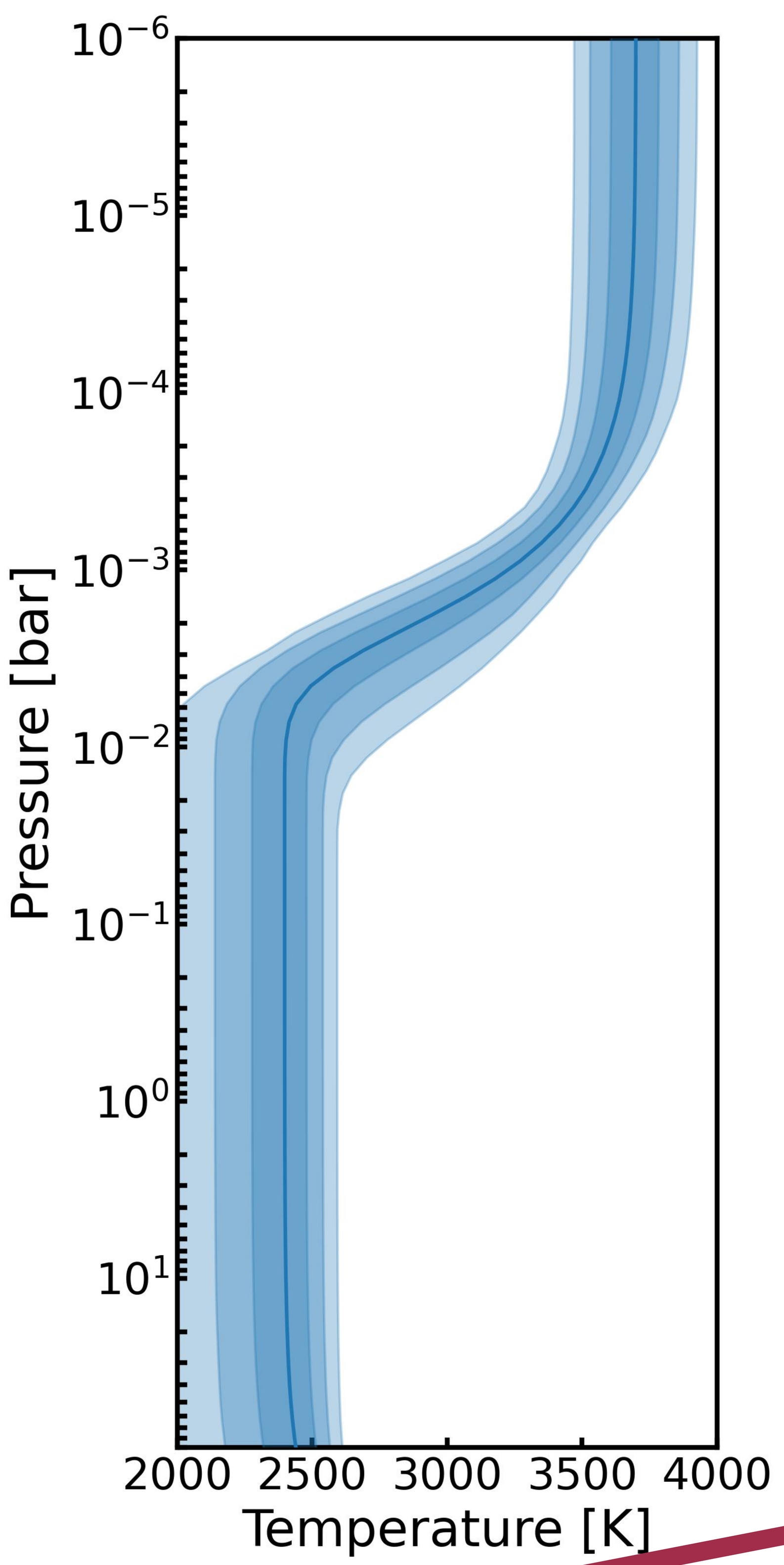
WASP-121 b is an **ultra-hot Jupiter** that orbits an F star. Such extreme dayside temperatures vaporize **refractory species**, giving us a unique opportunity to measure the refractory-to-volatile ratio. This provides an important benchmark for planet formation models.

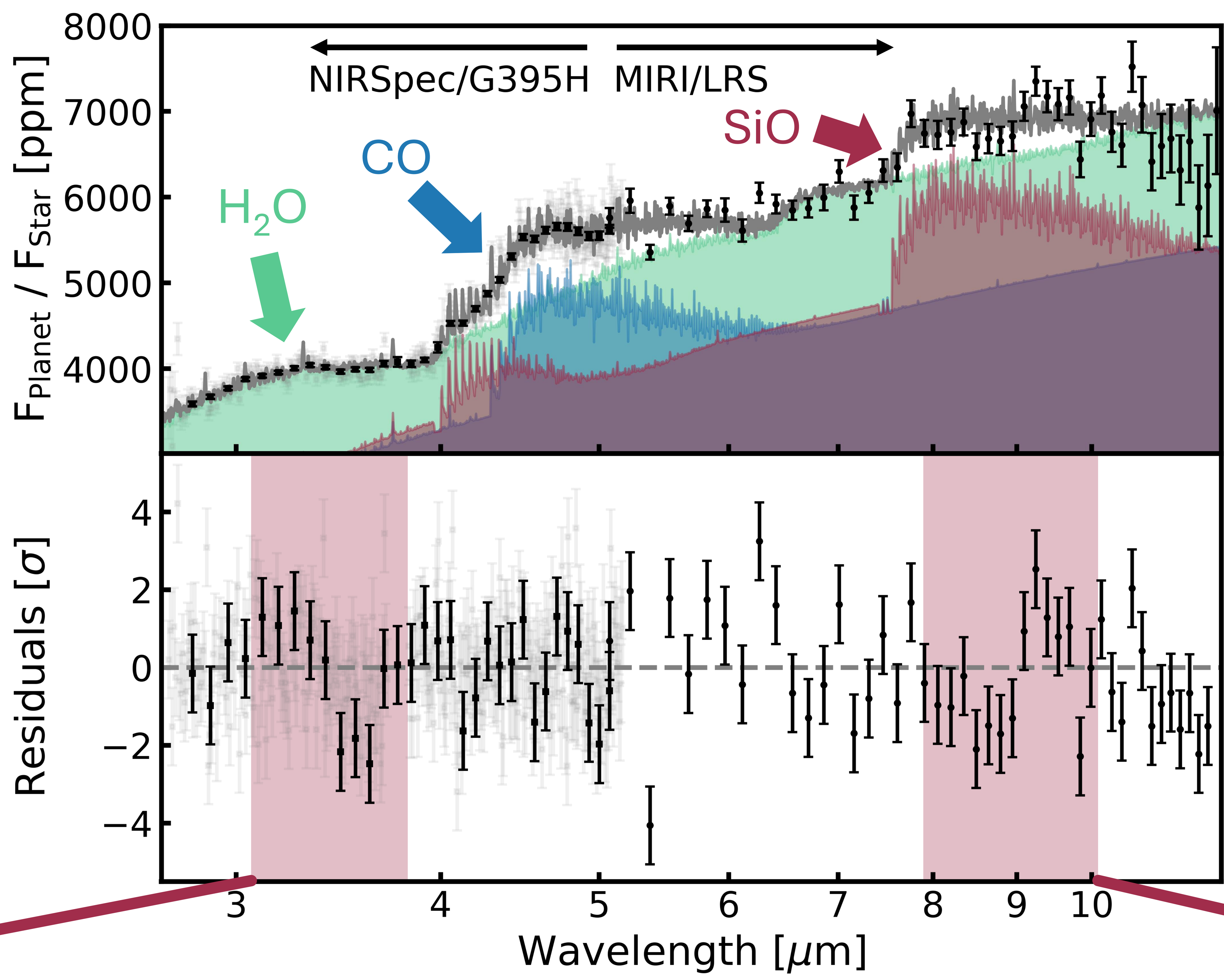
Observations with JWST MIRI/LRS

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





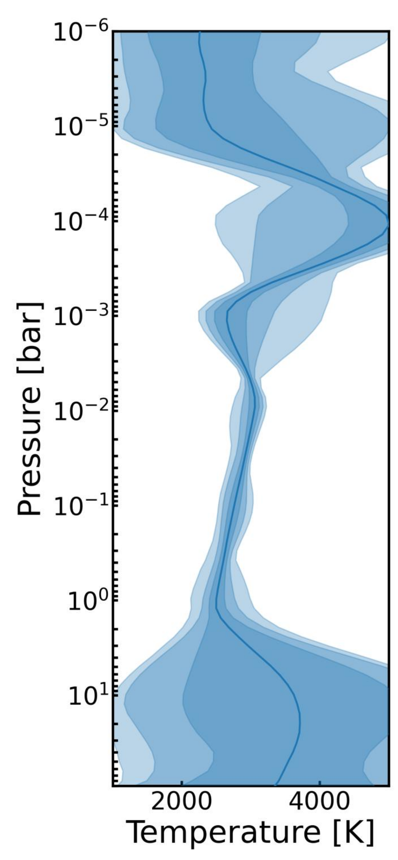
We model the spectrum using **petitRADTRANS** (Mollière et al. 2019) and **detect CO, H_2O, and SiO** signatures in the gas phase.

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!

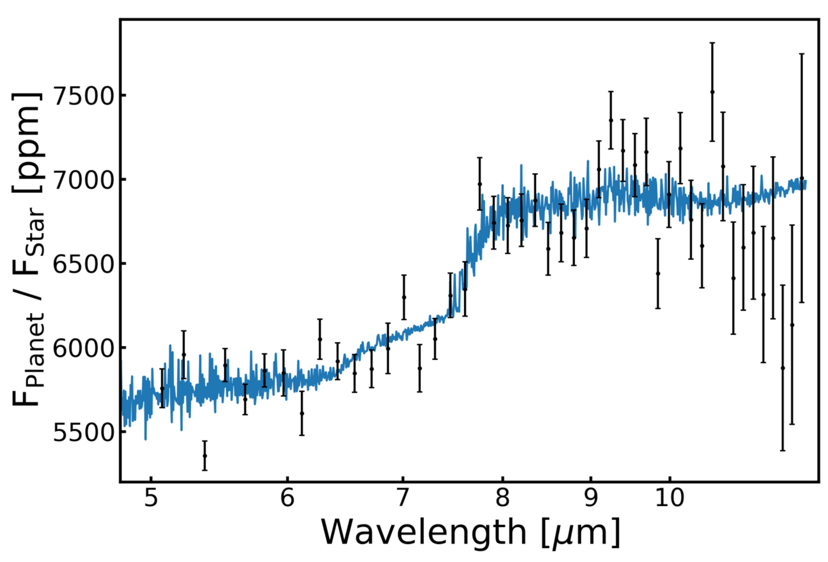
Temperature profile



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

Bets:

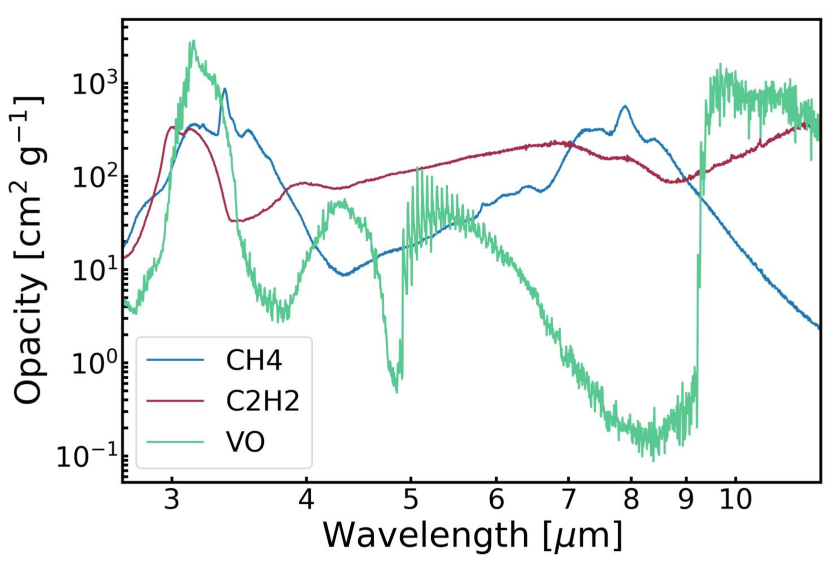
Nightside clouds on the dayside



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

Bets:

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!

Bets:

Nothing, maybe it's just noise

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

Add your ideas:

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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