

A Hot Jupiter Orbiting a Metal-Poor ($[\text{Fe}/\text{H}] = -0.7$) Star

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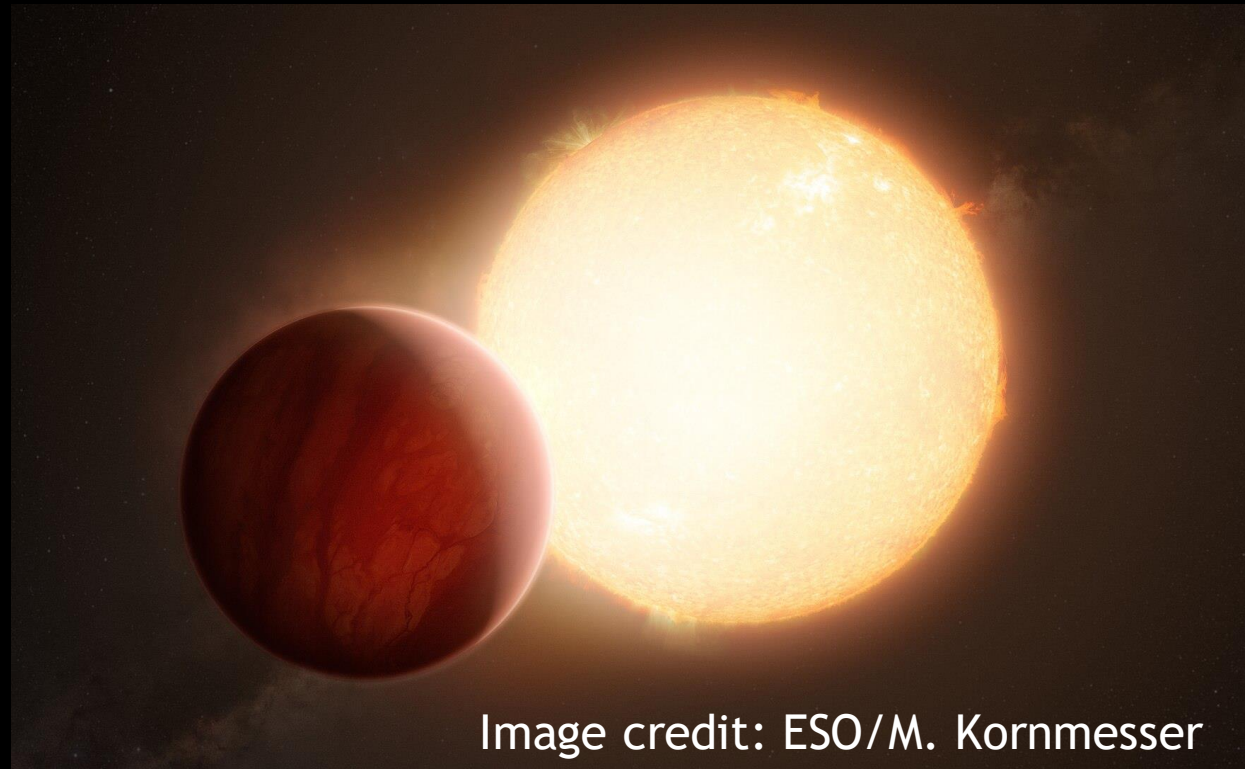


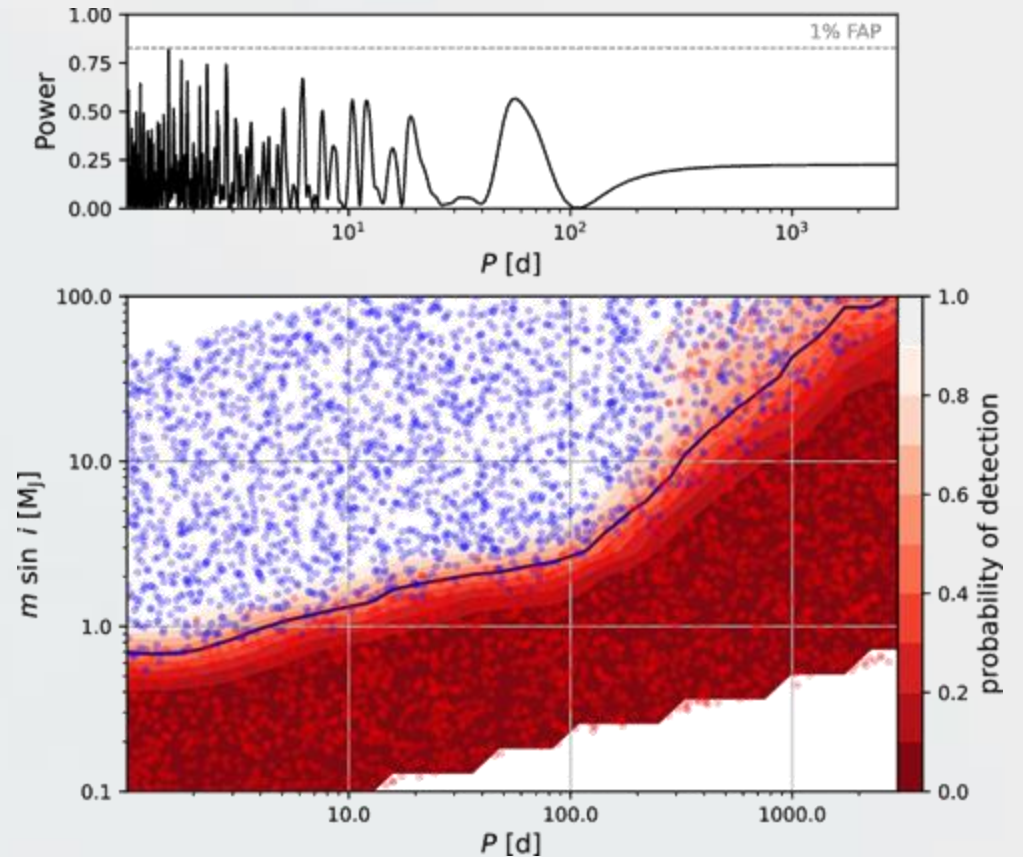
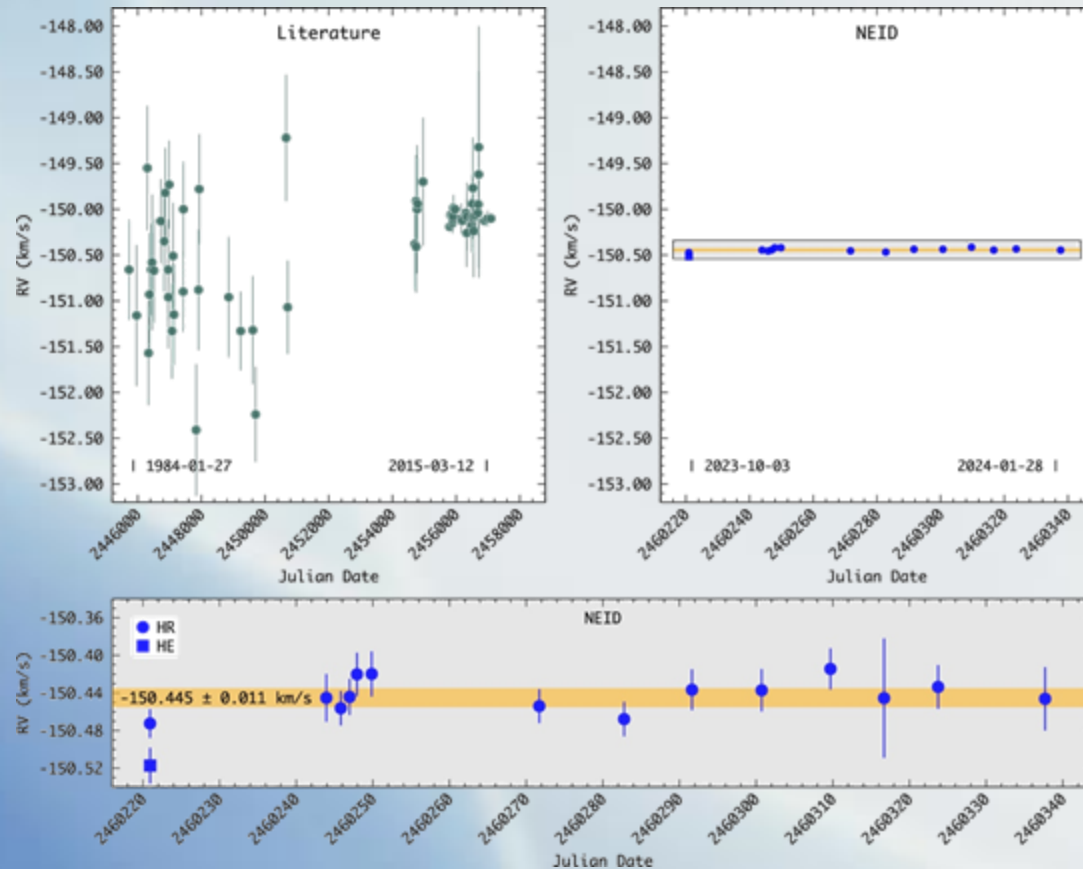
Image credit: ESO/M. Kornmesser

Why Are Metal-Poor Stars Interesting Planet Hosts?

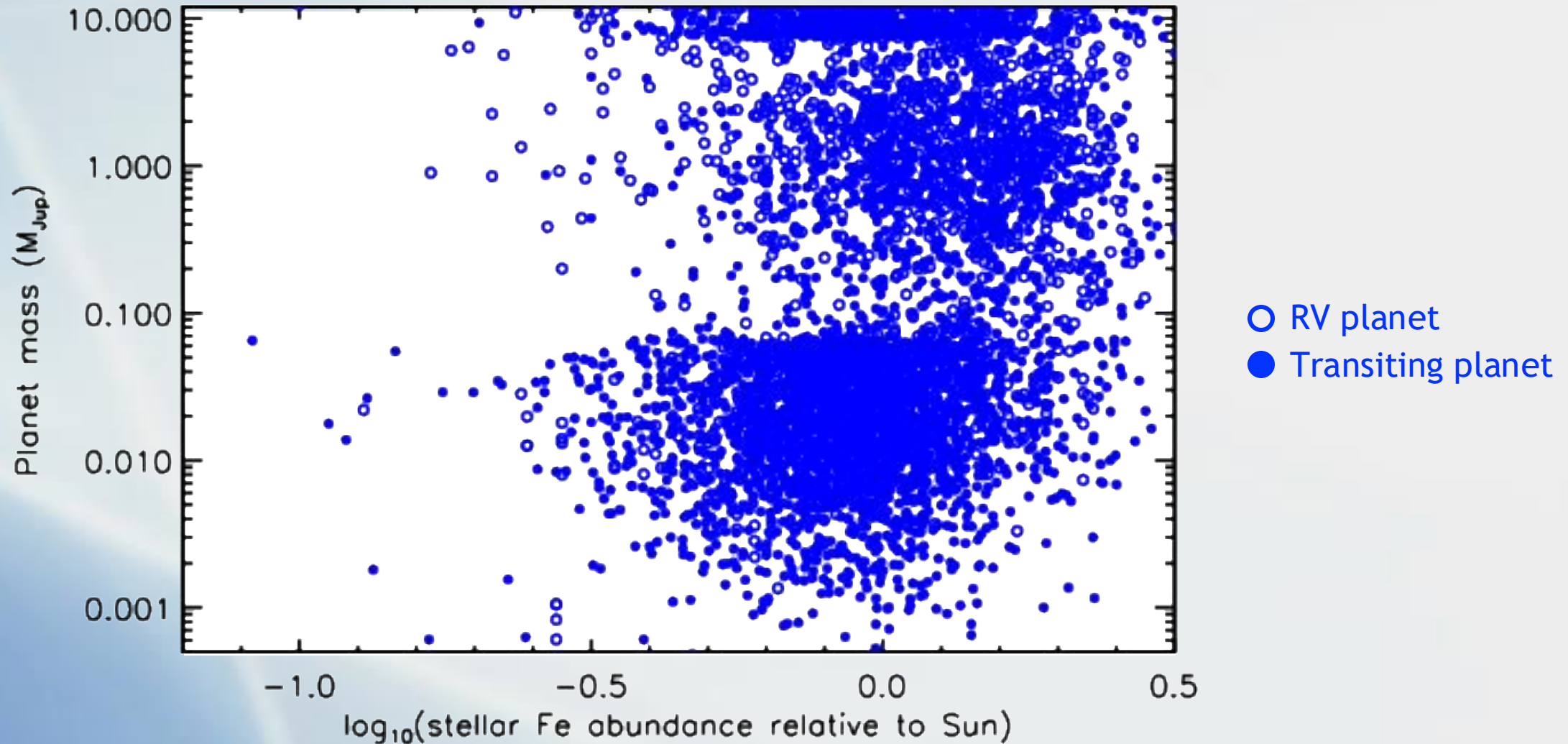
- Probe the limits of planet formation
- Study long-term evolution of planetary systems
- Investigate the effect of heavy element abundance on planet atmospheres
- Find the first planets that formed in the Galaxy

The Most Metal-Poor Star Searched For Planets

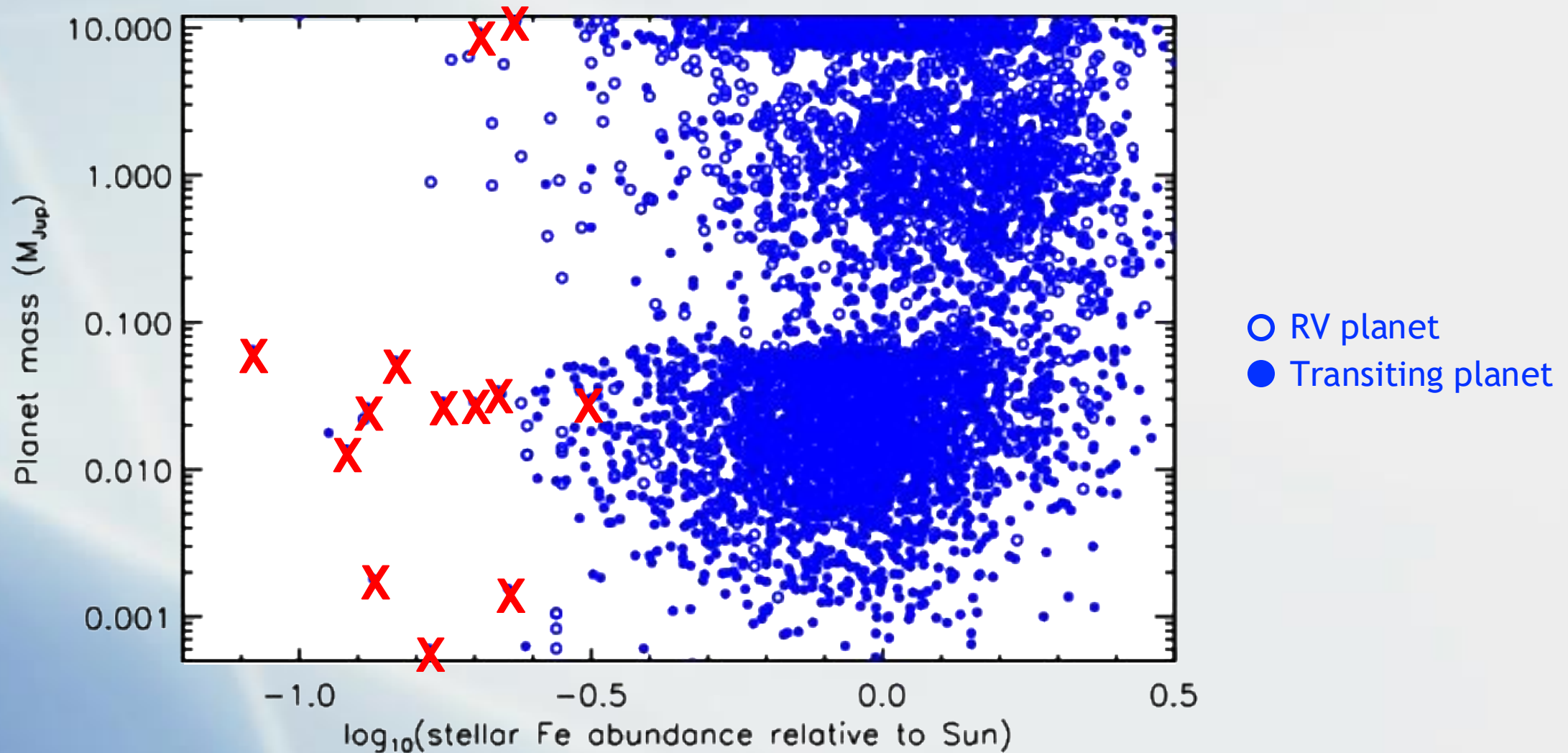
- BD+44 493: 9th magnitude, $[\text{Fe}/\text{H}] = -3.7$



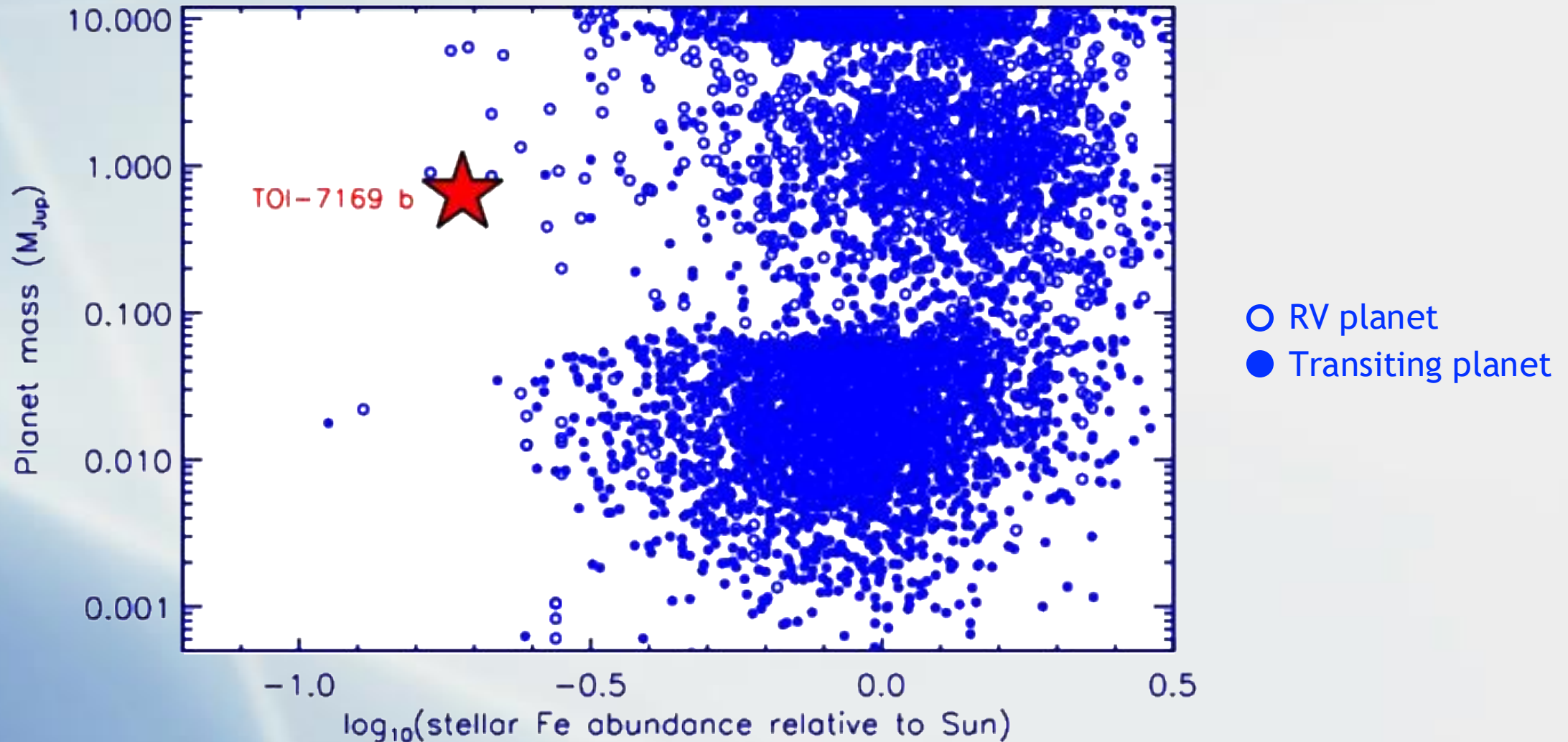
Metallicity Distribution of Exoplanet Hosts



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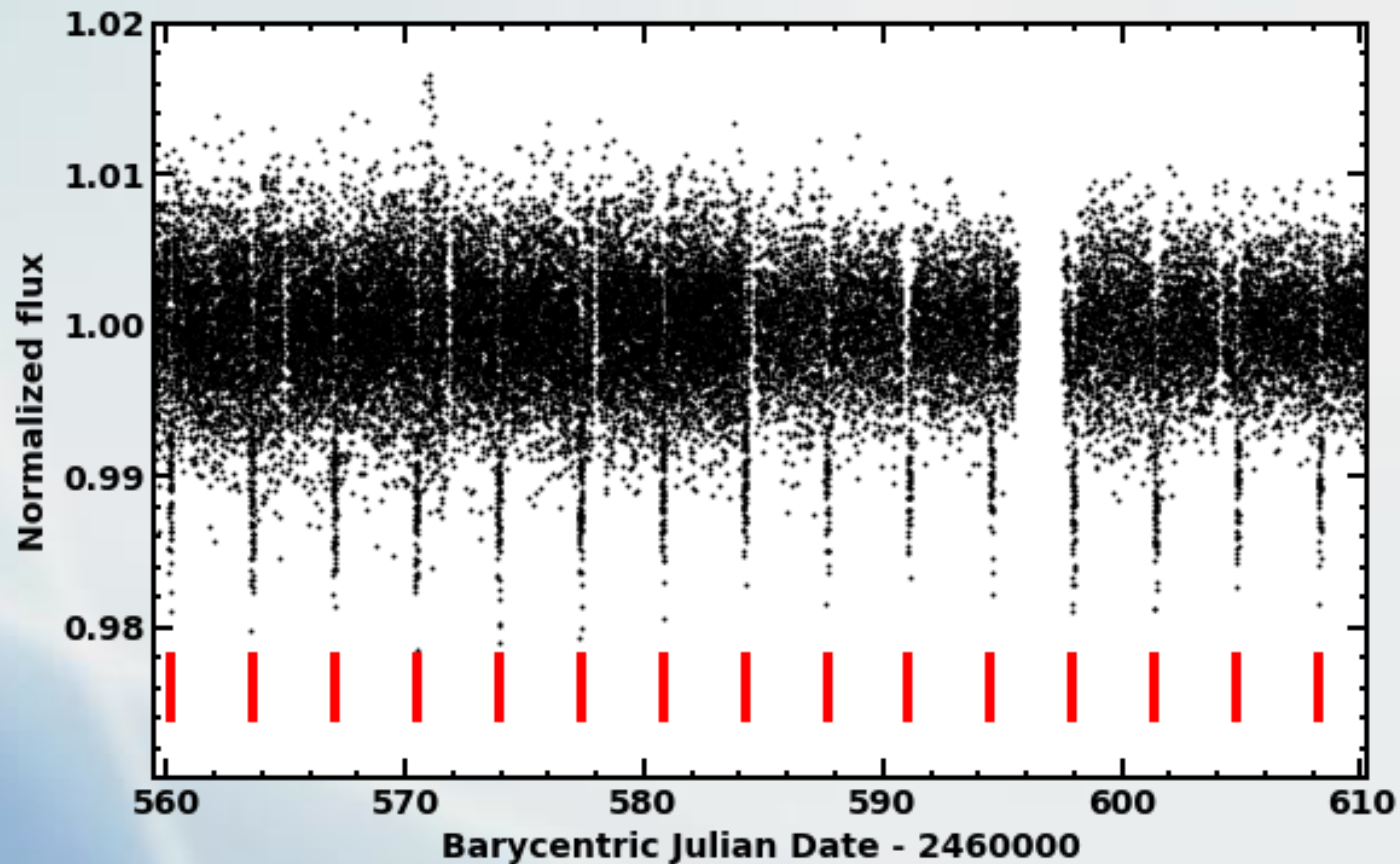


Metallicity Distribution of Exoplanet Hosts

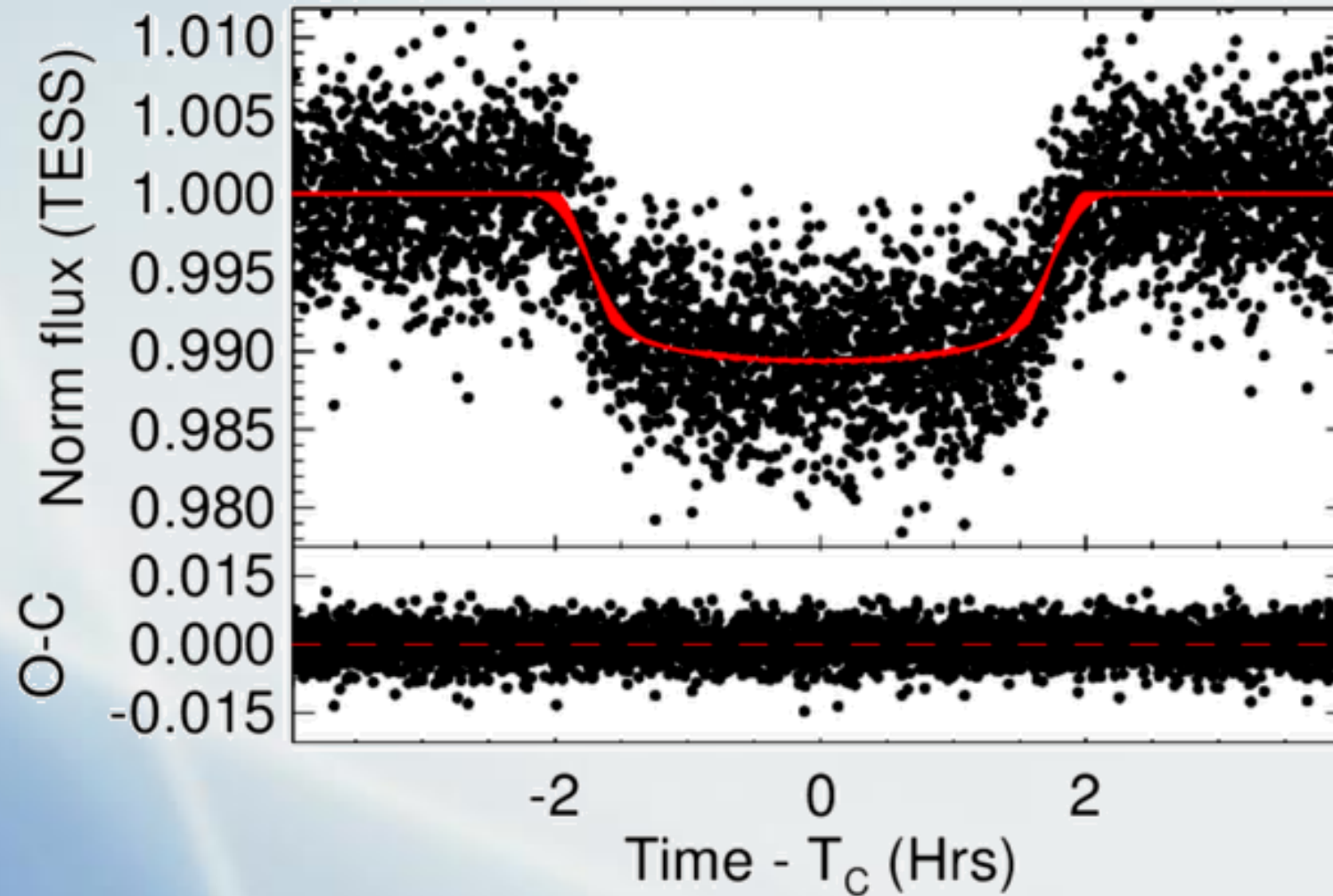


TOI-7169 with TESS

- Strong transiting signal seen ($P = 3.4$ d, depth = 1%)

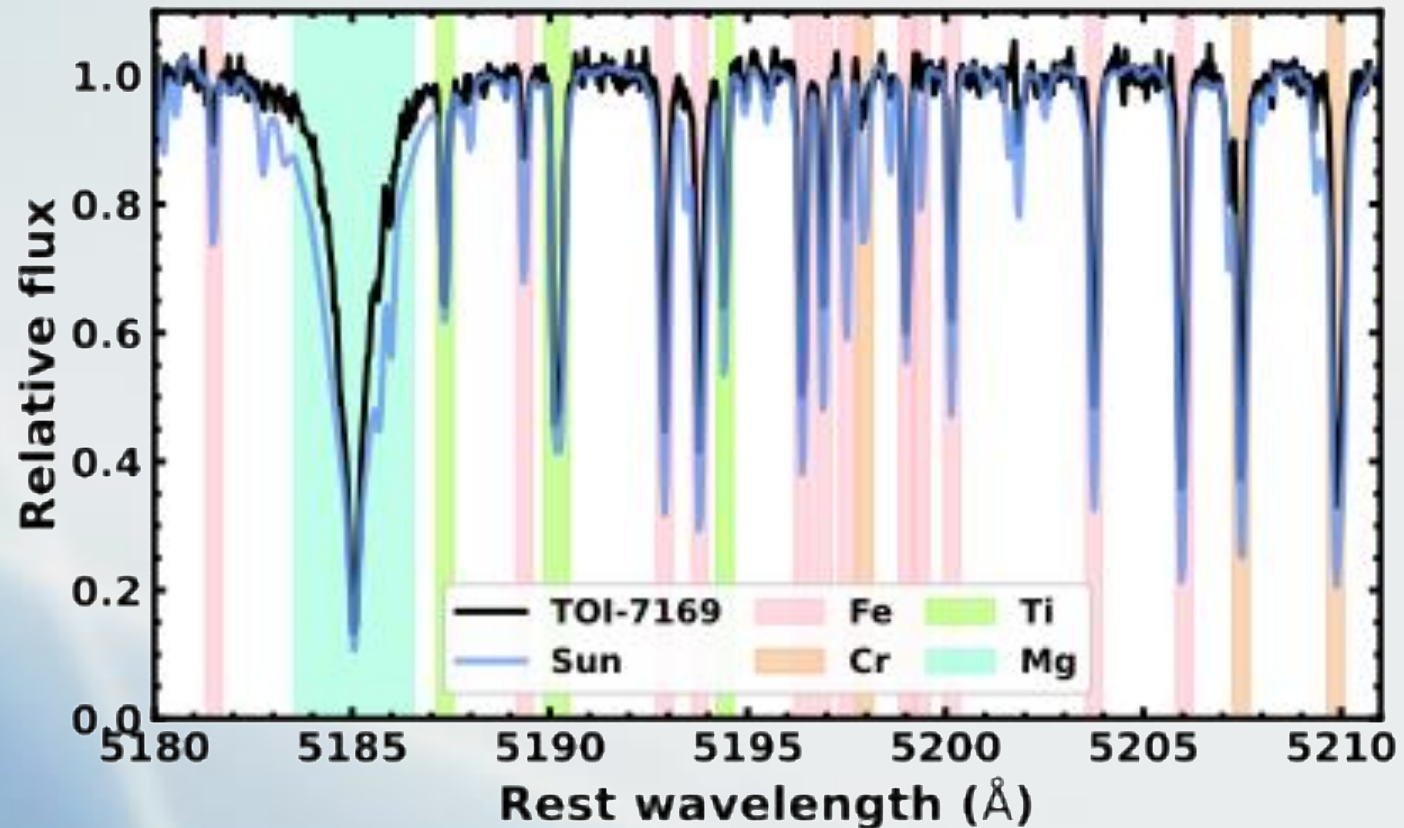


TOI-7169 with TESS



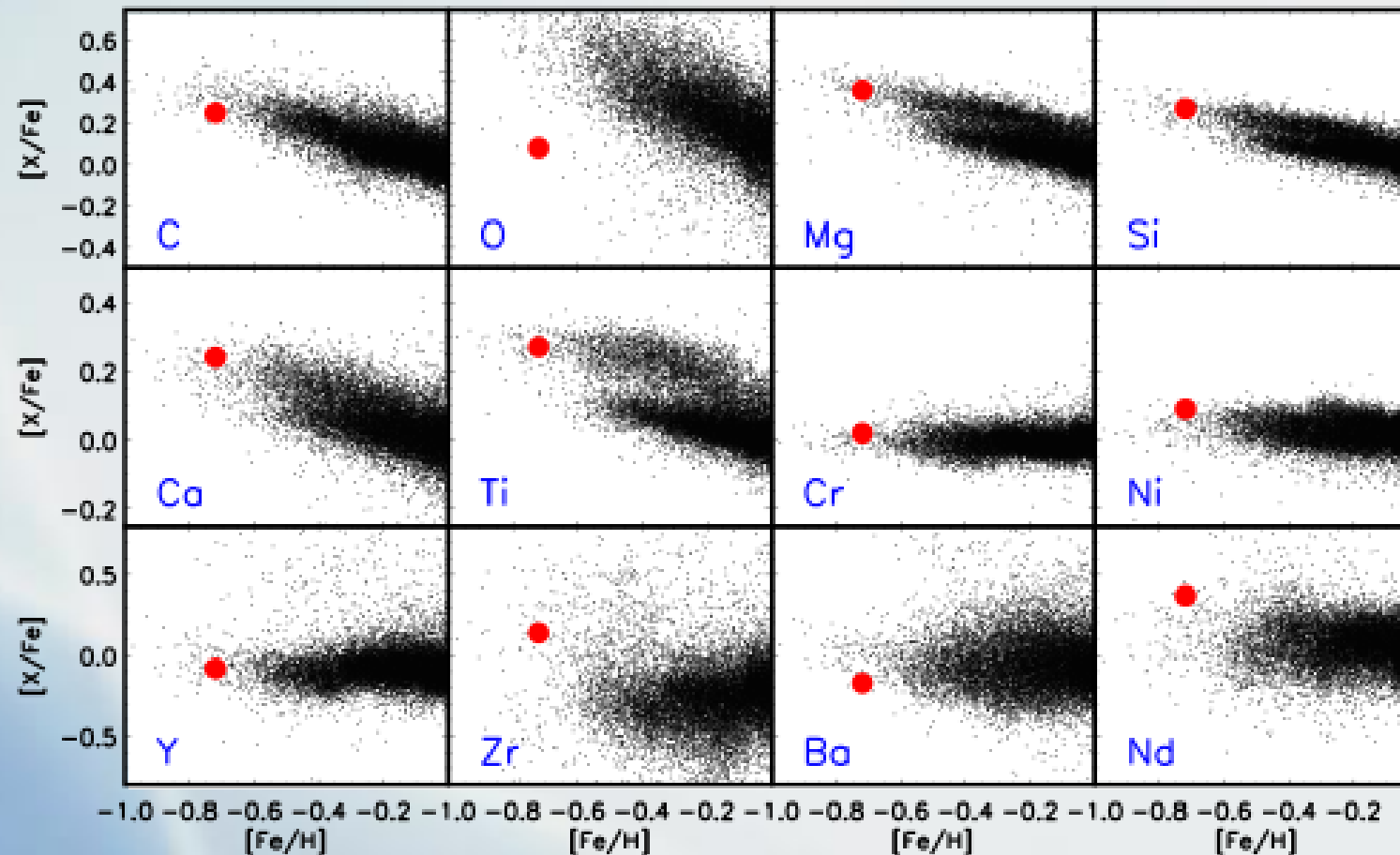
TOI-7169 with TRES

- Host star selected as metal-poor from Gaia spectrophotometry; spectroscopic $[\text{Fe}/\text{H}] = -0.72$



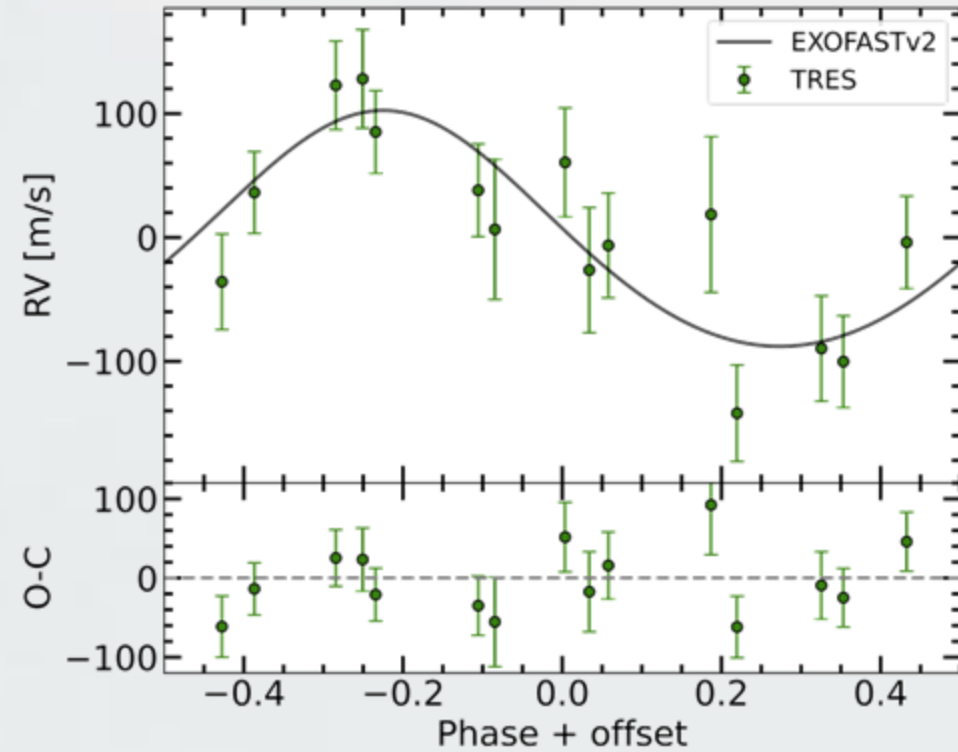
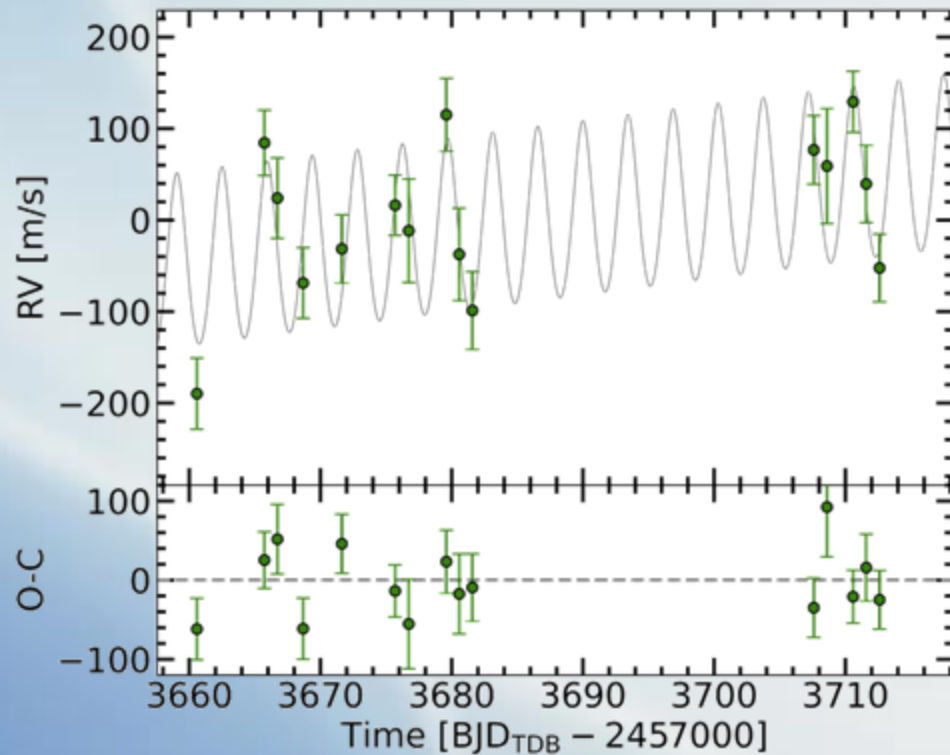
TOI-7169 with TRES

- Generally normal abundance pattern (α -enhanced)



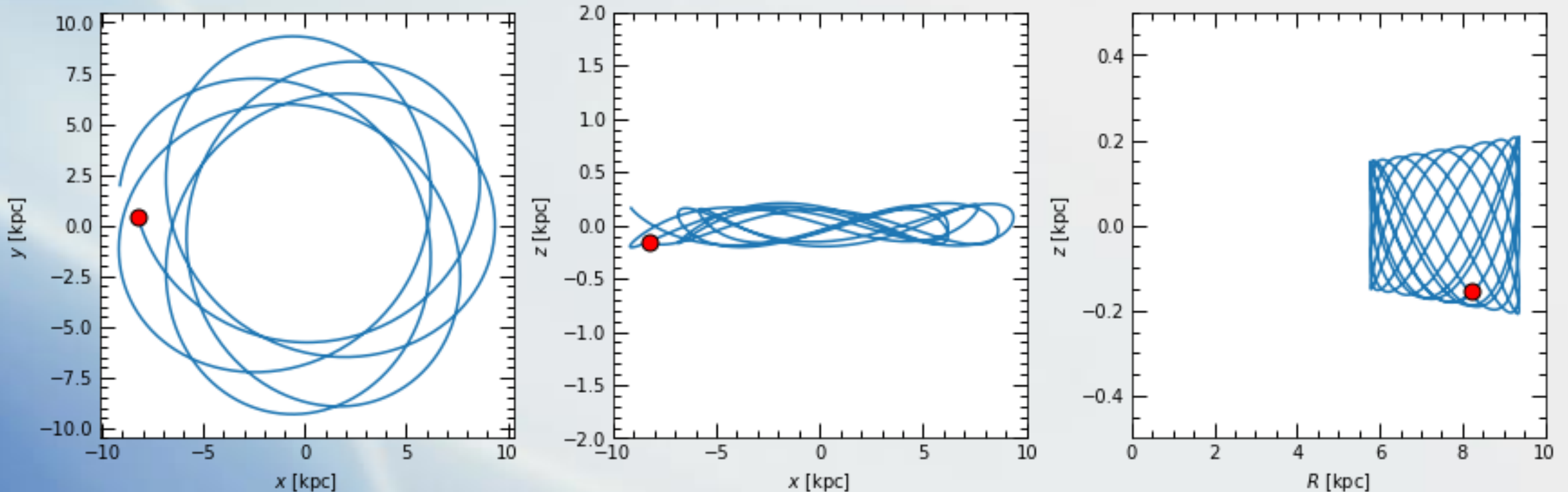
A Giant Inflated Planet

- TRES RVs: $M = 0.62 M_J$ (0.28 g cm^{-3})



TOI-7169 Is a Thin Disk Member

- Host star never gets more than 200 pc away from Galactic plane



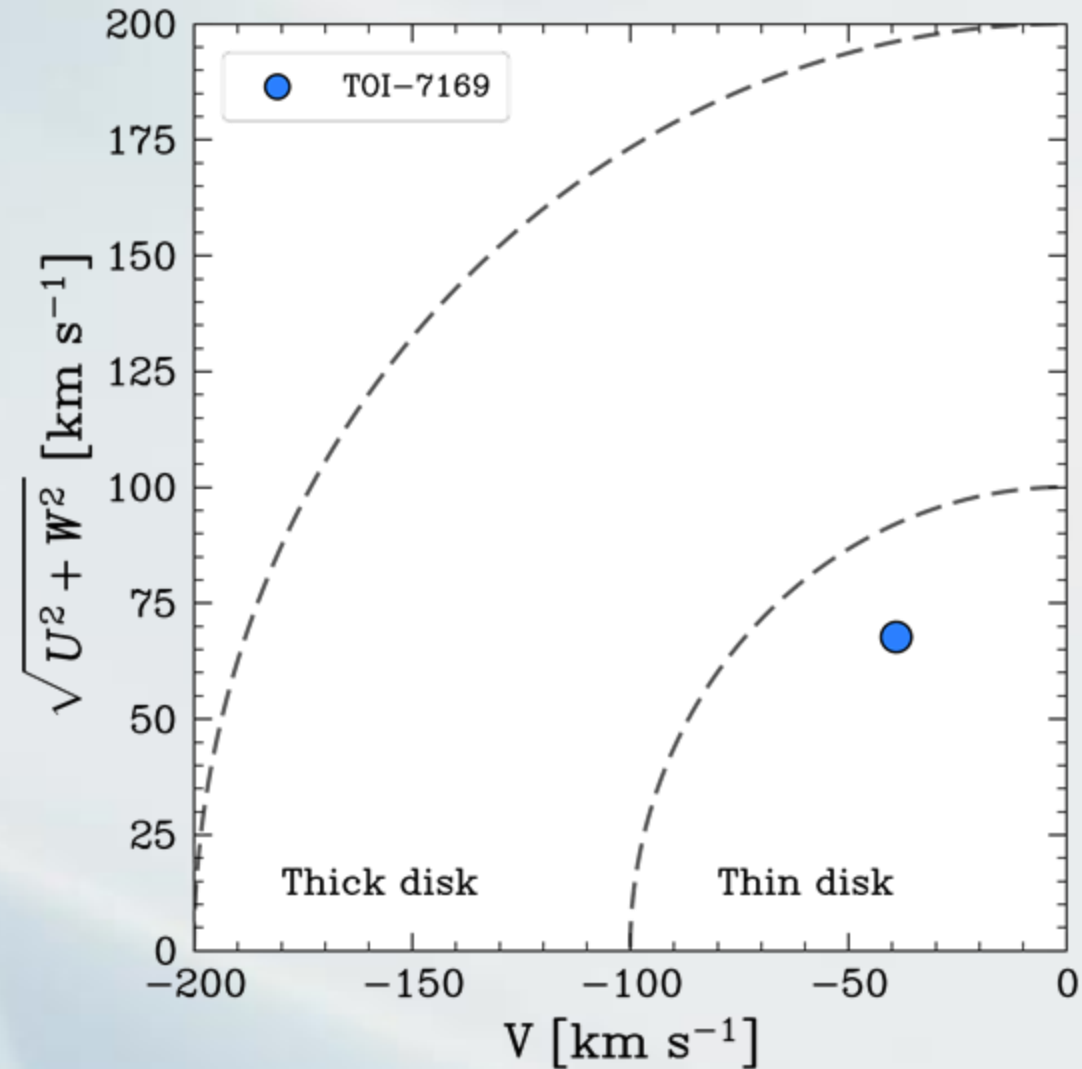
How Did TOI-7169 b Get Here?

- Consistent with existing upper limits on occurrence rates at low metallicity (e.g., Boley et al. 2021)
- Should a hot Jupiter be able to survive for a Hubble time?
- Possible outer companion ($P > 100$ d)?
- Interesting candidate for Rossiter-McLaughlin and transmission spectroscopy measurements . . .

Summary

- TESS search for metal-poor planets has revealed an inflated hot Jupiter with $[\text{Fe}/\text{H}] = -0.72$
- Host star is generally unremarkable except that it formed in the thin disk
- How long has TOI-7169 b been a hot Jupiter?
- How has its atmosphere been affected by the unusual composition of its birth environment?

Toomre Diagram



Ground-based Photometric Followup

