

# A high-resolution spectroscopic survey of directly imaged companions and hot Jupiters with Keck/KPIC

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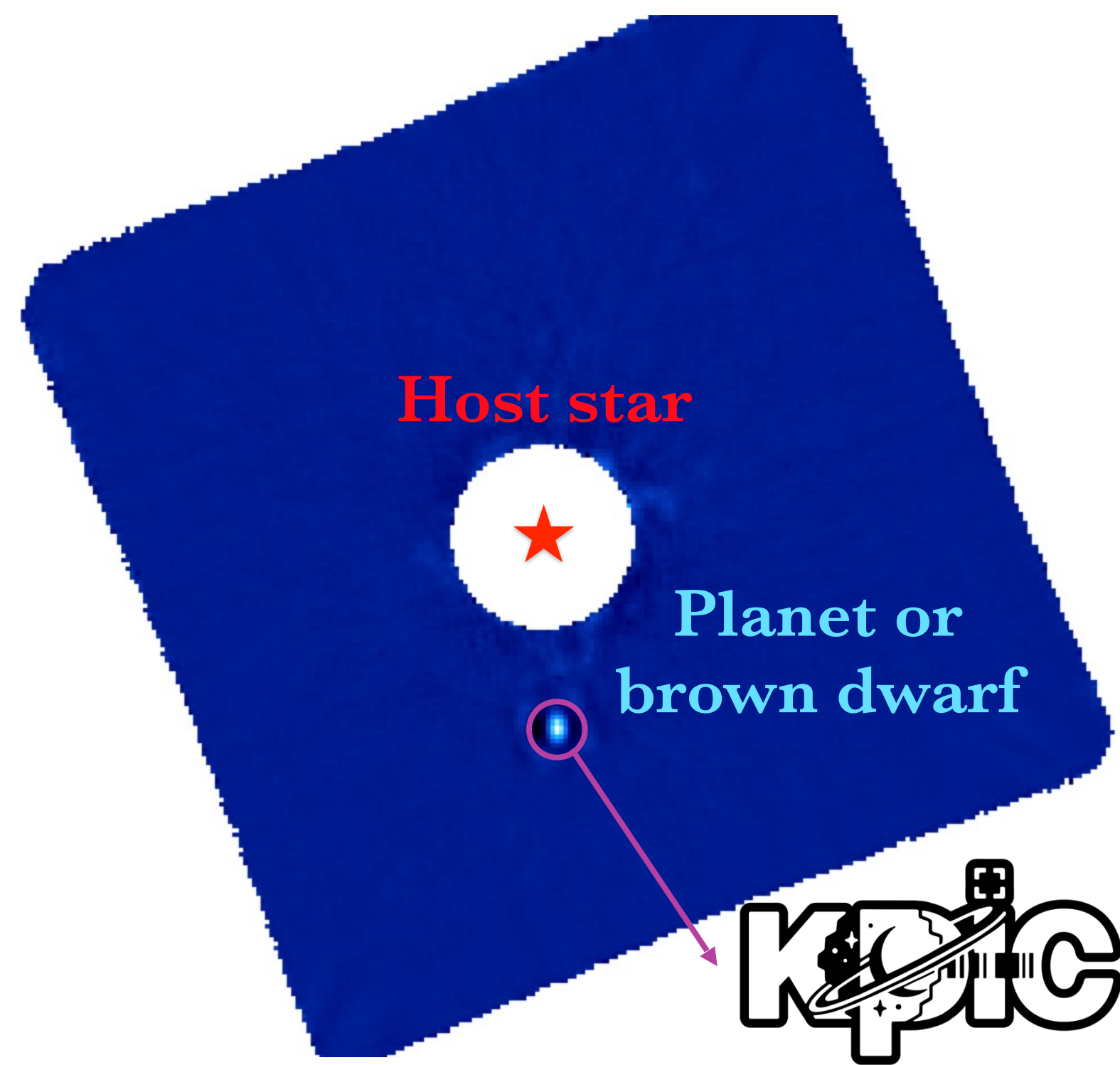
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## The Keck Planet Imager and Characterizer (KPIC)

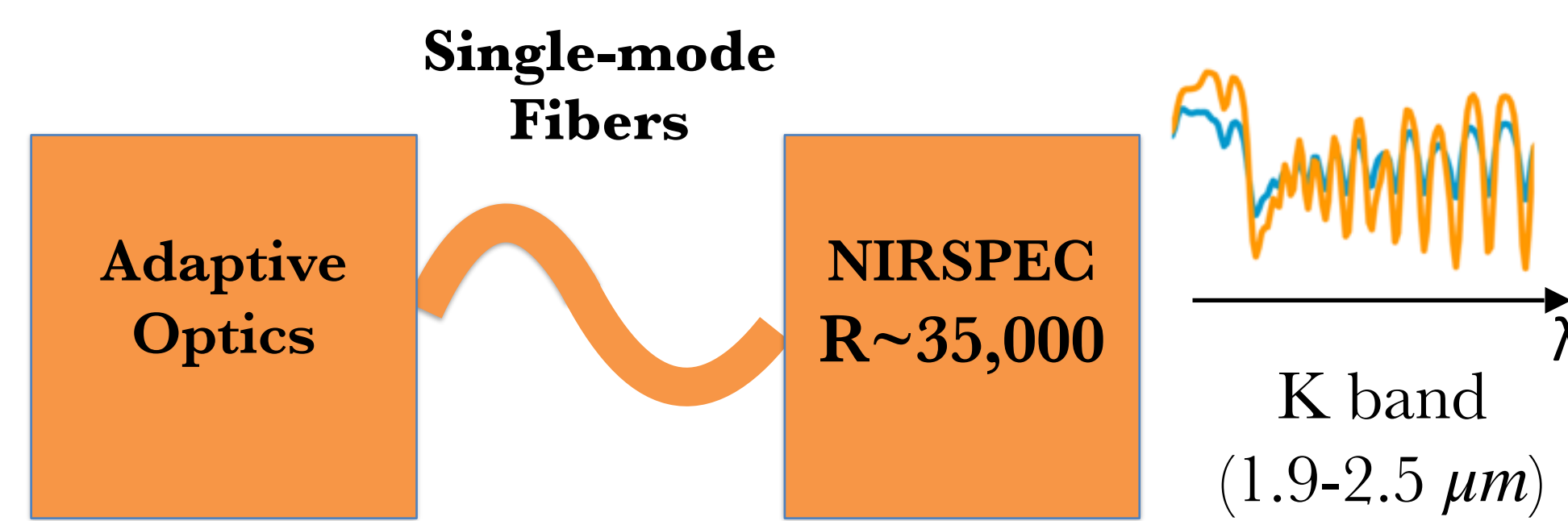
### 1. Directly imaged planets and brown dwarfs (~30 detections)

- Atmospheric abundances ([C/H], [O/H])
- Projected rotation velocities
- Radial velocity monitoring



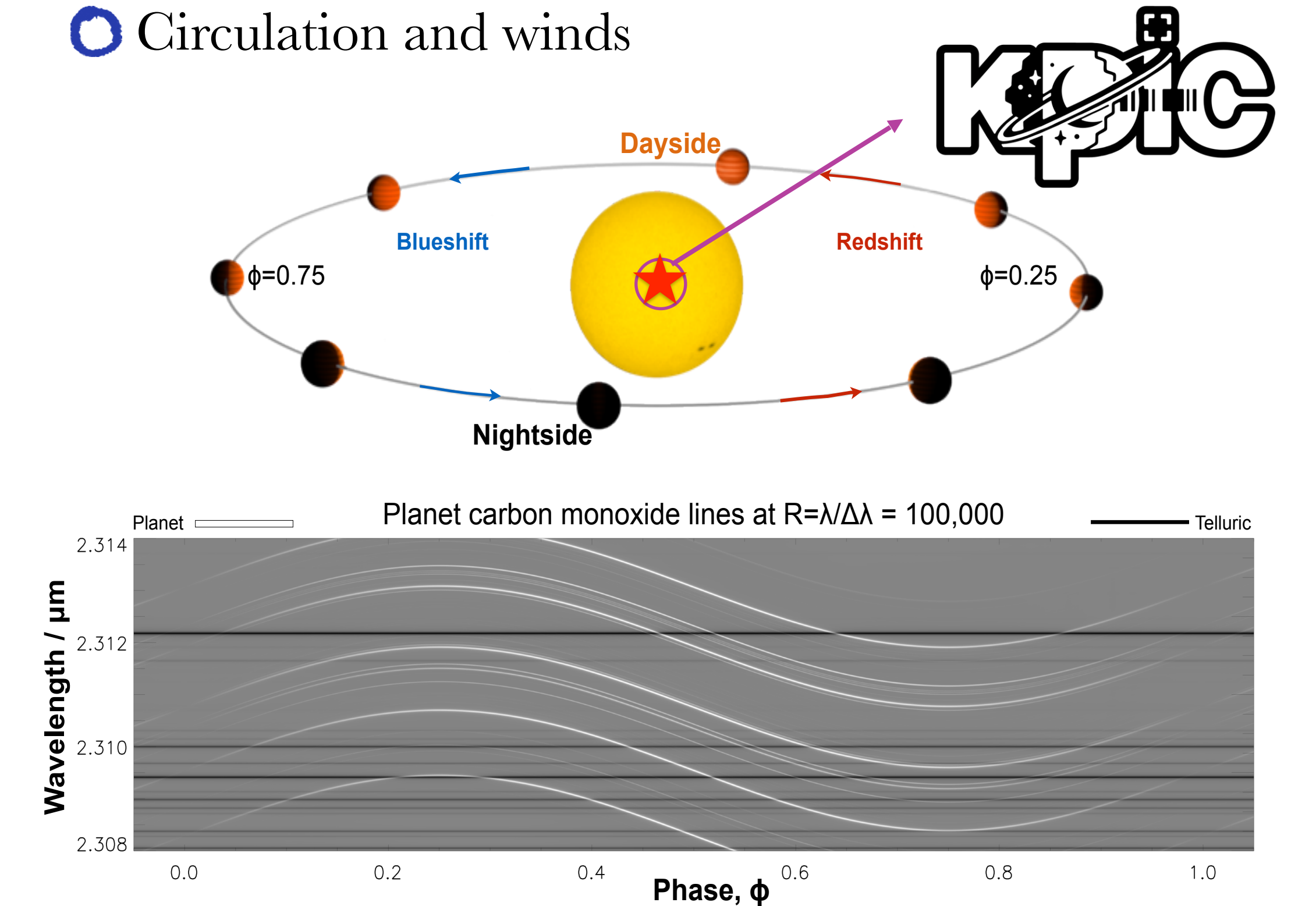
### Why KPIC?

- Stable line spread function
- Background rejection
- Starlight rejection (for directly imaged companions)
- High spectral resolution ( $R \sim 35,000$ )



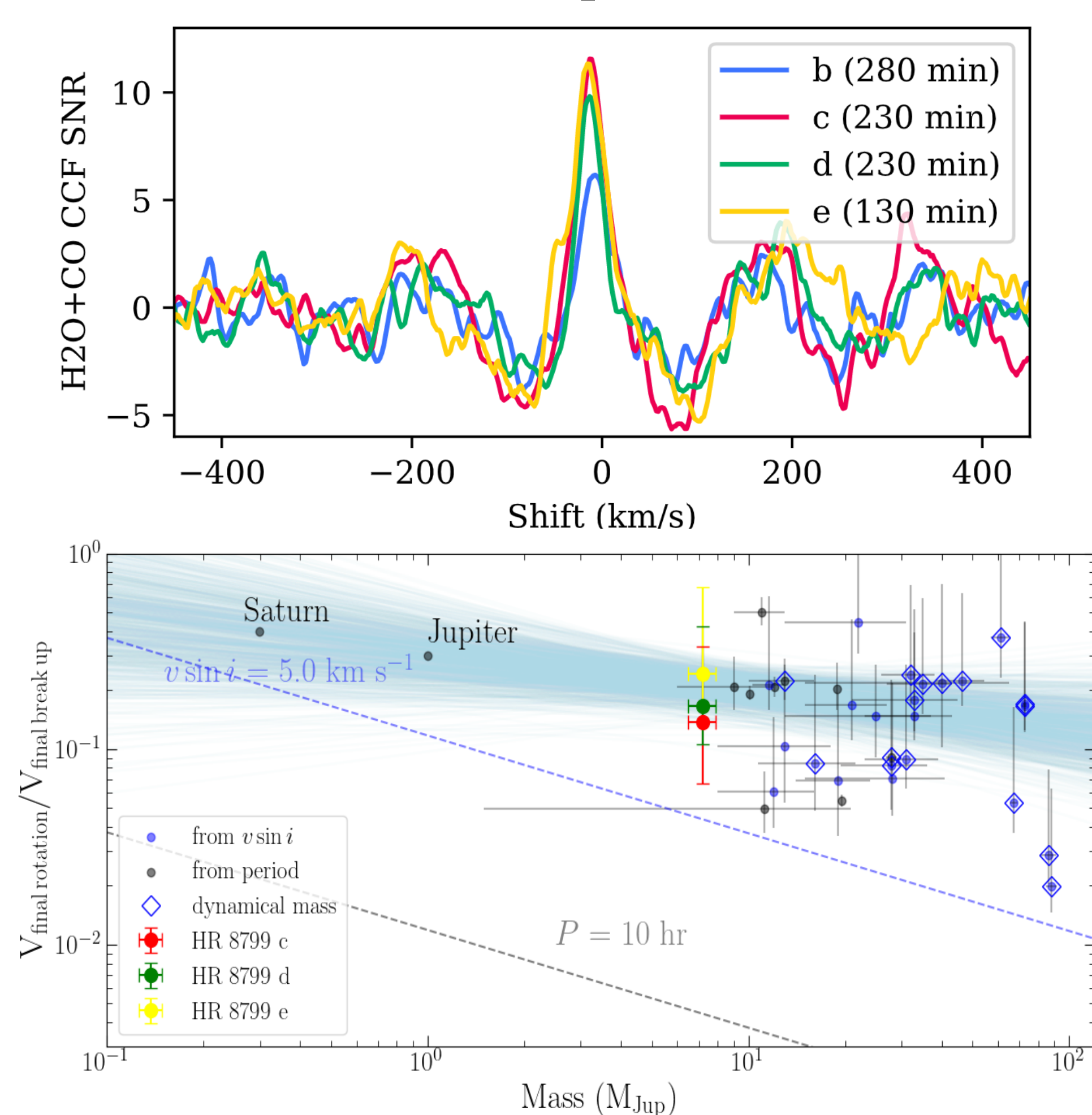
### 2. Hot Jupiters (~10 detections)

- Atmospheric abundances
- Radial velocity and orbital inclinations
- Circulation and winds

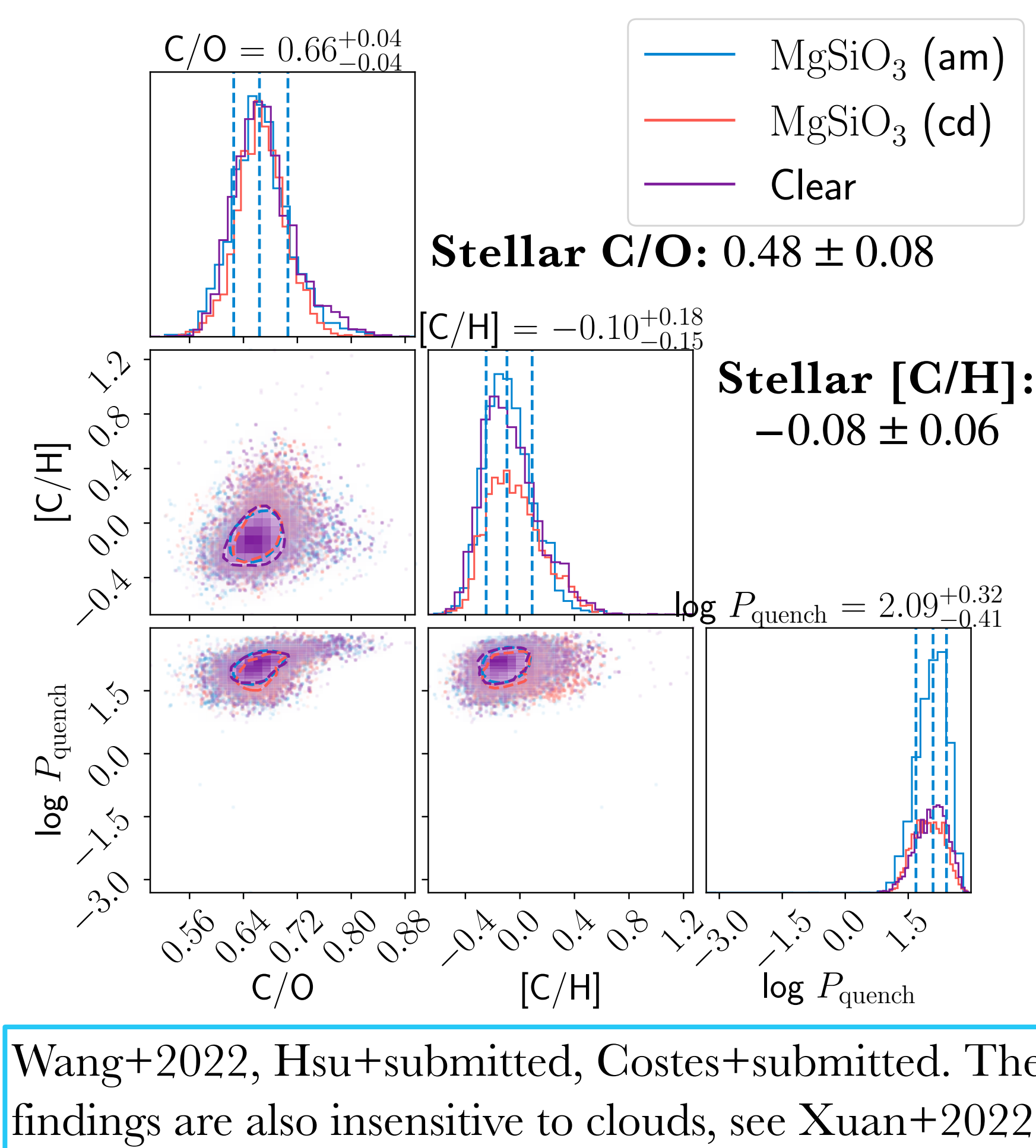


## Science highlights from KPIC

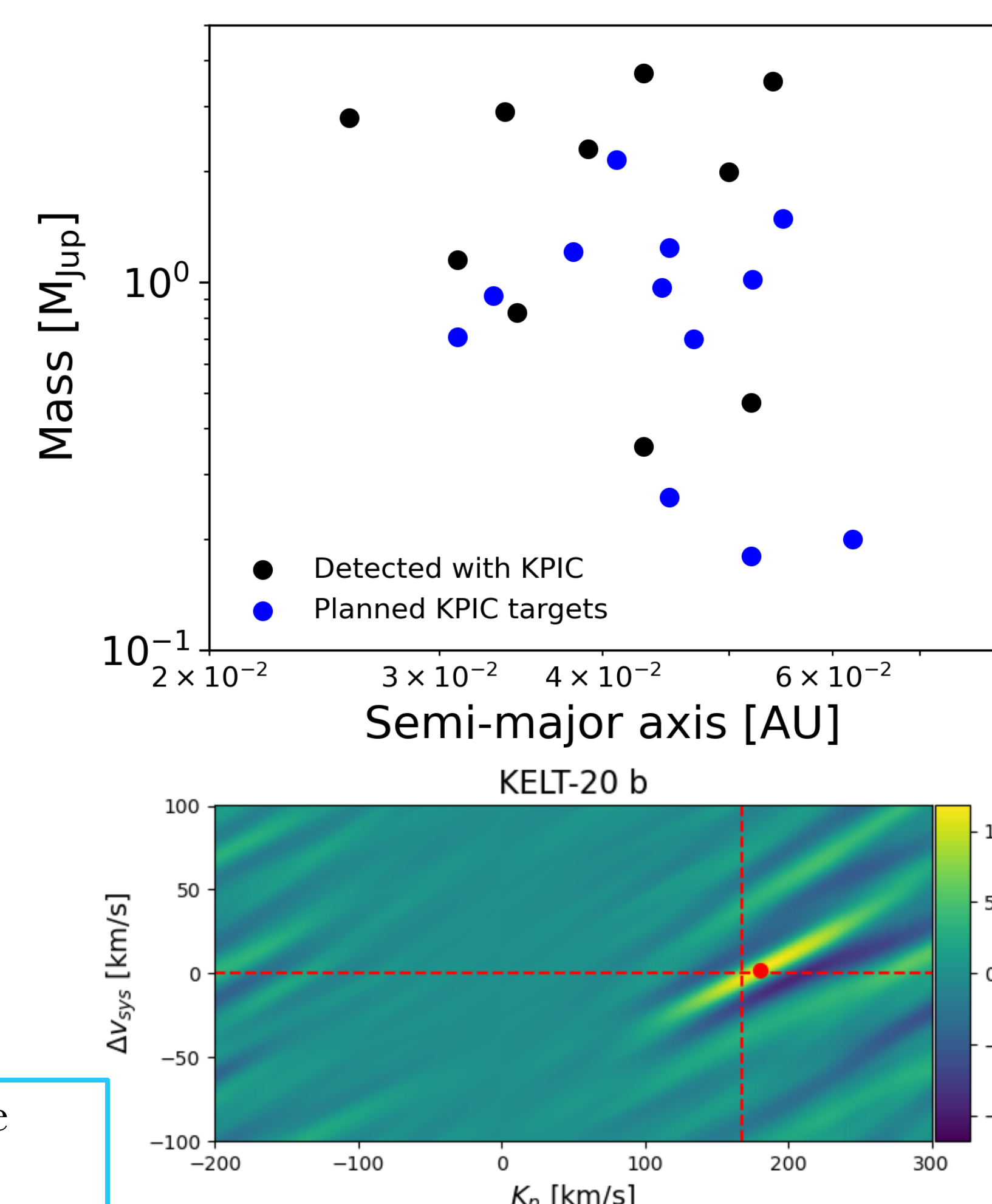
### First spin measurements of the HR 8799 planets Wang+2021



### Reliable compositions validated on benchmark brown dwarfs



### Hot Jupiter Survey

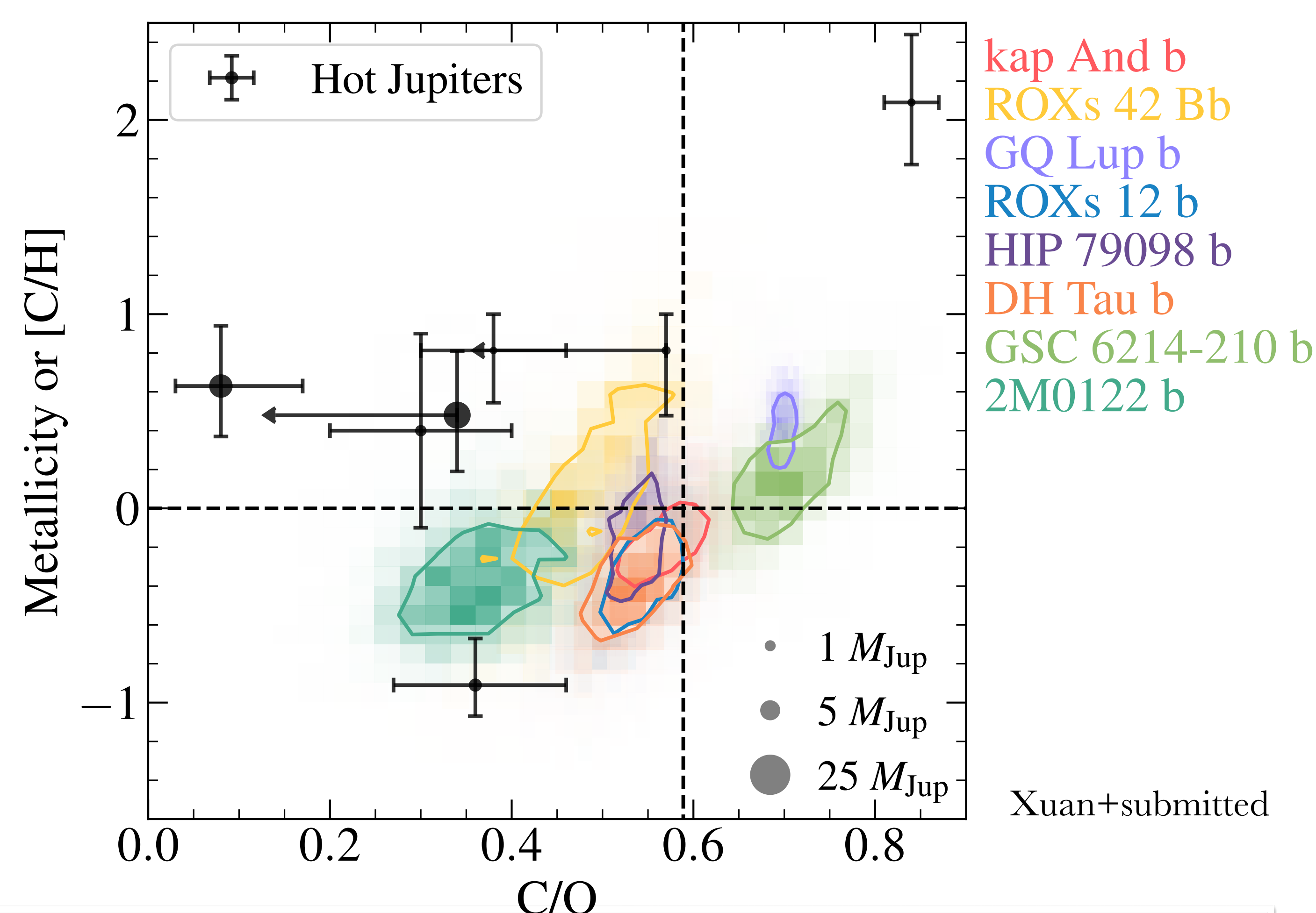


### And more!

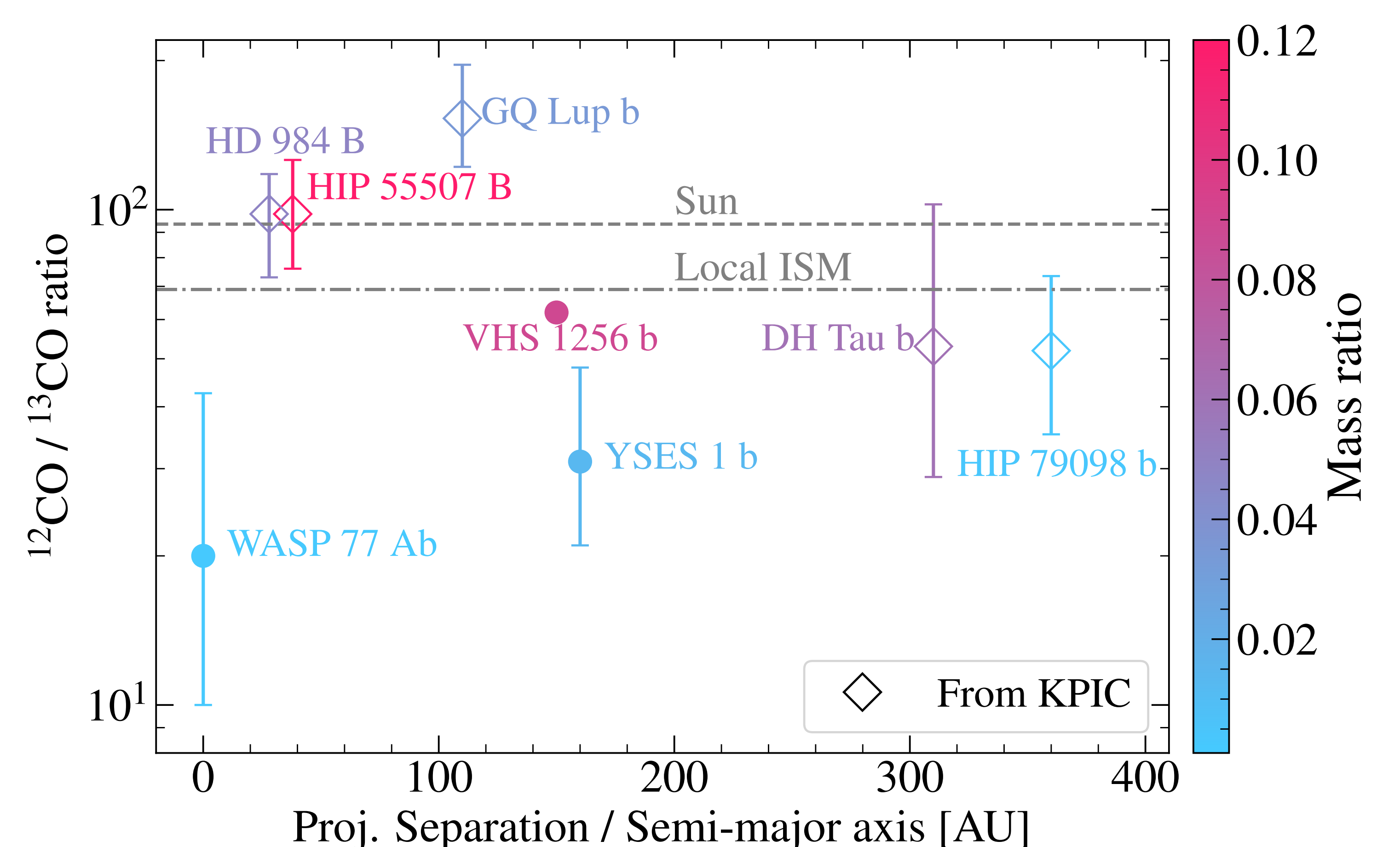
See Posters from  
Katelyn Horstman  
◆ Exomoon survey (632.07)  
Yapeng Zhang  
◆ Detailed analysis of Super-Jupiter HIP 99770 b (626.03)

Finnerty+2023, 2024

## New result: broadly solar compositions for young, 10-30 $M_{\text{Jup}}$ companions



◆ We perform atmospheric retrievals for **eight** substellar companions with masses of  $\sim 10$ -30  $M_{\text{J}}$ , orbital separations  $\sim 50$ -360 au, and  $T_{\text{eff}} \sim 1500$ -2600 K. We find that **all companions have solar C/O ratios, and metallicities**, to within 1-2 $\sigma$ .

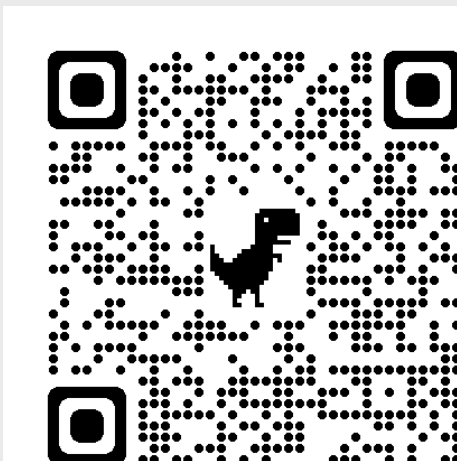


◆ We add **three new  $^{12}\text{CO}/^{13}\text{CO}$  measurements**. Our values agree with the local ISM or solar values. Measurements of the same value in the host star are needed to fully utilize isotopic ratios as a formation tracer (see Xuan+2024)

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### KPIC Publications



### Supported by

