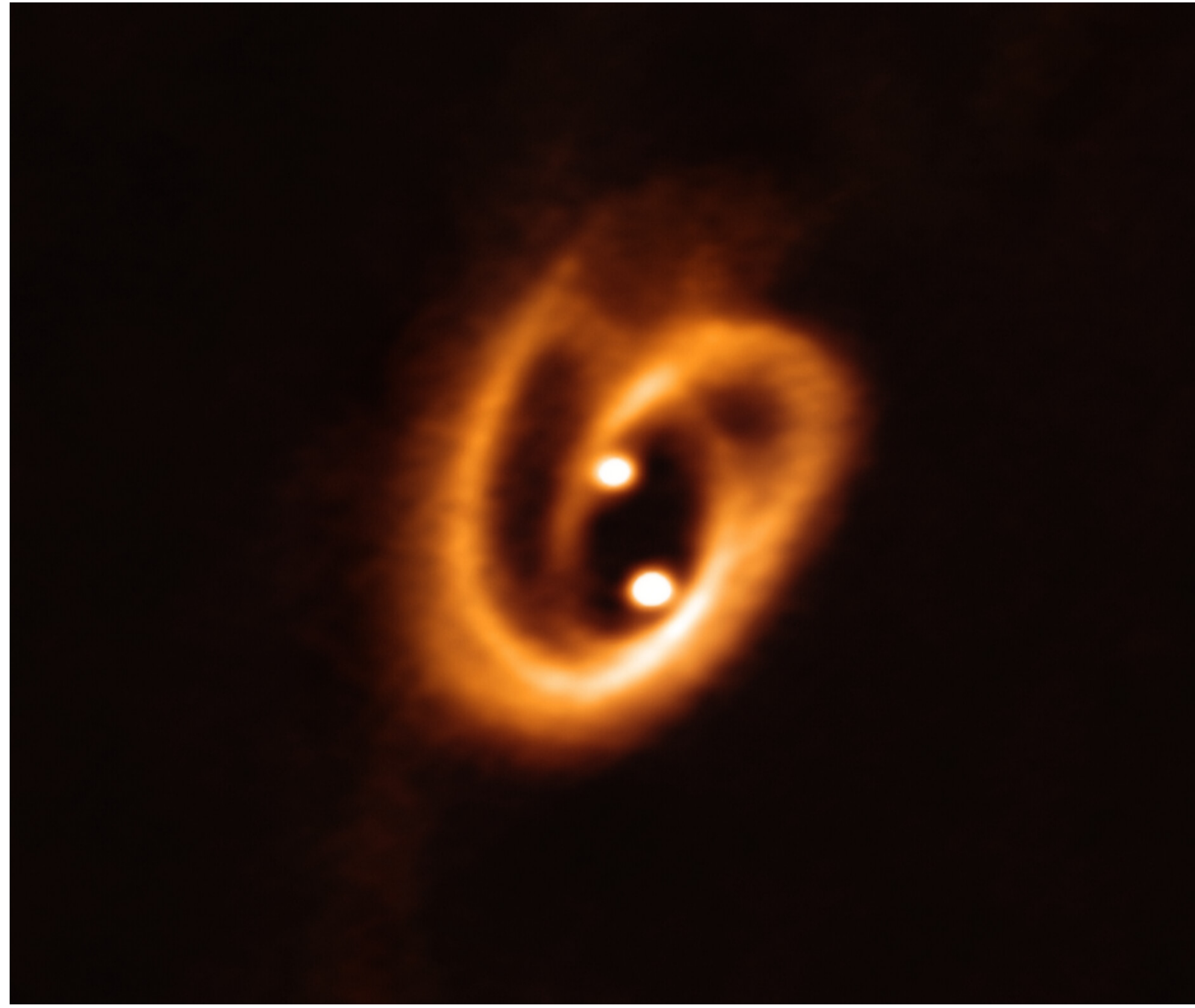


Evidence of rocky planet engulfment in the wide binary system HIP 71726-37

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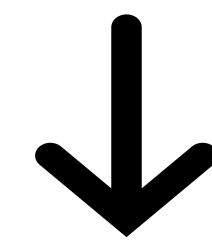
Binary Systems



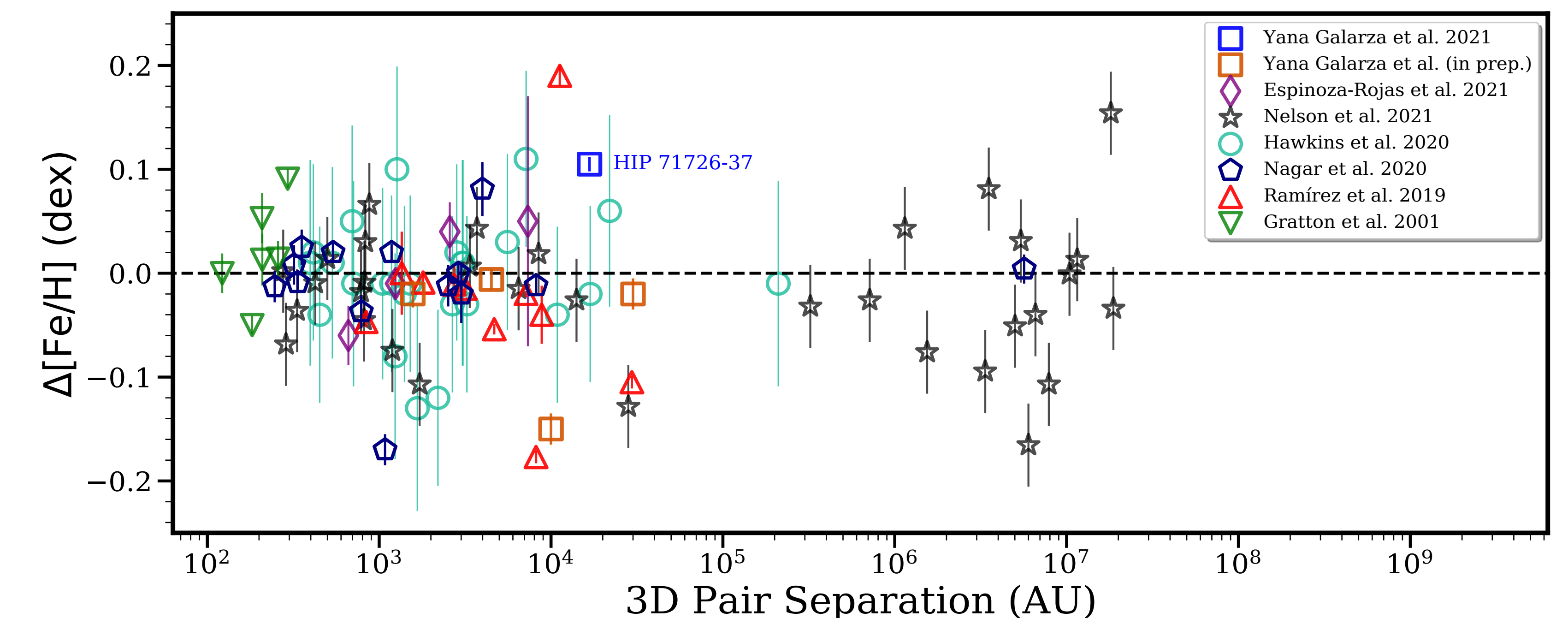
Credit: ALMA (ESO/NAOJ/NRAO)

Assumptions:

- (1) Binary systems stars are formed at approximately the same time (**coeval**) and from the same pre-stellar gas (**conatal**).
- (2) If the assumption (1) is true, then the components of a binary system should be **chemically homogeneous**.

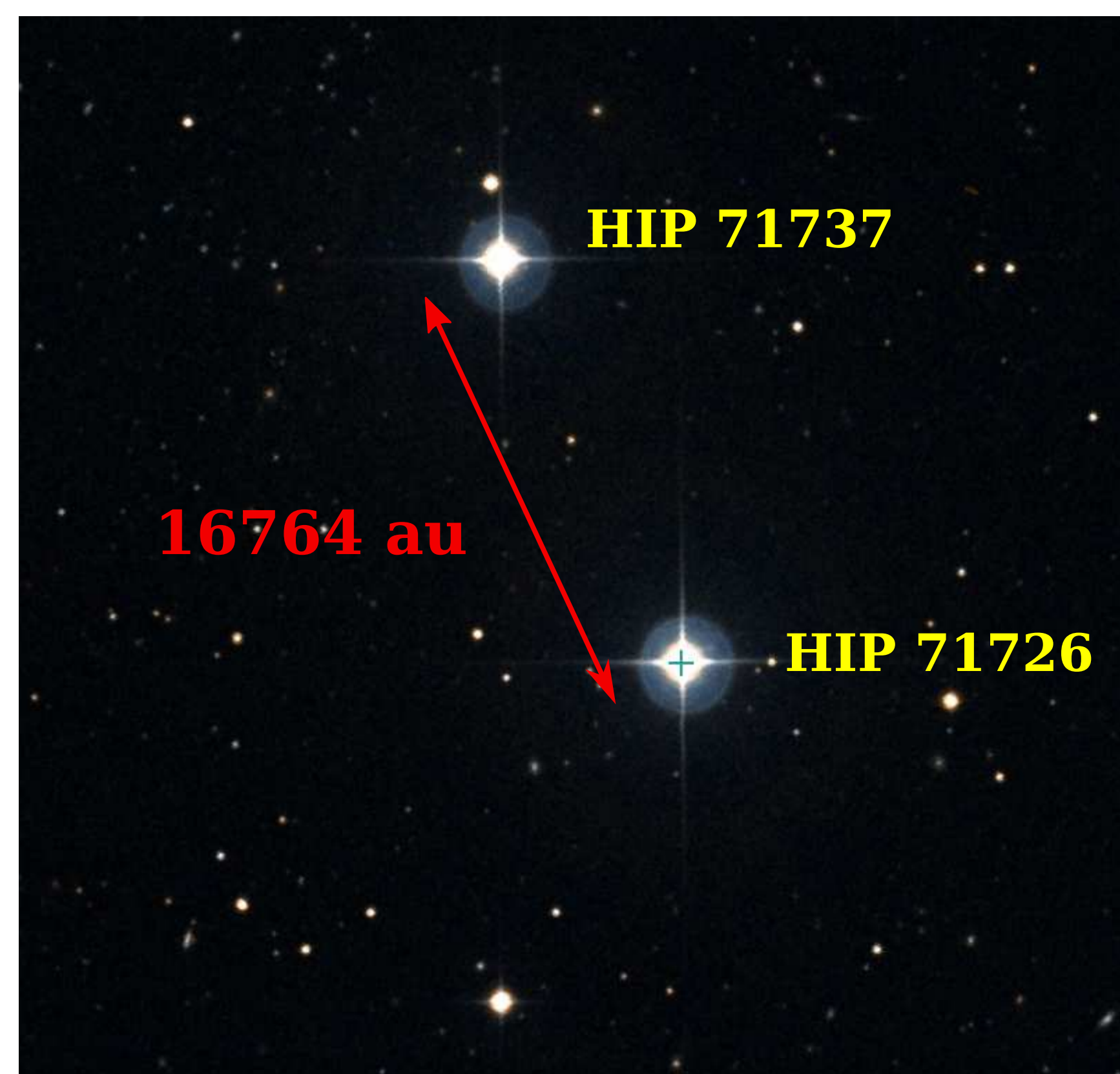


$$\Delta[\text{Fe}/\text{H}] = [\text{Fe}/\text{H}]_{\text{A}} - [\text{Fe}/\text{H}]_{\text{B}} \sim 0.0 \text{ dex}$$



Most of the binary systems analyzed with high-resolution instruments ($R > 60\,000$) are consistent to the level of 0.1 dex. However, within this level, some pairs have a large difference in Li abundance between the components, which may indicate a planet engulfment event.

The wide binary system HIP 71726/HIP 71737



Credit: Simbad

Observation and analysis

- Spectra ($S/R = 350$) obtained with the Robert G. Tull Coudé Spectrograph ($R = 60\,000$) at the McDonald Observatory.
- Stellar parameters and chemical abundances determined through the differential technique.
- Ages and masses estimated using isochrones of stellar evolution.

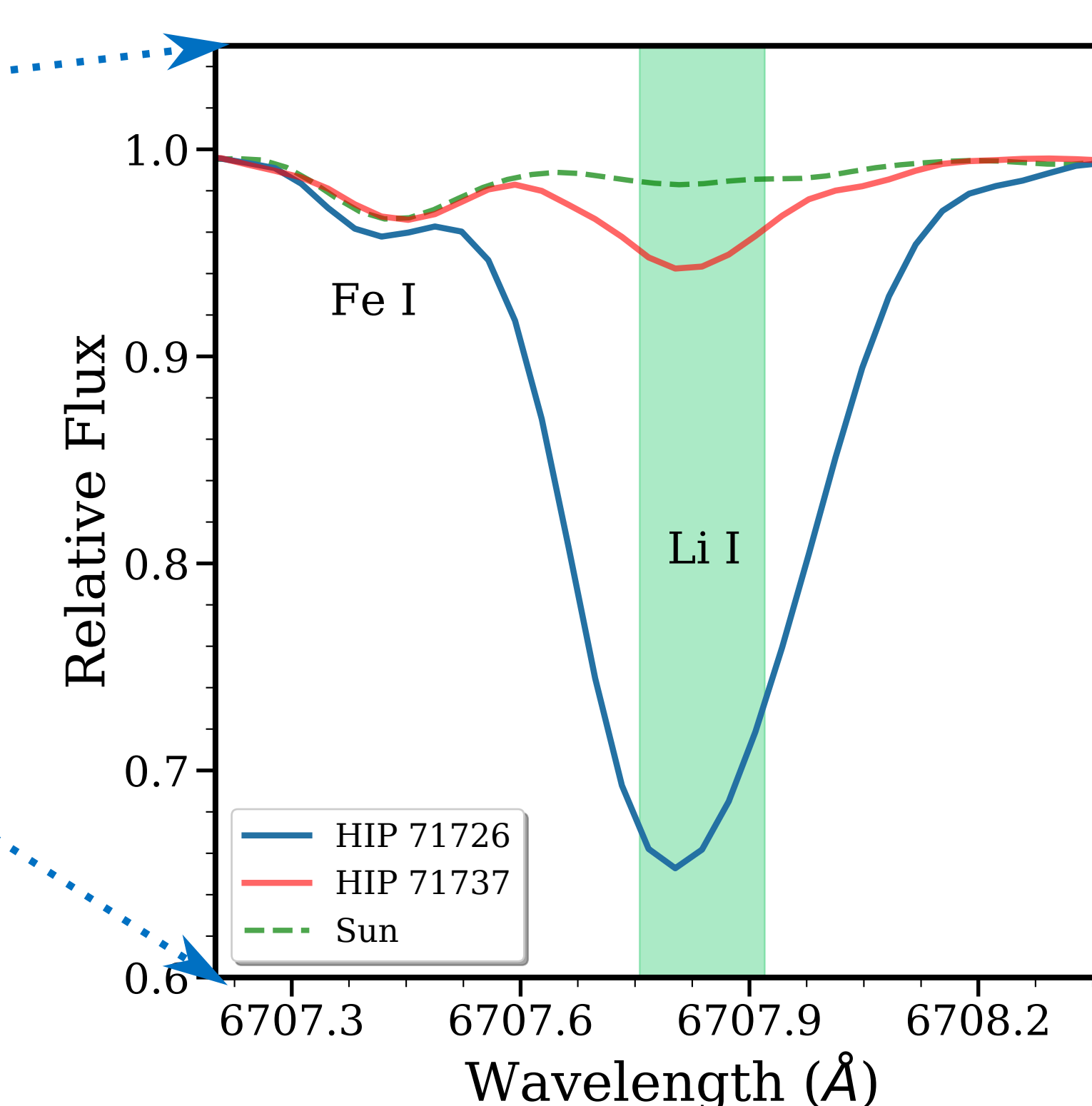
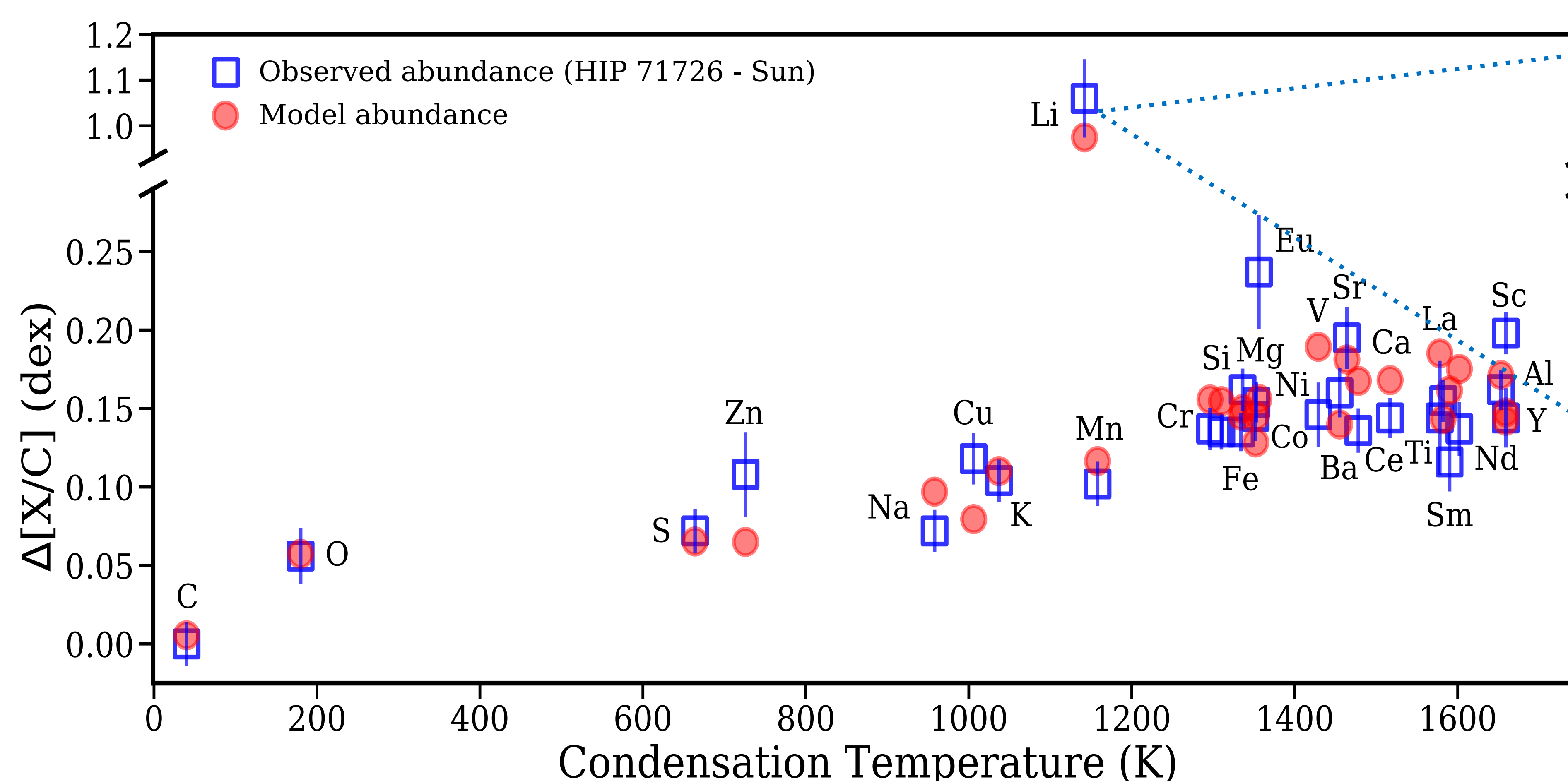
Fundamental parameters

ID	Teff (K)	[Fe/H] (dex)	Log g (dex)	Age (Gyr)	Mass (M_{\odot})
HIP 71726	5957 \pm 9	0.16 \pm 0.01	4.26 \pm 0.02	4.2 \pm 0.3	1.18 \pm 0.01
HIP 71737	5934 \pm 9	0.05 \pm 0.01	4.35 \pm 0.03	5.1 \pm 0.3	1.09 \pm 0.01
Difference	23	0.11	0.09	0.9	0.09

The components of HIP 71726-37 are chemically inhomogeneous at the level of ~ 0.1 dex.

The difference in age could indicate that the pair is not coeval. However, it is coeval when we adopt the median or the lowest $[\text{Fe}/\text{H}]$ as the 'real' metallicity of the system in the age determinations.

Therefore, the system HIP 71726-37 is truly **coeval** and **conatal**!



HIP 71726-37 has the **largest difference of Li (~ 1.0 dex)** detected in twin-star binary systems!

Planet engulfment

Conclusions

- HIP 71726 is rich not only in refractory elements, but also in lithium abundance.
- A planetary engulfment of ~ 10 Earth masses reproduces well the abundance pattern of HIP 71726 and its high lithium abundance.
- Our results has important implications for studies of the evolution of planetary systems and chemical tagging.

More details in:
Yana Galarza et al. 2021, [arXiv:2109.00679](https://arxiv.org/abs/2109.00679)