Observation of the Youngest Exoplanets around Active Stars

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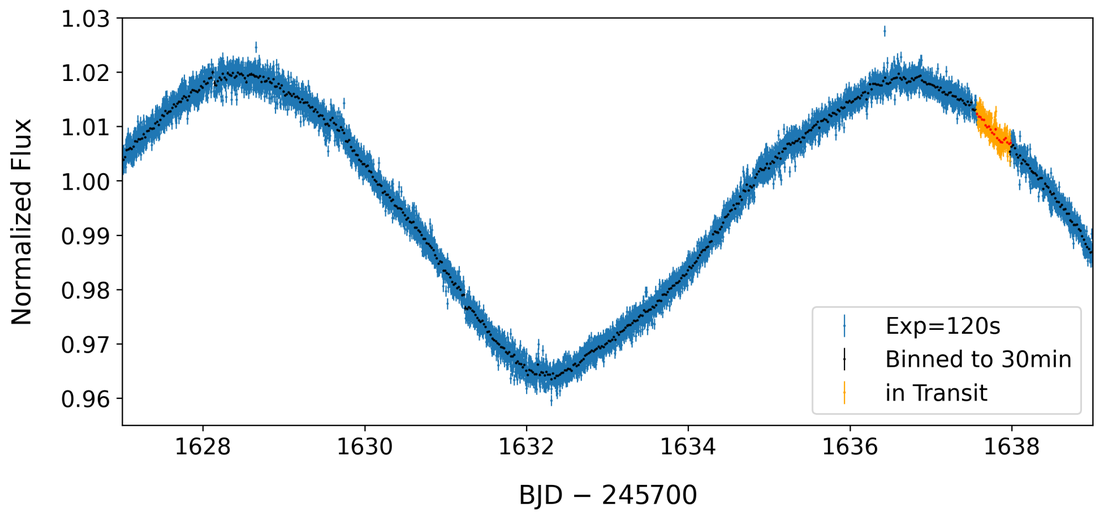
Introduction

We report one of the **youngest** exoplanets ever discovered, at 6 Myrs, with $4.94^{+0.46}_{-0.45}\,R_\oplus$ and $37^{+31}_{-16}\,M_\oplus$.

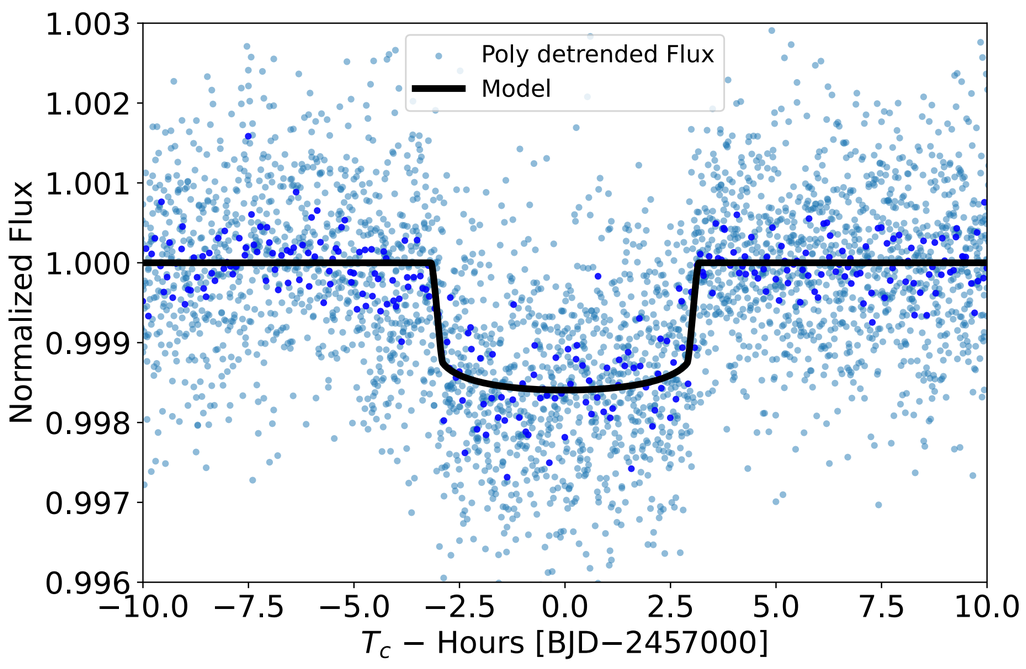
Young exoplanets are key for the understanding of planet formation mechanisms. Stellar activity remains a central issue in observations, especially for young stars.

Photometry

TESS observations in multiple sectors (11, 12, 38, 39, 64, 65) are available. Stellar activity is very strong, photometric variability is **35x larger than transit depth**. I used the Notch detrending algorithm (Rizzuto, 2017) to detect the transit ***P* = 18.71 days**.

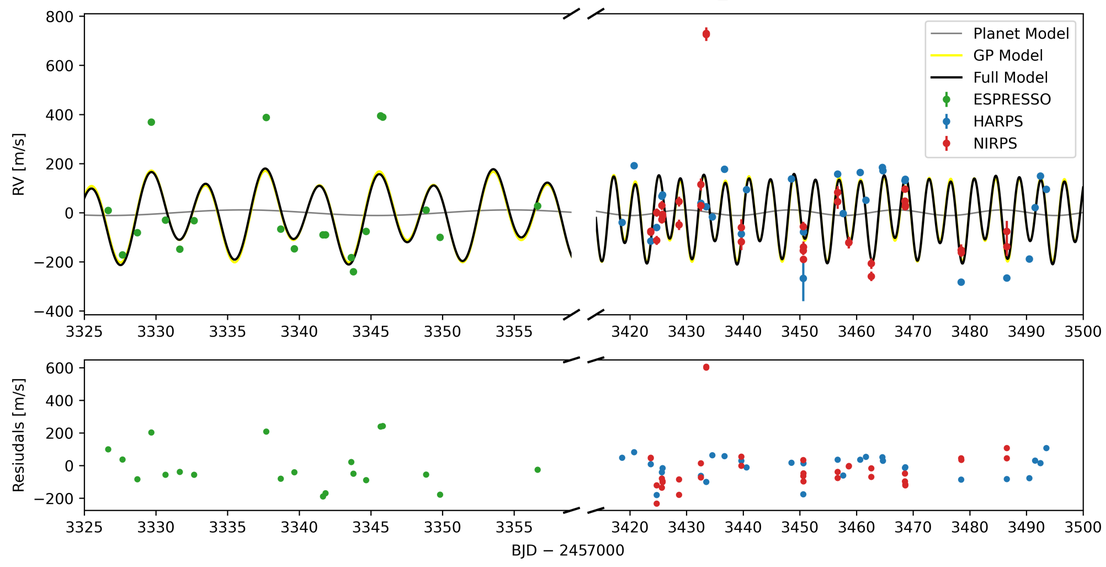


Using the ephemeris from Notch detrending we detrend the LC with a polynomial as a baseline.

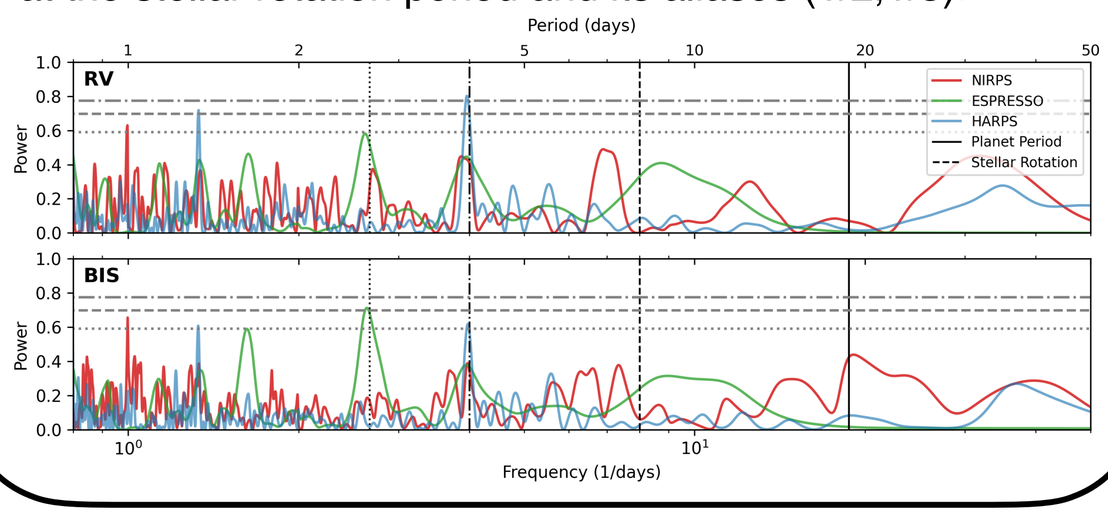


Radial Velocities

The RV data is from ESPRESSO (20), HARPS (29), NIRPS (34) The scatter of the RV signal ($\overline{\text{RMS}} \approx 200$ m/s) far exceeds that from a potential 30 $M_\oplus$ planet (10 m/s).



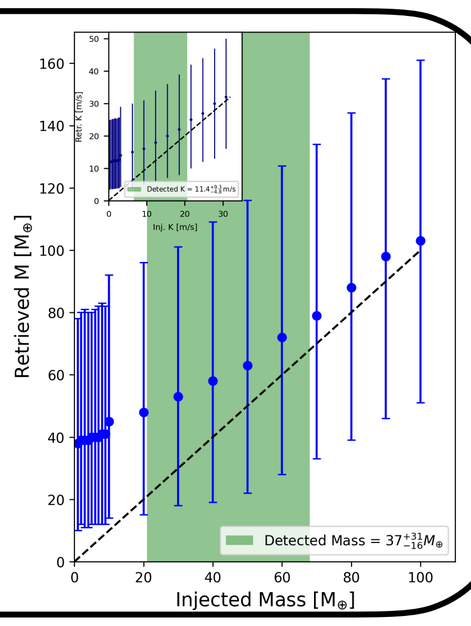
Lomb-Scargle Periodograms of the RV and activity indicator timeseries show no signal of the planet, but only at the stellar rotation period and its aliases (1/2,1/3).



Injection and Recovery Test

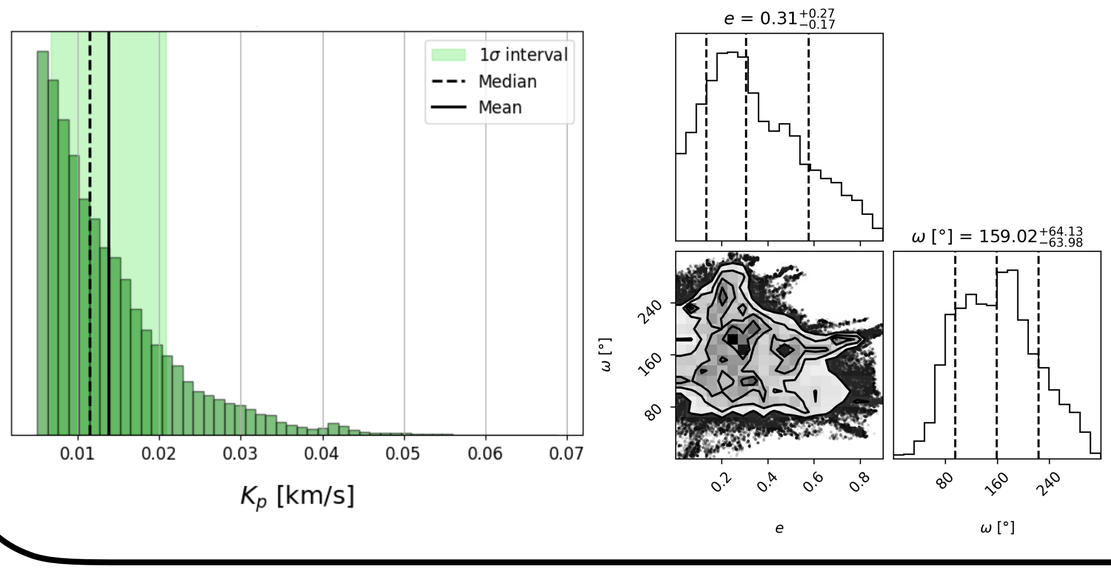
I detected an upper mass limit of $\mathbf{37^{+31}_{-16}\,M_\oplus}$.

An injection test was performed to test the validity of the result. The detected upper mass limit lies at the edge of detectability.



Conclusion

We find an **upper mass limit of $\mathbf{37^{+31}_{-16}\,M_\oplus}$**. The K_P posterior distribution is consistent with 0. Eccentricity was considered but could not be constrained with the current dataset.



The location in the mass-radius diagram is between giant planets and sub-Neptunes. Contraction via cooling is expected.