

V1298 Tau

Extracting planetary signals buried in extreme stellar activity

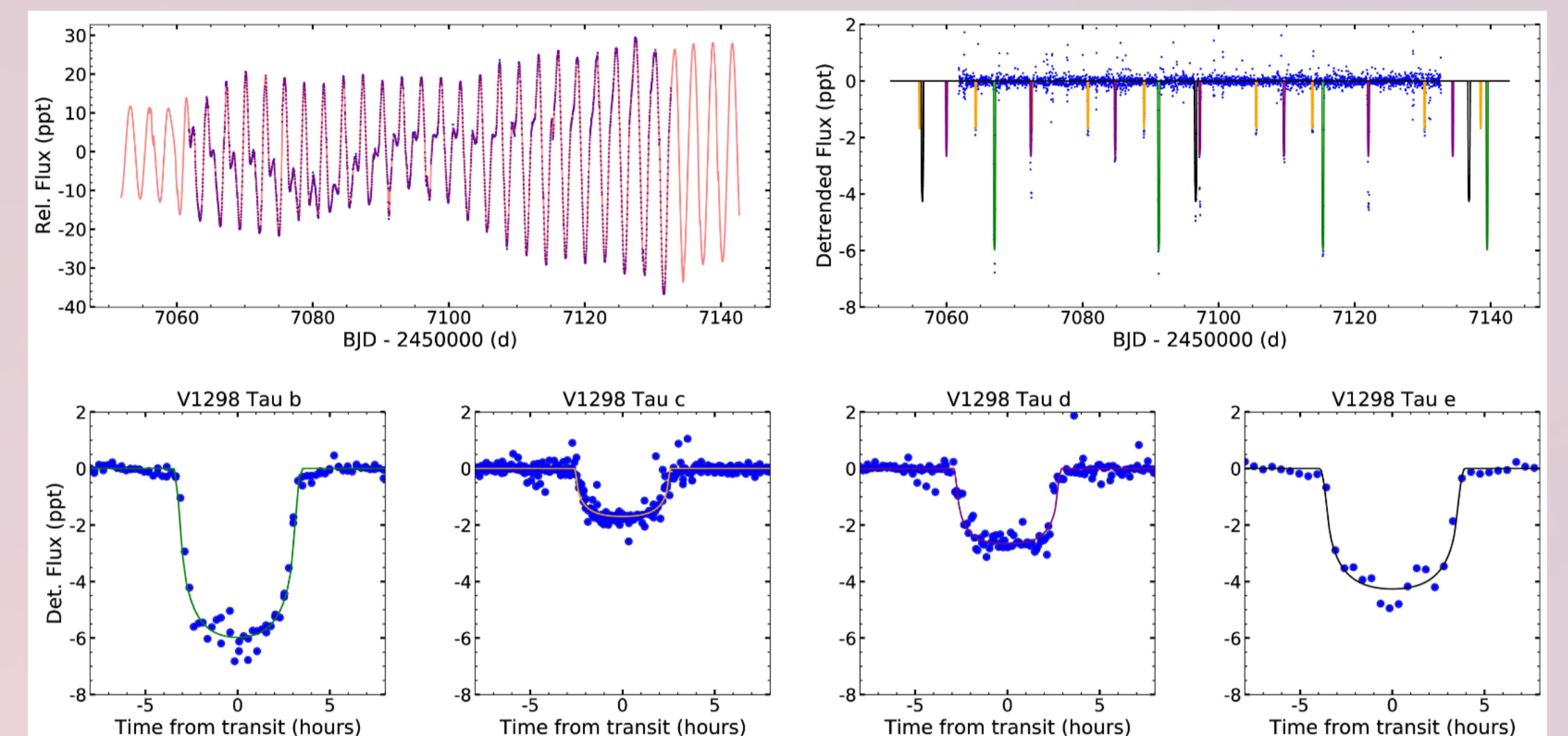
Suárez Mascareño, A.; Damasso, M.; Lodiéu, N.; Sozzetti, A.; Béjar, V. J. S.; Benatti, S.; Zapatero Osorio, M. R.; Micela, G.; Rebolo, R.; Desidera, S.; Murgas, F.; Claudi, R.; González Hernández, J. I.; Malavolta, L.; del Burgo, C.; D'Orazi, V.; Amado, P. J.; Locci, D.; Tabernero, H. M.; Marzari, F.; Aguado, D. S.; Turrini, D.; Cardona Guillén, C.; Toledo-Padrón, B.; Maggio, A.; Aceituno, J.; Bauer, F. F.; Caballero, J. A.; Chinchilla, P.; Esparza-Borges, E.; González-Álvarez, E.; Granzer, T.; Luque, R.; Martín, E. L.; Nowak, G.; Oshagh, M.; Pallé, E.; Parviainen, H.; Quirrenbach, A.; Reiners, A.; Ribas, I.; Strassmeier, K. G.; Weber, M. & Mallonn, M.

A young star with 4 transiting planets

20 ± 10 Myr

Why study young planets?

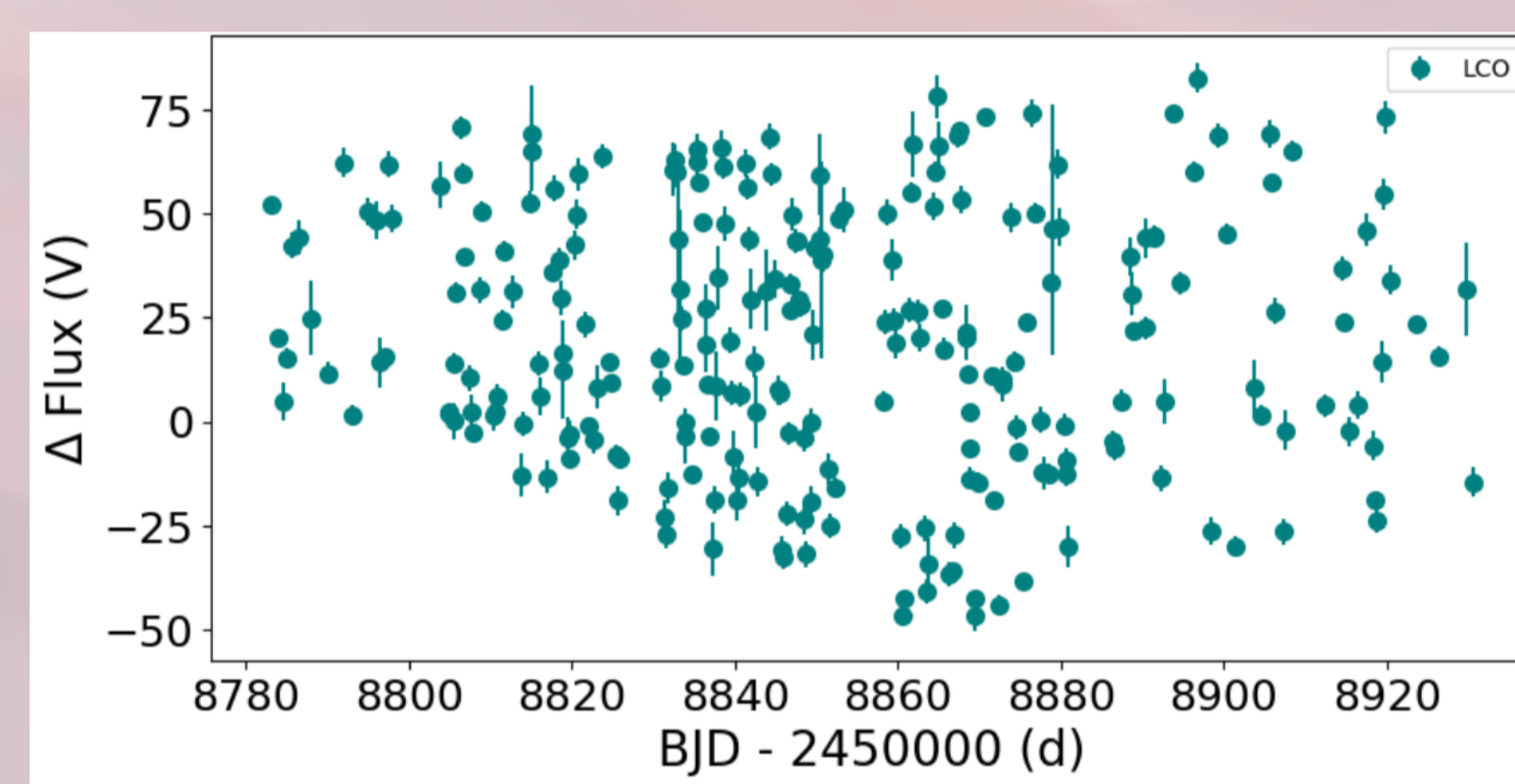
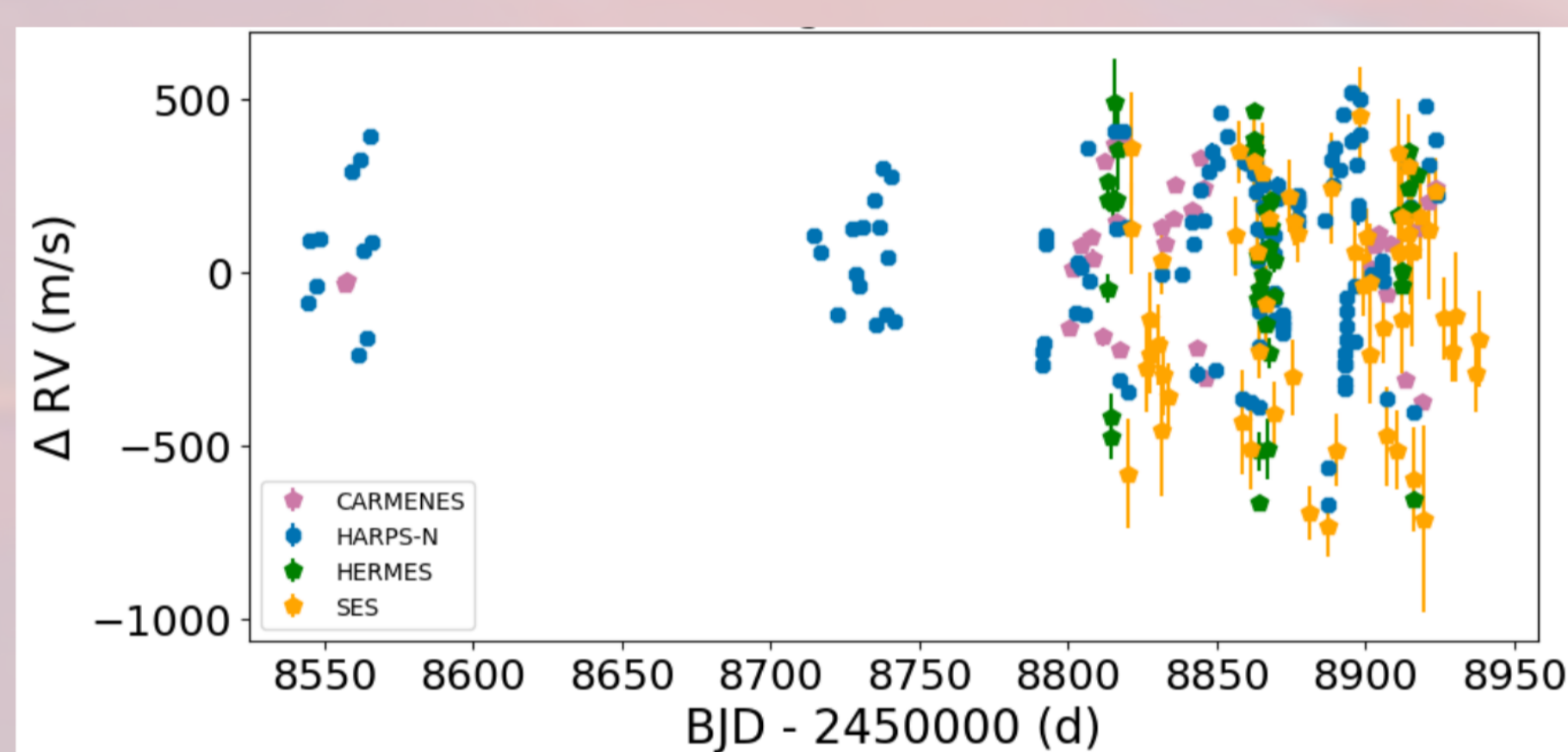
Laboratories to test models of early evolution of planets and planetary systems. *Very young planets are expected to be very inflated.*



Intense observational campaign

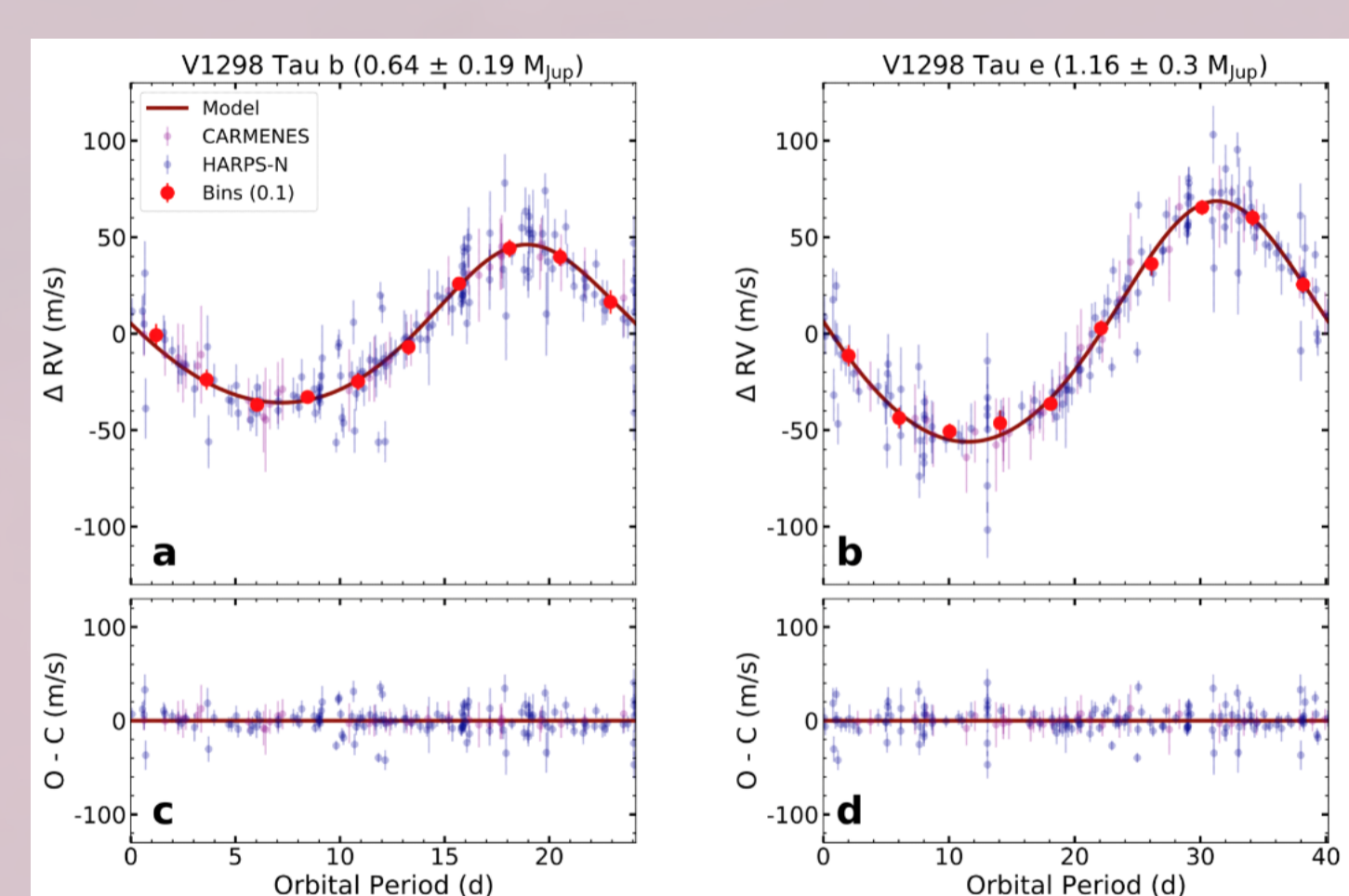
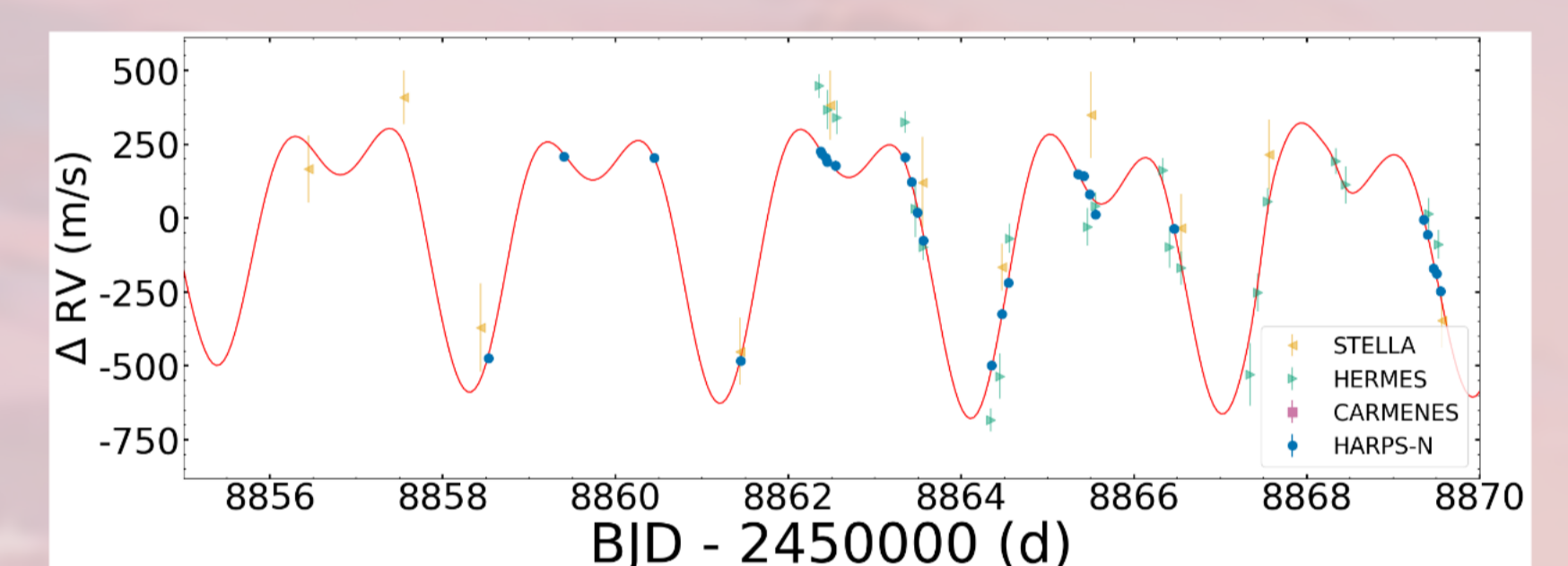
250 RV measurements in 1 year (200 in 5 months)

250 photometric measurements in 5 months



Joint model RV+K2+LCO

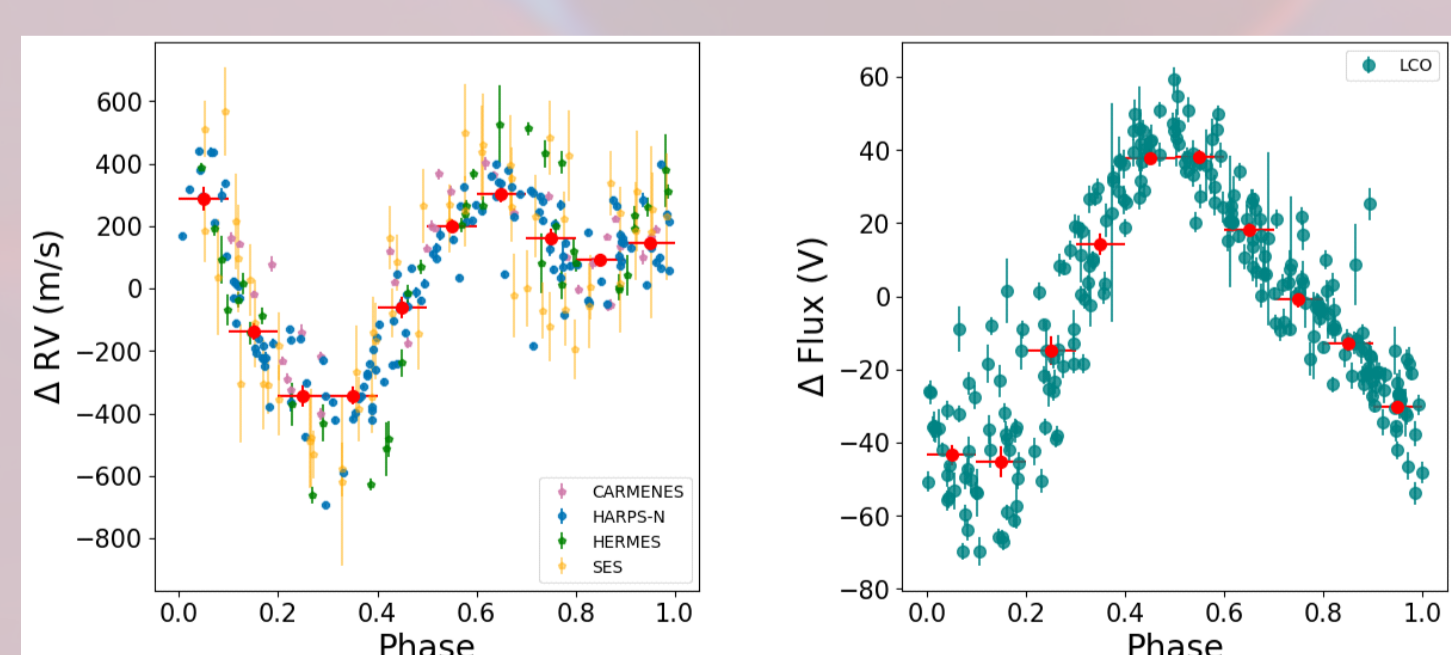
GP regression combining RV and photometry to constrain parameters of stellar activity



Planetary signals?

40 m/s at period of planet b

60 m/s signal at 40.2 days period (activity? see Feinstein et al. 2022)



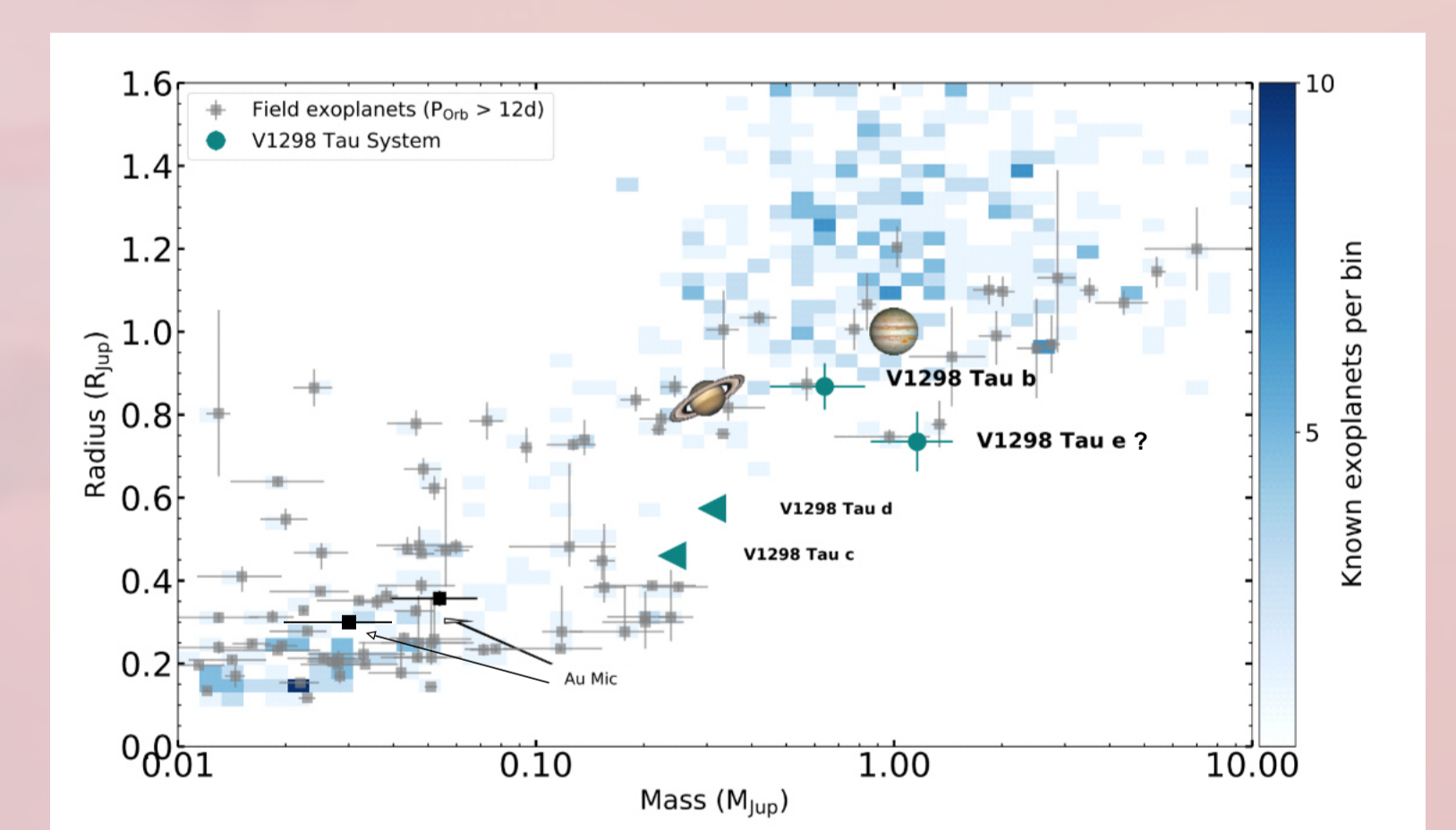
Rotation signal

Stable over ~5 months

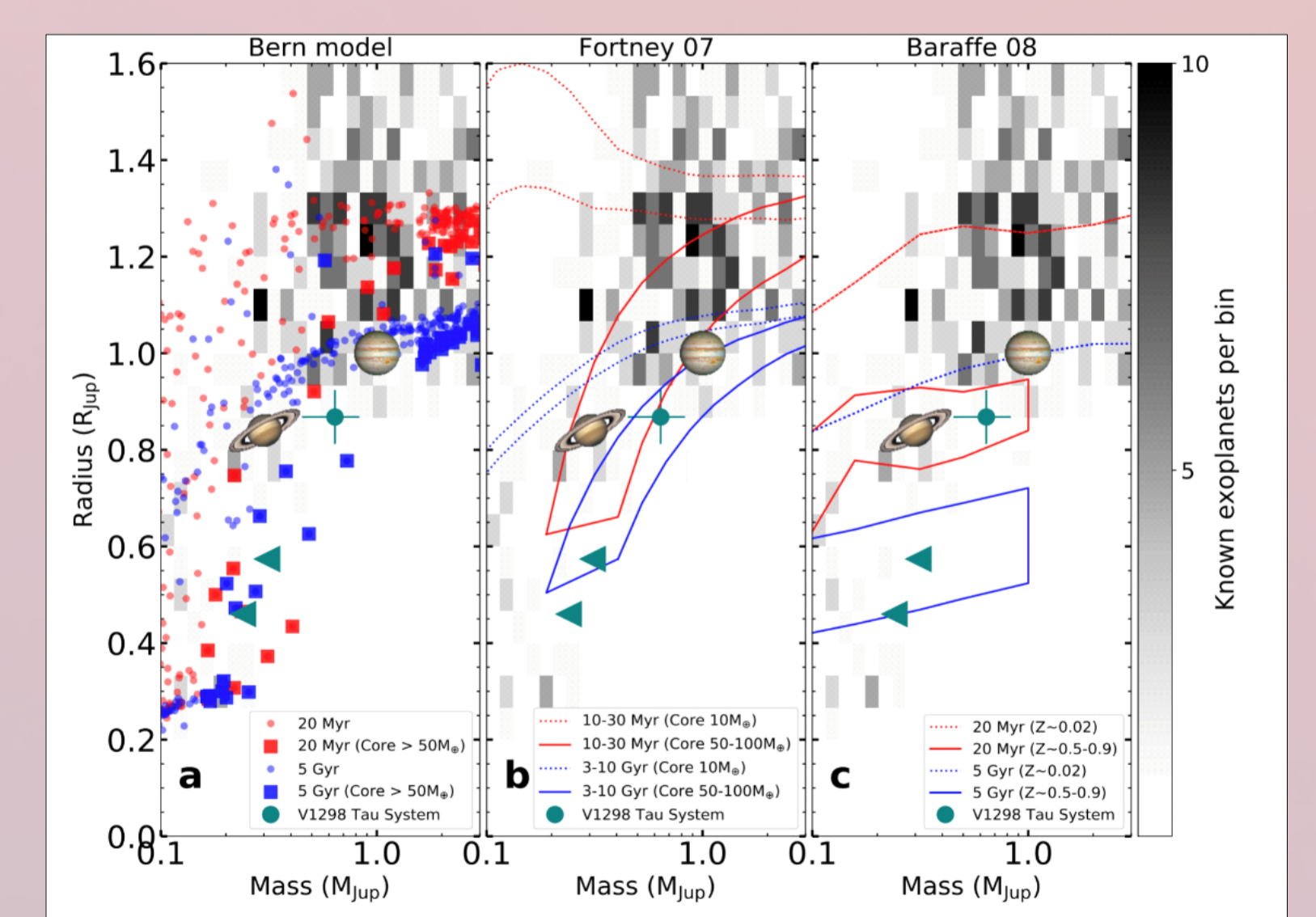
More harmonic complexity in RV

Similar to old planets?

Mass-radius ratio of V1298 Tau b consistent with solar-system planets. Similar situation with AU Mic planets.



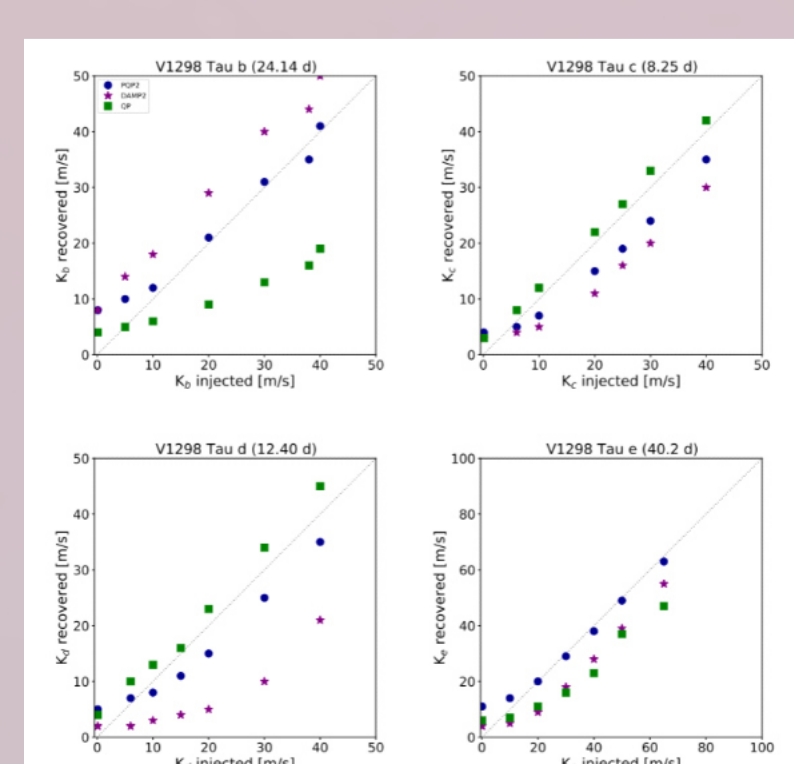
If the mass measurements of V1298 Tau b and AU Mic b and c are correct, **early evolution of young planets is not consistent with current models.**



A word of caution

Different activity models provide different mass measurements.

Injection-recovery tests favour the presented solution, *but...* the **potential biases introduced by the choice of GP model in low signal to noise scenarios haven't been fully explored within the community.** These biases can potentially affect our understanding of the physical properties of exoplanets.



Rapid contraction of giant planets orbiting the 20-million-year-old star V1298 Tau - Nature Astronomy, Volume 6, p. 232-240

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*Mostly in Spanish

