

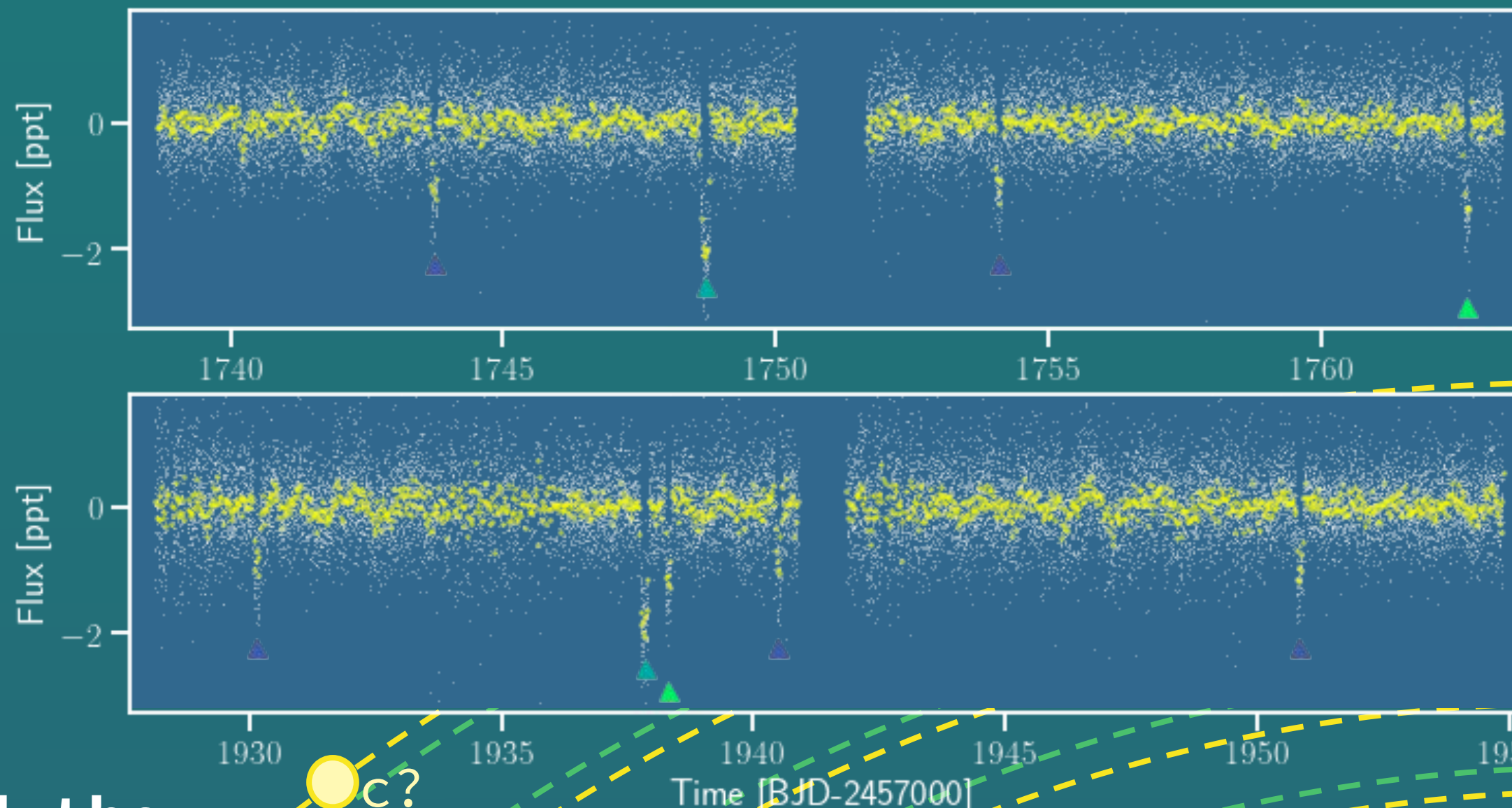
RECOVERING LONG-PERIOD TESS PLANETS WITH CHEOPS: THE TOI-2076 SYSTEM

Hugh P. Osborn et al, [2203.03194](https://arxiv.org/abs/2203.03194)

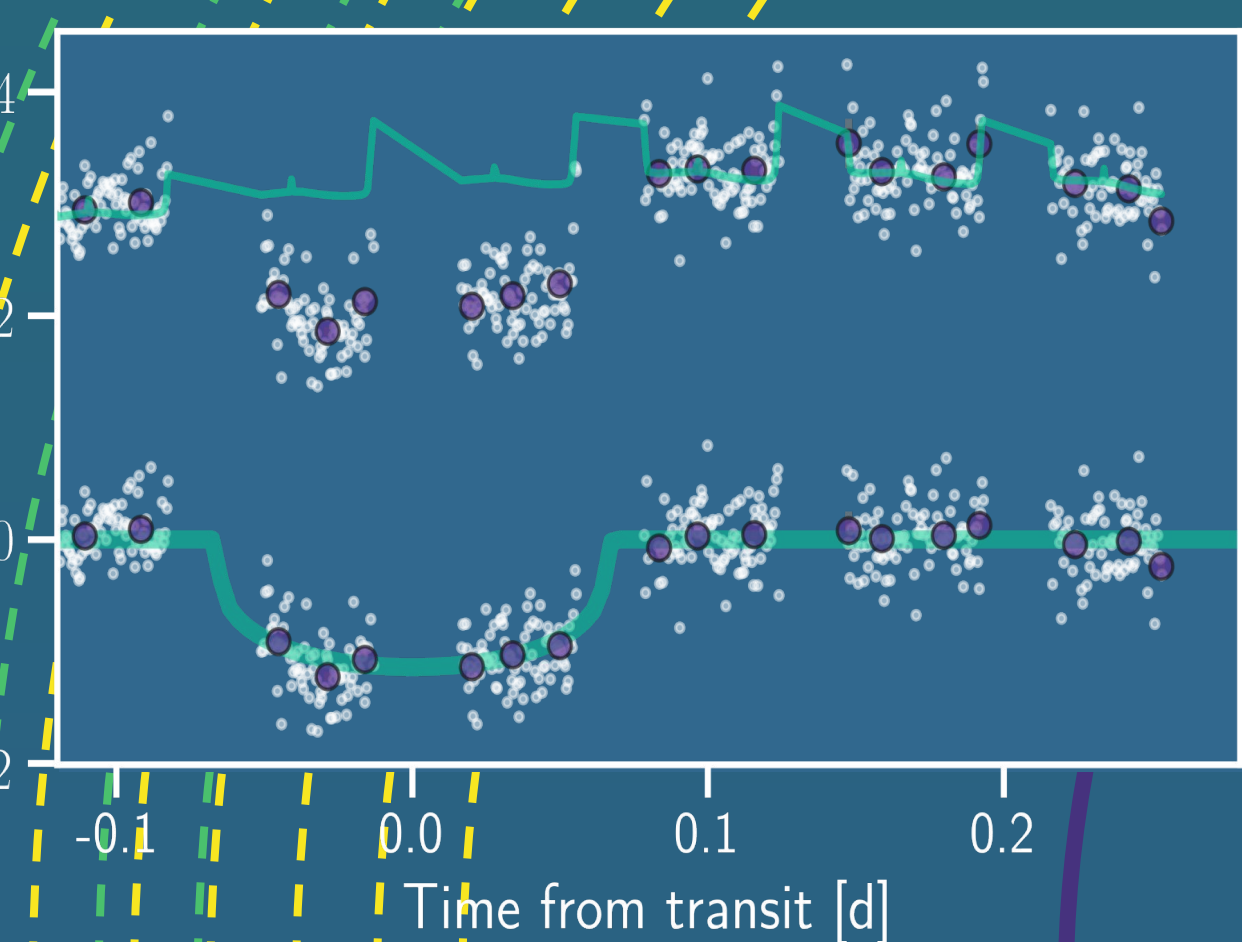
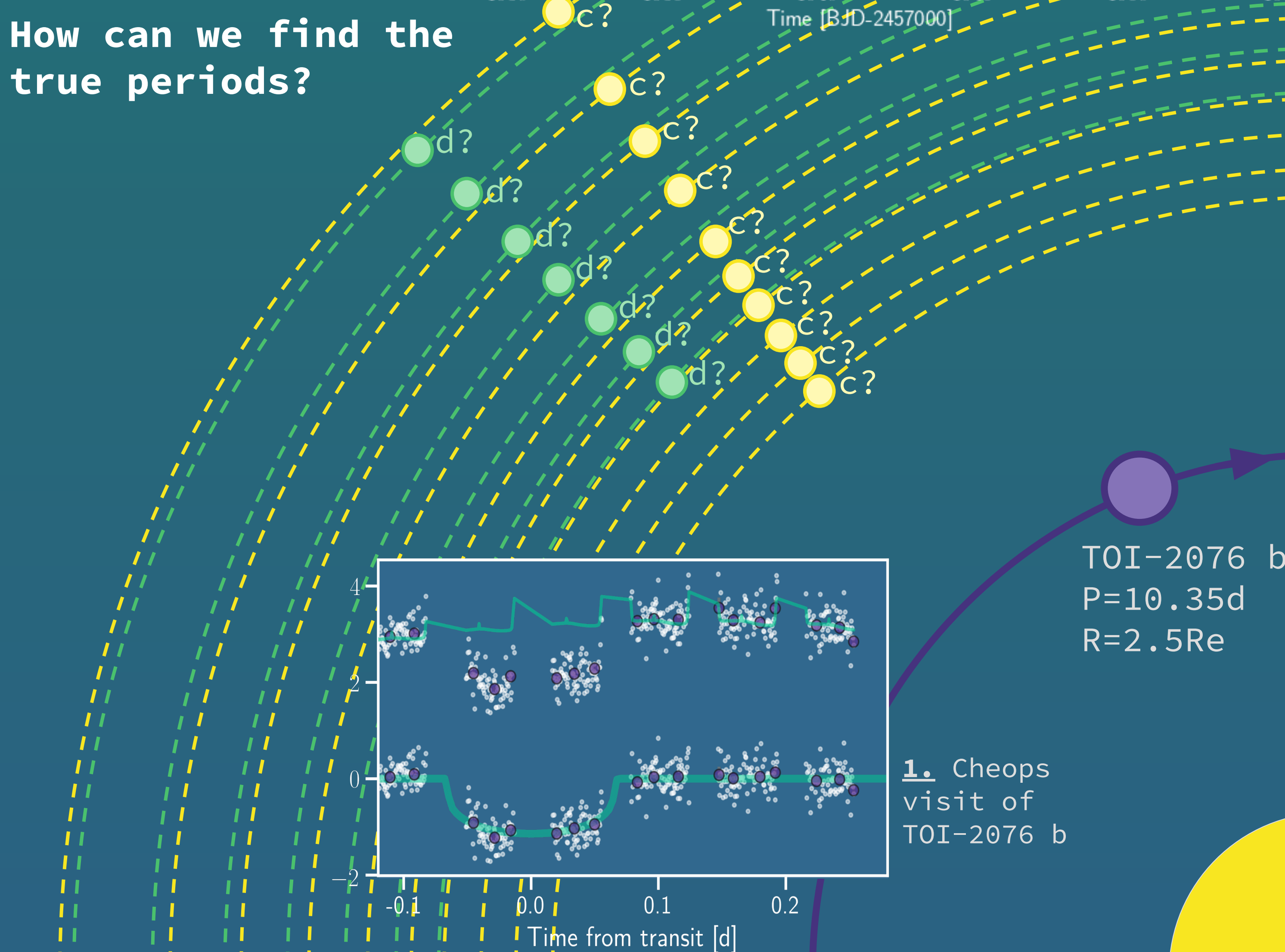
The TOI-2076 system: 3 transiting sub-Neptunes around a bright (G=8.9, K=7.1) young (340Myr) K1 star

TESS saw each of the two outer planets transit only once per sector separated by a ~190 day gap.

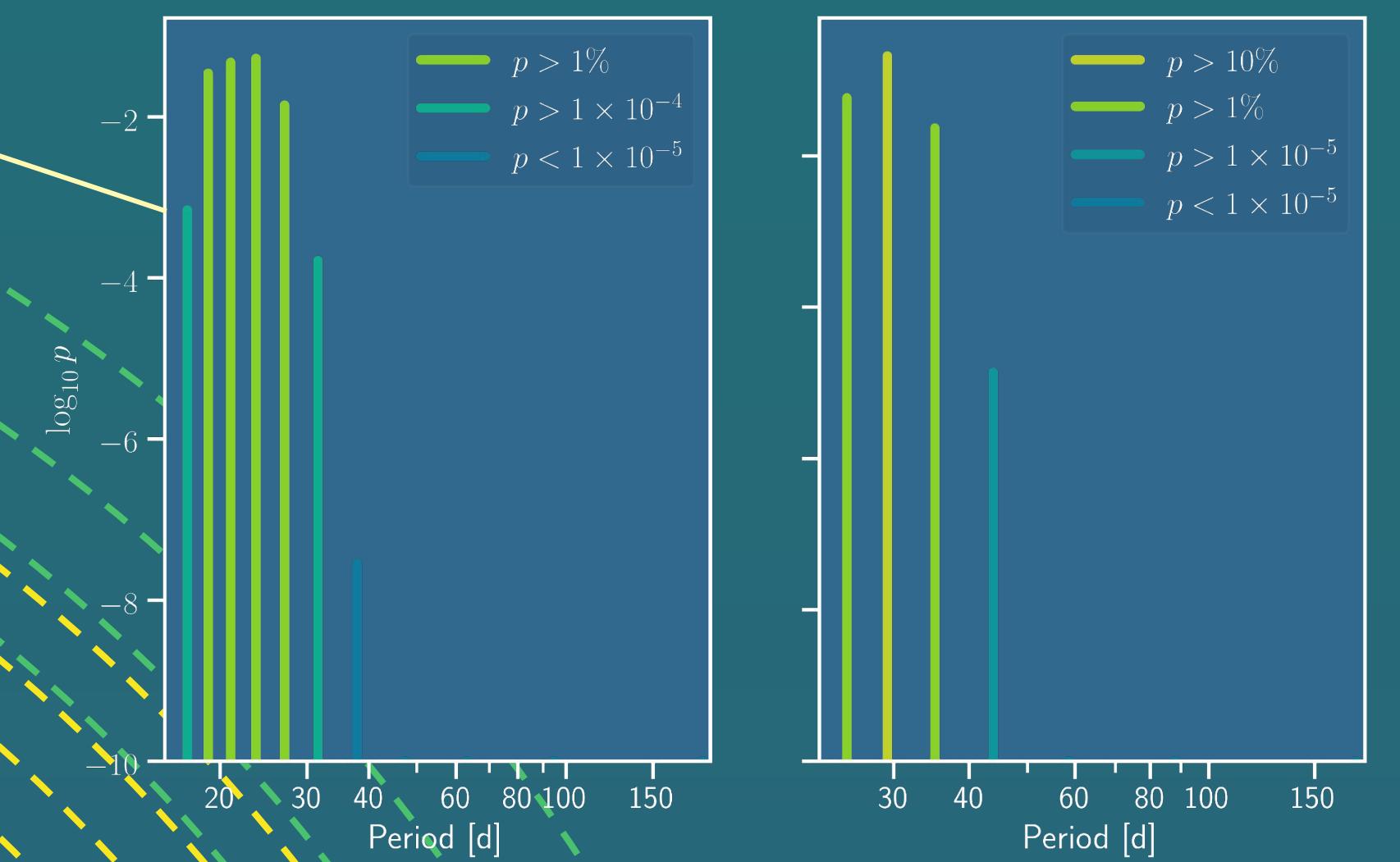
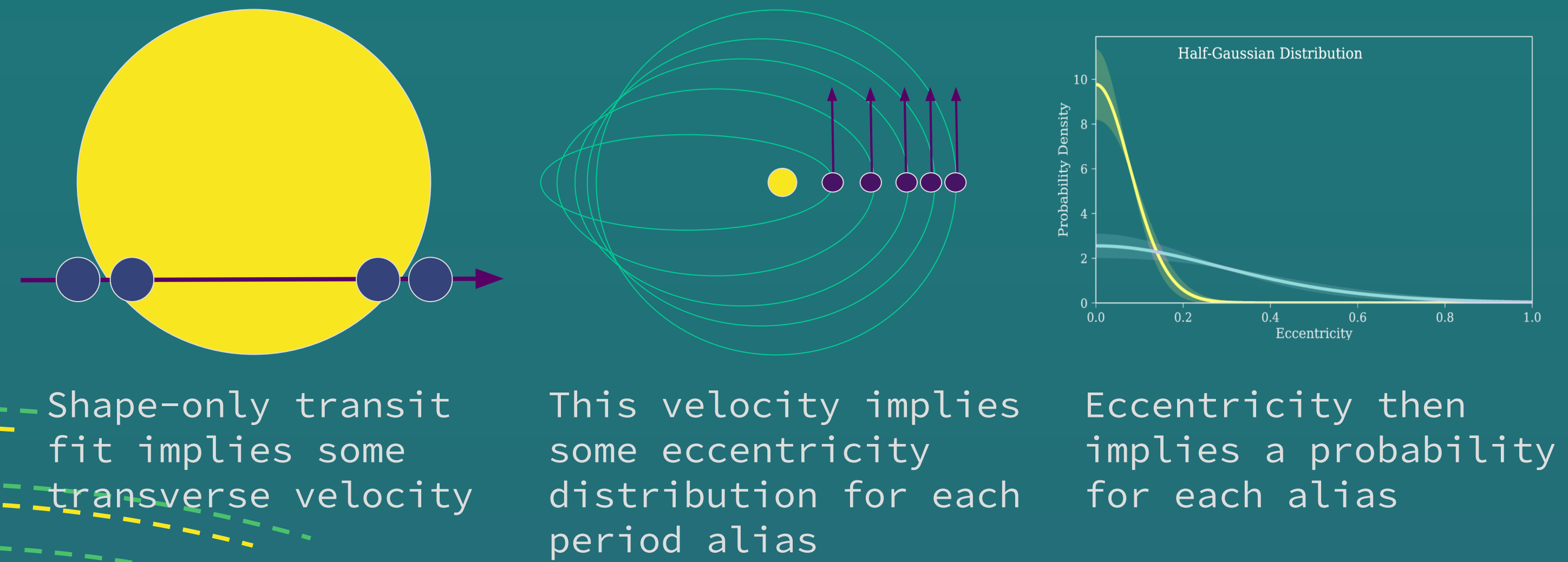
These 'duotransits' have 7 & 11 possible period aliases for planets c & d.



How can we find the true periods?



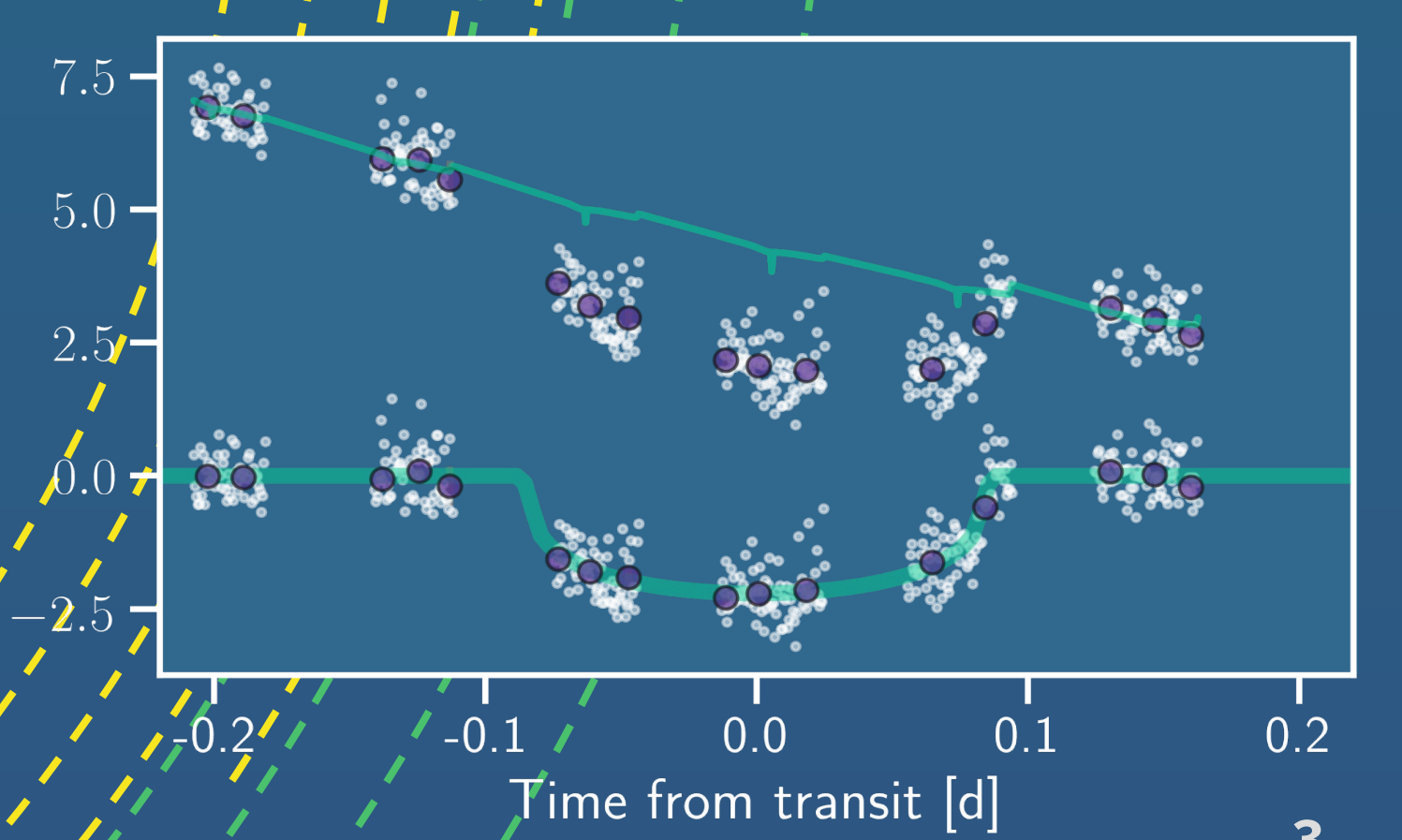
1) Calculate period probabilities with transit models



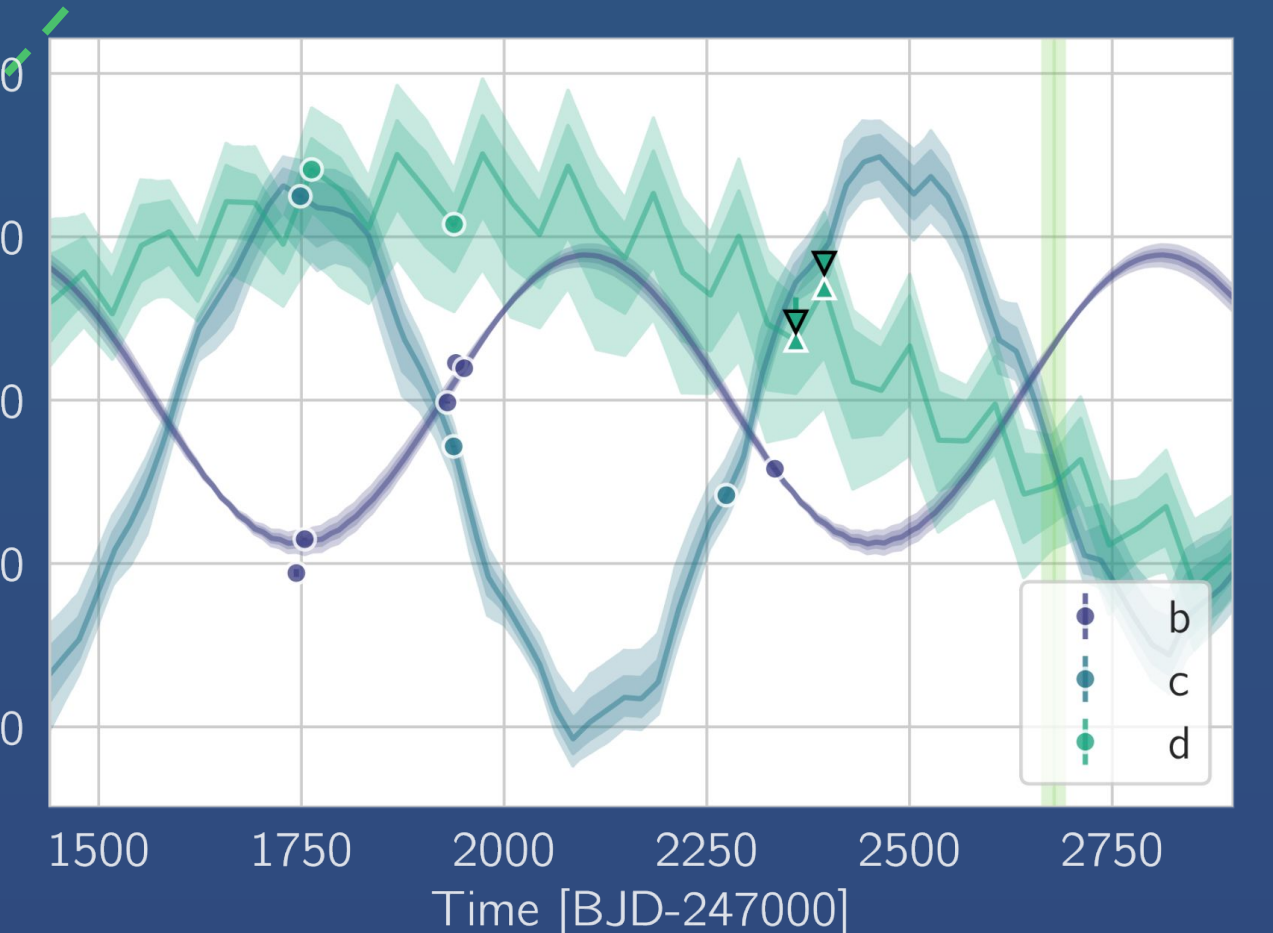
2. Long periods (P>50d) probabilistically ruled out

([MonoTools](#) code is open-source)

2) Perform targeted follow-up of period aliases with Cheops

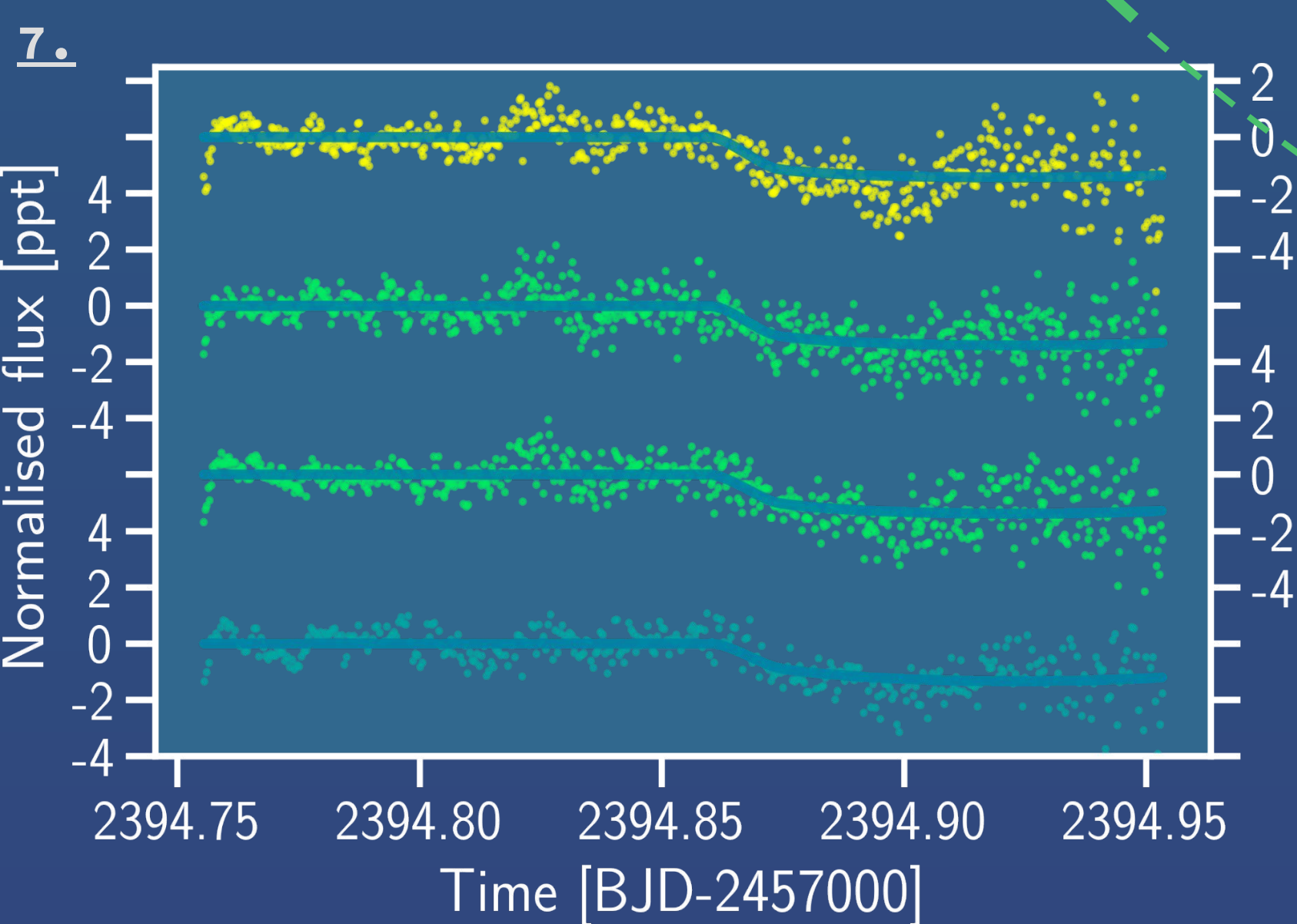


3. Successfully detected a transit at 21.1d alias of TOI-2076 c

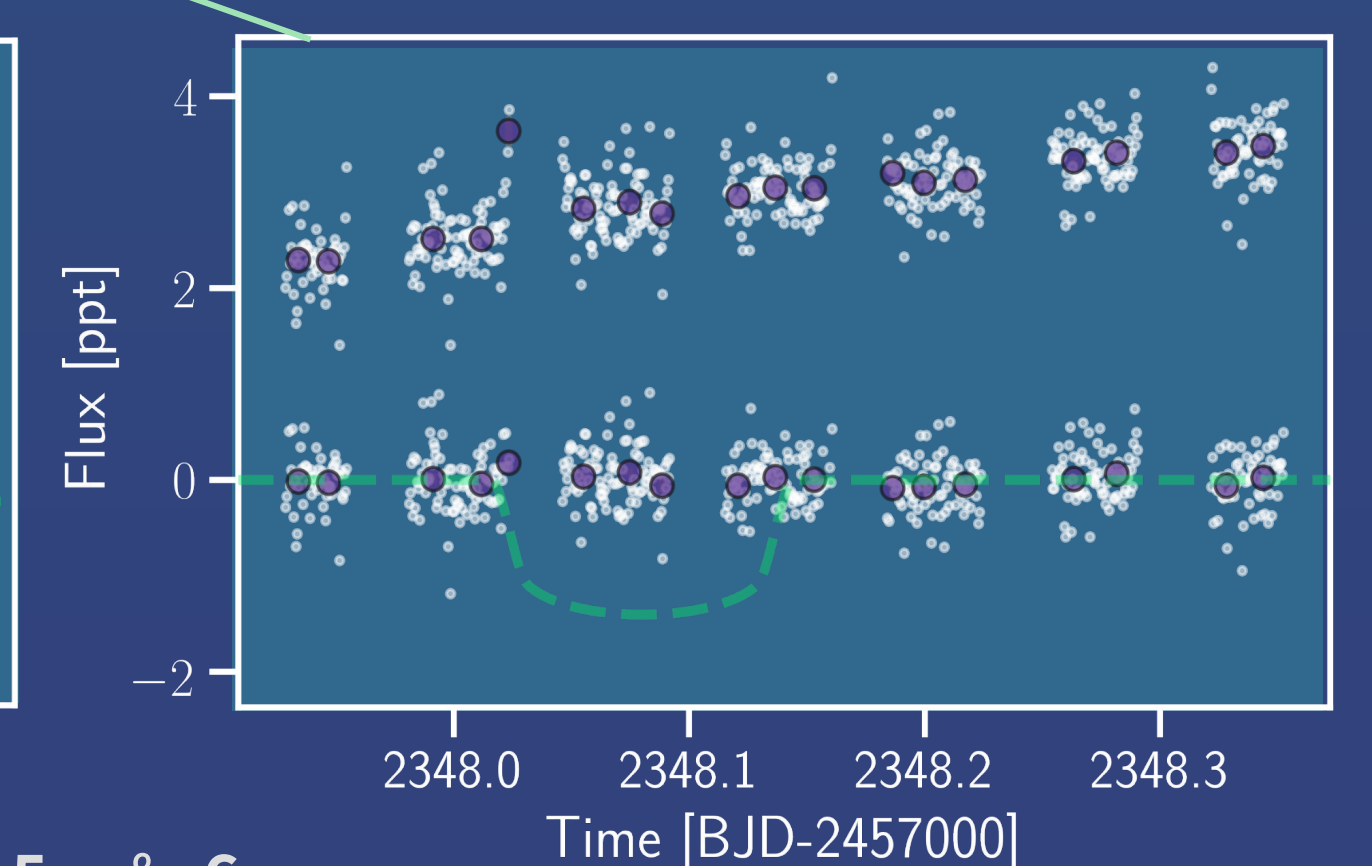
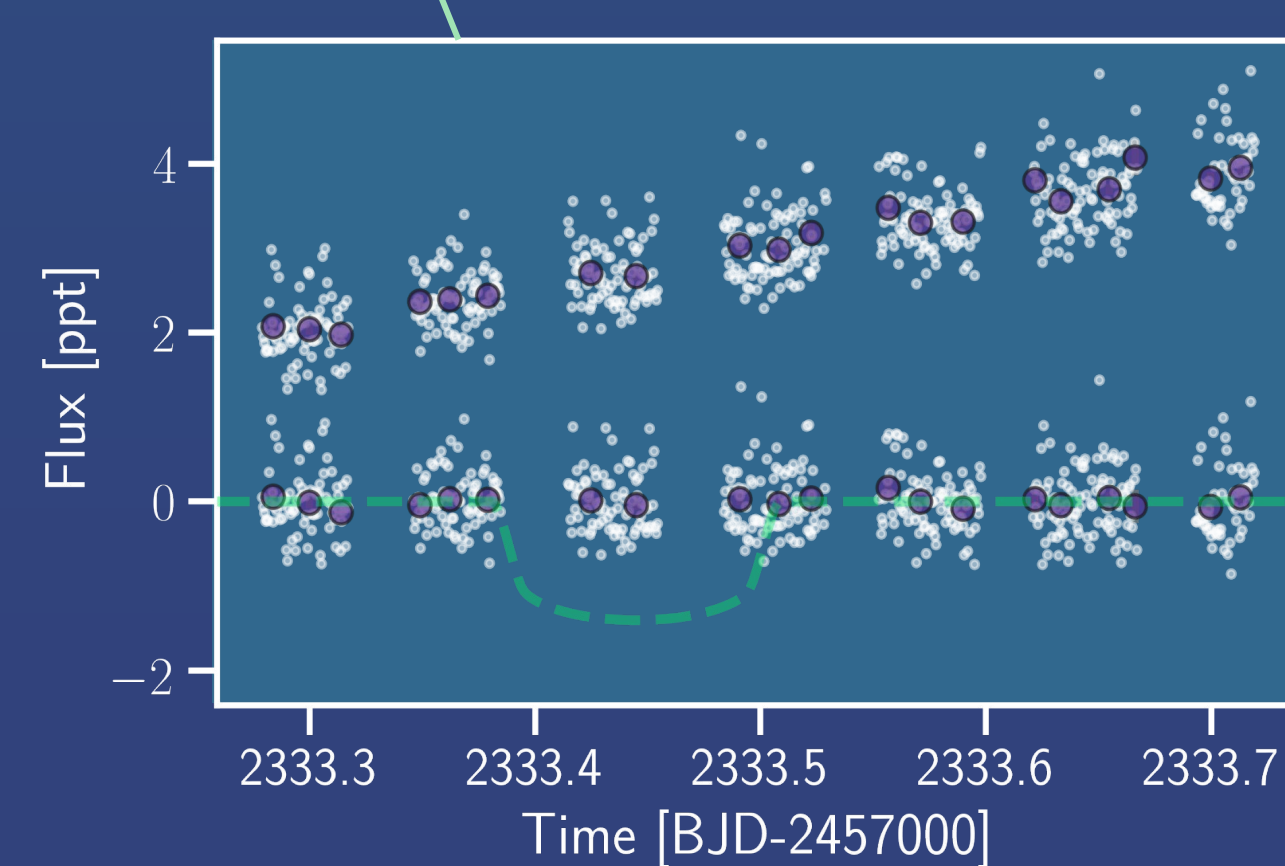


4. Reveals TTVs with amplitudes of ~30mins anti-correlated with TOI-2076b

Photometry with LCO/MuSCAT3 confirm that the period of TOI-2076 d is 35.1d



A combination of ground-based observations & stability simulations rule out the 25d alias. Only the 35.1d alias remains



5. & 6.

Two visits rule out the 29.3, 43.9 and 58.5d aliases of TOI-2076 d

Conclusions

Using a combination of TESS, Cheops & ground-based photometry we found the true periods of two warm, young sub-Neptunes orbiting TOI-2076.

With periods now known a priori, RV campaigns can more easily find the true masses, assisted by the TTVs we detected. With TSM>100 for all 3 planets, transmission spectra with HST/JWST can also be considered.