

EXOPLANETS

A Kepler multiplanet system precursor

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One of the many surprises found by the Kepler mission was the abundance of compact multiplanet systems with masses between Earth and Neptune orbiting close to their stars and co-planar with each other. Trevor David and colleagues report the discovery of a system that could help us understand and constrain their formation, which is still debated.

David et al. find four planets around the 20-Myr-old solar analogue V1298 Tau, using K2 data. These planets fulfil almost all of the criteria of a Kepler compact system: they are co-planar and they are all within an orbital period of ~60 days. However, they are much bigger than usual. In fact, V1298 Tau b is Jupiter-sized, and the radii of the others stand between Saturn and Neptune. Their masses cannot be determined with precision from only the K2 transits, but based on their mutual separation the authors infer that all of them have quite low density.

The system is probably still actively evolving: all of the planets are particularly inflated, and David et al. estimate that they will contract by 40–90%, possibly experiencing significant photoevaporation. In addition, several of them are close to mean-motion resonances (planets c–d, close to 3:2; and d–b, to 2:1). Thus, either there is a formation mechanism that creates planets close to resonances, or the migration process bringing formed planets near resonances can act very quickly, on the order of ten million years.

David et al. conclude that V1298 Tau is a young precursor of the ‘standard’ Kepler multiplanet systems.

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