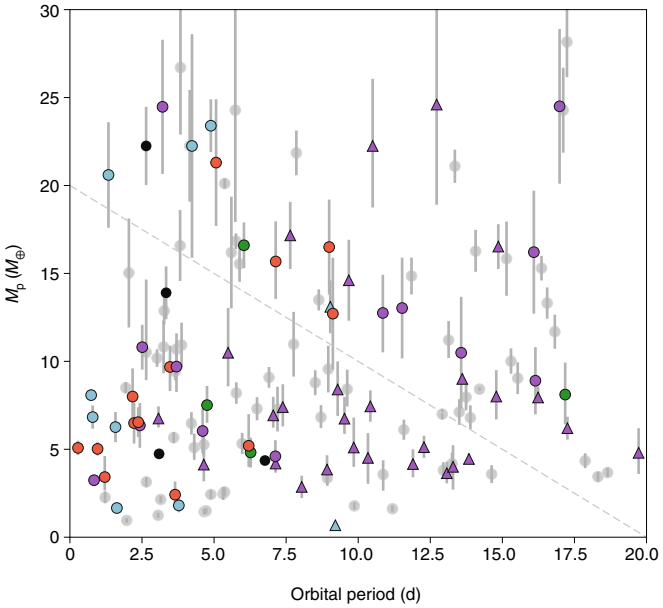
EXOPLANETS

A rift in the mass distribution continuum

Astrophys. J. Lett. (in the press); preprint available at https://arxiv.org/abs/1906.11865



Credit: AAS/IOP

As the counter on the NASA Exoplanet Archive ticks over to read 4,000 confirmed planets, robust statistical studies of exoplanet properties are becoming increasingly common. Curious features appear in plots of one property against another, such as the now well-established 'Neptunian desert' — a sparsely populated region of the period–radius plane where Neptune-sized planets are being stripped of their atmospheres by their host stars. David Armstrong and colleagues have zoomed in on a region at the edge of the Neptunian desert inhabited by planets with orbital periods less than 20 days. There they find another feature: a gap in mass for planets less than 20 Earth masses.

Planets with reliable mass estimates are hard to come by. Armstrong et al. found just 72 short-period, low-mass planets with mass estimates better than 3σ (the coloured points in the image). A broader sample of planets, with unmeasured orbital inclinations (and thus more loosely constrained masses) added 71 planets to the tally (grey points in the image). In the period–mass plane, a gap four Earth masses wide is apparent, following a straight line with a gradient of approximately $-1\ M_\oplus\ d^{-1}$ passing through the point 10 d, 10 $M_\oplus$ (grey dashed line).

Physical reasons for such a gap are not immediately clear. The authors inconclusively explore several, including a quirk of accretion dynamics, a planetary system dynamical instability and star–planet tides, but note that this gap is not likely to be related to the 'photoevaporation valley', another previously seen feature of exoplanet property distributions. Further observations will hold the key.

Paul Woods

Published online: 26 July 2019
https://doi.org/10.1038/s41550-019-0873-1