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Title: The shortest-period planets
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Abstract: We report on a Kepler survey for the planets with the shortest possible orbital periods. We have identified a sample of about 110 planet candidates with periods shorter than one day, through our own Fourier analysis of the Kepler data as well as a critical evaluation of previously reported candidates. Statistical considerations suggest that most of these candidates are true planets. One remarkable member of this population is Kepler-78b (Sanchis-Ojeda et al. 2013), an Earth-sized planet with a period of 8.5 hours, which has a host star bright enough to enable robust detections of the planetary occultations and illumination phase variations, and possibly also the radial-velocity variations induced by the planet. Another noteworthy planet is KOI 1843.03 (Rappaport et al. 2013), which is so close to its star that it must be composed mainly of iron to avoid tidal destruction. We will also present an estimate of the occurrence rate of ultra-short period planets. We find that among this population, planets smaller than $2 R_E$ are more common than planets between $2-3 R_E$, the opposite of what has been observed among longer-period planets. This might be because gaseous atmospheres are impossible to retain under such strong irradiation. We also find that cooler stars are more likely than hot stars to host ultra-short period planets, in agreement with the previously noted trend for longer period planets. Future follow-up observations of the Kepler candidates, and future discoveries with TESS, will give a more complete picture of these extreme planetary systems.

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