

Exoplanet Characterisation: threshold radii for water-worlds and Neptune-like planets

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Abstract

Upcoming space missions such as CHEOPS, TESS, and PLATO will bring exoplanetary characterisation to the next level with the aim of constraining the planetary composition.

We present a statistical analysis to determine the threshold radii for various compositions of exoplanets with masses up to 20 Earth masses. First, we confirm that most planets with radii larger than 1.6 Earth radius (R_{\oplus}) are not rocky, and must consist of lighter elements, as found by previous studies. We suggest that planets with radii larger than 2.6 R_{\oplus} cannot be pure-water worlds, and must have atmospheres, presumably, of hydrogen and helium (H-He). We suggest that the threshold from Earth-analogs to Neptune-analogs occurs at $\sim 3 R_{\oplus}$. We also discuss and present the sensitivity of the results to the assumed envelope's metallicity, the distribution of the elements, the planetary temperature and albedo, and the accuracy of the mass and radius measurement.