Masses and radii for the three super-Earths orbiting GJ 9827, and implications for the composition of small exoplanets - DTU Orbit (14/10/2019)

Super-Earths belong to a class of planet not found in the Solar System, but which appear common in the Galaxy. Given that some super-Earths are rocky, while others retain substantial atmospheres, their study can provide clues as to the formation of both rocky planets and gaseous planets, and - in particular - they can help to constrain the role of photo-evaporation in sculpting the exoplanet population. GJ 9827 is a system already known to host 3 super-Earths with orbital periods of 1.2, 3.6 and 6.2 days. Here we use new HARPS-N radial velocity measurements, together with previously published radial velocities, to better constrain the properties of the GJ 9827 planets. Our analysis can’t place a strong constraint on the mass of GJ 9827 c, but does indicate that GJ 9827 b is rocky with a composition that is probably similar to that of the Earth, while GJ 9827 d almost certainly retains a volatile envelope. Therefore, GJ 9827 hosts planets on either side of the radius gap that appears to divide super-Earths into pre-dominantly rocky ones that have radii below ~1.5R⊕, and ones that still retain a substantial atmosphere and/or volatile components, and have radii above ~2R⊕. That the less heavily irradiated of the 3 planets still retains an atmosphere, may indicate that photoevaporation has played a key role in the evolution of the planets in this system.

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