Could mini-Neptunes be irradiated ocean planets?

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Many exoplanets known today are 'super-Earths,' with a radius 1.3 times that of Earth, and 'mini-Neptunes,' with 2.4 Earth radii. Mini-Neptunes, which are less dense, were long thought to be gas planets, made up of hydrogen and helium. Now, scientists at the Laboratoire d'Astrophysique de Marseille (CNRS/Aix-Marseille Université/Cnes) have examined a new possibility, namely that the low density of mini-Neptunes could be

explained simply by the presence of a thick layer of water that experiences an intense greenhouse effect caused by the irradiation from their host star.

These findings, recently published in *Astrophysical Journal Letters*, show that mini-Neptunes could be super-Earths with a rocky core surrounded by water in a supercritical state, suggesting that these two types of exoplanet may form in the same way. Another paper recently published in *Astronomy & Astrophysics*, involving scientists mainly from the CNRS and the University of Bordeaux, focused on the effect of stellar irradiation on the radius of Earth-sized planets containing water. Their work shows that the size of the atmospheres of such planets increases considerably when subject to a strong greenhouse effect, in line with the study on mini-Neptunes. Future observations should make it possible to test these novel hypotheses put forward by French scientists, who are making major contributions to our knowledge of exoplanets.

More information: Olivier Mousis et al, Irradiated Ocean Planets Bridge Super-Earth and Sub-Neptune Populations, *The Astrophysical Journal* (2020). DOI: 10.3847/2041-8213/ab9530

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