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Characterising the interior structures and atmospheres of multiplanetary systems.

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The increasing number of well characterised low-mass planets, combined with the valuable informations from stellar and planetary spectroscopy, opens the way to the modeling of planetary structures and compositions, which can be obtained with theoretical and numerical works. This approach gives a valuable insight to understand the formation of planetary systems in the low-mass range. We present a 1D planetary model where the interior is coupled with the atmosphere in radiative-convective equilibirum within a Bayesian retrieval scheme. In addition to a Fe core and a silicate mantle, we take into account water in all its possible phases, including steam and supercritical phases, which is necessary for systems with a wide range of stellar irradiations.

Our interior-atmosphere model calculates the compositional and atmospheric parameters, such as Fe and water content, surface pressures, scale heights and albedos. We analyse the multiplanetary systems K2-138 and TRAPPIST-1, which present six low-mass planets with different densities and irradiations. From the individual composition of their planets, we derive a similar trend for both systems: a global increase on the water content with increasing distance from the star in the inner region of the systems, while the planets in the outer region present a constant water mass fraction. This trend reveals the possible effects of migration, formation location and atmospheric mass loss during their formation history.