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Low-mass exoplanets: From internal structure to long-term evolution

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During the past decade, exoplanet detections have revealed a vast diversity of planets, particularly in the low-mass regime below 20-30 Earth masses. Mass and radius observations are the main constraints to infer the present-day internal structure of these planets whose knowledge provides a starting point to characterize them and answer many fundamental questions in exoplanetary science: How did these planets form and evolve? How unique are the Earth and the Solar System? Which of these planets have the potential to host life?

Planets are not static objects. Interiors and atmospheres as inferred today from remote observations are the result of a complex evolution in response to a variety of factors such as long-term cooling, volcanic outgassing, atmospheric escape, as well as orbital and stellar evolution.

In this talk, we will discuss the work on exoplanet interiors currently carried out at DLR, focusing on two main aspects. 1) We will show how machine-learning methods can be used to rapidly gain insight into the interior structure of exoplanets and how accurate radius and mass measurements from PLATO can help to better constrain the size of the interior reservoirs. 2) We will present simulations of the coupled long-term evolution of the interior and atmosphere of large populations of terrestrial bodies and discuss the key factors that influence their long-term habitability.

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