Characterizing Hot Rocky Exoplanets: Insights from Lava Oceans and Atmospheric Interactions

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Abstract

In the current Era of Exoplanet Characterization, hot rocky exoplanets are the new frontier, particularly those orbiting close to their stars, which are more accessible to detailed observations. These unique planets suffer from intense stellar irradiation, causing lava oceans to be present on their day-side surfaces. The direct interaction between these molten surfaces and their overlying atmospheres offers unique insights into the planets' internal compositions, making them exceptional planets different than the rocky planets in our Solar System. In this presentation I will discuss methodologies for modelling outgassed magma oceans and their interactions with atmospheric volatiles, highlighting the processes shaping these exoplanetary environments. Additionally, I will present state-of-the-art models that integrate outgassing, radiative transfer, and atmospheric chemistry, providing fits to recent JWST observations of exoplanets like 55 Cnc e and K2-141b. The talk will also address the critical need for enhanced atomic and molecular data to resolve the existing ambiguities in these complex models, towards more precise characterizations of exoplanetary atmospheres.