DETERMINING THE BULK WATER ABUNDANCE OF LOW-MASS EXOPLANETS

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Introduction: Measuring the bulk water abundance of exoplanets through remote sensing is a key step on the road toward identifying and characterizing habitable planets. While the terrestrial planets in our Solar System are all relatively dry, 'water-worlds' — planets with bulk water content in the tens of percent — are robustly predicted as an outcome of planet formation (e.g. [1], [2]). Yet tying the water abundance derived from atmospheric observations to a planet's bulk water abundance is not straightforward. Models must be used to relate the water content of the planet's interior to that of its atmosphere. In these models, the partitioning of water into disparate layers of the planet must be carefully accounted for. In this talk, I will describe efforts to build a self-consistent whole-planet modeling framework by coupling together calculations of a planet's interior structure and atmosphere to determine the observable signatures of a planet with a specified water content. We focus here on planets composted of iron, rock, water, and H/He, with atmospheres composed of mixtures of H_2O, H_2, and He. The aim of this work is to have a modeling toolkit at the ready to capitalize on atmospheric observations of water-rich exoplanets and provide the first unambiguous detections of water-worlds with *JWST*, ultimately paving the way toward the characterization of smaller habitable exoplanets.

References: [1] Léger, A. et al. (2004) *Icarus*, 169, 499-504. [2] Raymond, S. N., Barnes, R., Mandell, A. M. (2008) *MNRAS*, 384, 663-674