THE PHYSICS COLLOQUIUM

Thursday 15 February 2024, 4:00 p.m.
Nijenborgh 4, Lecture Hall 5111.0080

Internal fractionation of atmospheric volatiles on molten exoplanets

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Low-mass exoplanets in a fully to partially molten state open a novel window into key processes that shape the earliest, high-temperature evolutionary regimes of rocky planets; a crucial barrier to connect planetary accretion with long-lived climate states on temperate worlds.

I will outline how internal magma ocean dynamics and chemical differentiation between core-forming metals and atmospheric species influence the feedback mechanisms between largely molten interiors and volatile envelopes. The physical and chemical coupling between magma layers and their equilibrating atmospheres can fractionate the dominant compounds observable in the upper atmosphere to a degree that is testable with current instrumentation. As key examples, nitrogen species can be suppressed in H/He-dominated primary atmospheres if the volatile envelope is in direct contact with a molten interior; the total volume of atmospheric water vapour is closely related to the phase state of the rocky planetary mantle.

With an emphasis on a few individual, and then statistical ensembles, of super-Earth and sub-Neptune exoplanets, I will outline observational tests to distinguish internal phase state and evolutionary scenarios.

Join us for coffee starting 3:30 p.m. Refreshments will be served after the lecture.

For more information contact the host: Manuela Vecchi (m.vecchi@rug.nl)
Website: http://www.rug.nl/research/vsi/colloquia/