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Crystallization of Magma Oceans

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The composition of a cooling magma ocean largely influences its crystallization and evolution. Thermodynamic properties of the phases crystallizing and the rate of crystallization vary between a single component and a multicomponent system. We evaluate the influence of the bulk composition on the evolution and thermodynamics of the magma ocean by exploring the evolution of an ammonia – water ocean within the interior of Triton, an icy satellite of Neptune. It has been hypothesized that an ocean formed on Triton early on in the Solar System's history, after Triton was captured into orbit about Neptune. The way such an ocean has evolved and whether we can expect it to have been sustained until present is unclear. However, observations of geologic activity at Triton's surface suggest that the interior may be partially molten at present. If sustained, the presence of an ocean may explain these observations. We present initial results from a coupled thermal-structural-orbital evolution model of Triton's icy crust and ocean. The composition of Triton's ocean is prescribed to be Ammonia Dihydrate, allowing for the crystallization of either pure H_2O ice or solid Ammonia Dihydrate I, depending on the concentration of ammonia within the ocean.