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Thermo-chemical evolution of ice-silicate bodies: Application to Ceres.

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Considered as a protoplanet, Ceres is one of the remaining examples of the intermediate stage of planetary accretion, which is considerably different from most asteroids. Observations and modelling suggest aqueous alteration of the surface, and an icy mantle overlying a rocky core. This places Ceres in between the rocky bodies of the inner Solar system and the icy satellites. Alternatively, an undifferentiated porous interior has been recently proposed. We have tested the possibility whether Ceres' low density can be explained with a porous interior, rather than with the presence of ice and show that the porous structure is rather unlikely. For a macroporosity of 10 % and a CI chondritic composition, Ceres ultimately compacts due to hot pressing. Thus, this body is most probably ice-rich and may have a rocky core and an ice mantle. In a future project, we intend to study the thermo-chemical evolution of Ceres with a new numerical model that considers processes relevant for icy bodies: amorphous to crystalline ice transition, melting of ice, hydrothermal convection, hydration and dehydration of silicates, differentiation of ice and silicates, silicate and iron melting.

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