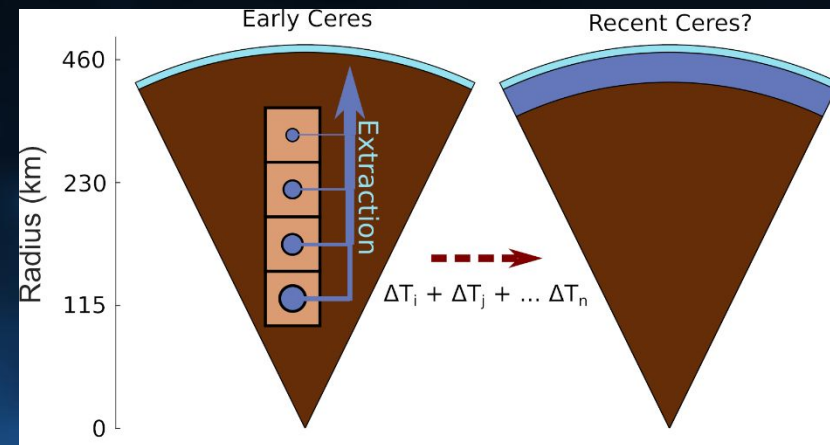


Porosity-filling Metamorphic Brines Explain Ceres's Low Mantle Density

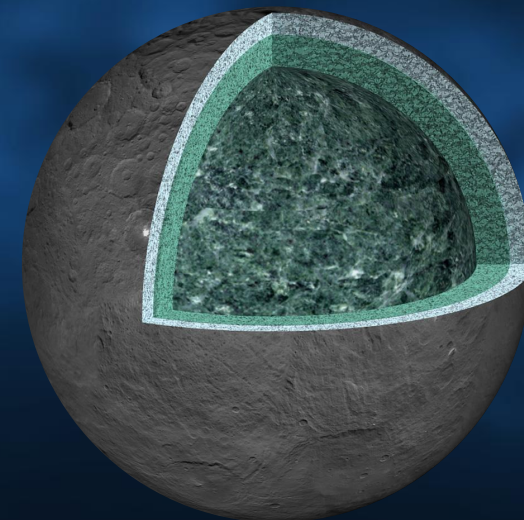
Exploration of Ceres by NASA's Dawn spacecraft revealed that the dwarf planet likely has a low-density mantle beneath its crust. Scientists investigated if this low-density is the result of a high fraction of porosity-filled brines and what implications this has for habitability.

- A series of numerical thermodynamic models were run to determine the mineralogy and fluid composition in Ceres' mantle as a function of thermal evolution.
- Results of these modeling efforts show that the phase assemblages present in Ceres' mantle could have changed drastically over time. Volatile-bearing minerals like serpentine and carbonates would have partially destabilized and released their volatiles as temperatures in the mantle reach their maximum about 3 billion years after Ceres's formation.
- The predicted present-day phase assemblage in the mantle, consisting of partially devolatilized minerals and 13–30 vol% fluid-filled porosity, may represent a habitable niche in Ceres.

Daswani and Castillo-Rogez (2022) *Planetary Science Journal*



Cartoon of Ceres' mantle releasing water over time. Left to right: Heating in the mantle.



Artist rendition of Ceres interior. Credit: NASA/JPL-Caltech/UCL/MPS/DLR/IDA