Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09915, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09915
EGU General Assembly 2008

Ceres' evolution and present state constrained by shape data

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We model Ceres' thermo-physical-chemical evolution by considering a large range of initial conditions as well as various evolutionary scenarios, following the earlier work by McCord and Sotin (*JGR*, 2005). Models are constrained by available shape measurements (Thomas et al., *Nature*, 2005), which point to a differentiated interior for this asteroid. We address the role played by hydrothermal activity in the long-term evolution of Ceres and especially the evolution of its hydrosphere. We suggest that models with times of formation shorter than about 5 My after the production of calcium-aluminum inclusions are more likely to undergo hydrothermal activity in their early history, which affect the models long-term thermal evolution. We evaluate the conditions for preserving liquid water inside Ceres. The protoplanet's warm surface temperature and the enrichment of its hydrosphere in a variety of chemical species favor such a scenario. We show that shape data can help constrain the amount of hydrated silicate in the core, and thus the extent of hydrothermal activity in Ceres. We discuss the importance of these results in the prospect of the *Dawn* mission at his arrival at Ceres in 2015.