P42A-03: Interior Evolution of Ceres and Vesta Revealed by Dawn

ABSTRACT

Thursday, 17 December 2015
10:50 - 11:05
Moscone West - 2007

Dawn's exploration of Vesta and Ceres has revealed their geophysical characteristics, informing the processes that shaped the bodies. Dawn has determined the average diameter of Ceres to be 940 km, smaller than the previously estimated 975 km [1]. This implies a density of 2160 kg/m^3, indicating that Ceres is less differentiated than predicted [2]. Ceres' entire surface is cratered, implying the lack of a thick (10's of km) water ice layer at the surface. Variability in Ceres' crater morphology indicates that the near-surface layer has variable strength and rheology, likely due to heterogeneity in the near-surface mixture of rock, ice and salt. These observations may indicate that Ceres lost a significant amount of an original surface ice layer due to impact erosion. The lack of large impact basins on Ceres can be interpreted to be the result of viscous relaxation. These data provide insights into Ceres' thermal evolution and mechanical properties, which appear to be unique to this warm, icy body. In contrast to Ceres, Vesta formed very early and hot, resulting in a fully differentiated body. Dawn's exploration revealed geophysical and geochemical evidence for an iron-rich core and basaltic crust. However, unlike the pre-Dawn paradigm of Vesta's evolution, Dawn found that the crust and mantle of Vesta are less distinct than predicted by classical differentiation models.

[1] Thomas, P. C., et al., Differentiation of the asteroid Ceres as revealed by its shape, *Nature*, 437**,** 224–226, 2005; [2] McCord et al., Ceres: Its Origin, Evolution and Structure and *Dawn*'s Potential Contribution, Space Sci RevDOI 10.1007/s11214-010-9729-9, 2011.

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