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GSA Annual Meeting in Denver, Colorado, USA - 2016

Presentation Time: 9:10 AM

DAWN AT CERES: FIRST RESULTS FROM CRATER STUDIES

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Dawn is the first spacecraft to closely observe the surface of Ceres with a Visible and Infrared Spectrometer (VIR), a Gamma Ray and Neutron Detector (GRaND), and a Framing Camera (FC) from an orbit as low as 850 km in radius. FC images (137 m/pixel) reveal that craters larger than 300 km are absent and that the northern cerean hemisphere is more heavily cratered than the southern hemisphere. We identified craters with bowl-shapes, polygonal shapes, terraces, central peaks, smooth floors, and flow-like features that we interpret as evidence for mobilization of crustal material in the presence of ice. Craters larger than 40 km exhibit central pits (preferentially in craters > 75 km), possible pitted floors, and floor fractures. Cerean craters are deeper than similar-sized fresh lunar craters, and modestly shallower than fresh craters on Tethys. They are much deeper than the completely flattened craters predicted for a pure outer ice layer. Dawn observations of preserved and relaxed craters along with Ceres' shape are also inconsistent with a pure rocky outer shell. The transition from bowl-shaped simple craters to modified complex craters (8-10 km) and the transition to complex craters with central peaks (~25 km) are most consistent with an ice-bearing upper crust or a material mixture of similar viscosity. Deriving absolute model ages (AMAs) from the observed crater size-frequency distributions requires a production function (PF) and a chronology function (CF). A lunar-derived model is adapted to impact conditions on Ceres, in a manner similar to adjustments for Mars and Mercury. An asteroid-derived model alternatively uses a PF by scaling the directly observed asteroid size-frequency distribution from the main belt and extended to sizes smaller than 5 km by a collisional model. We will present AMAs derived from both models.

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Monday, 26 September 2016: 8:00 AM-12:00 PM

Room 201 (Colorado Convention Center)

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