P53E-2185: The collisional history of dwarf planet Ceres revealed by Dawn

ABSTRACT

Friday, 18 December 2015
13:40 - 18:00
Moscone South - Poster Hall

Impact craters are a ubiquitous feature of solid surfaces of celestial objects. Craters are oftentimes used to constrain the past evolution of their host objects, as well as to assess their crustal structures. The Dawn spacecraft, currently in orbit around the dwarf planet Ceres, has revealed a surface peppered with impact craters. Two important facts emerge from their global spatial distribution: i) significant longitudinal and latitudinal asymmetries in the crater areal density, ii) and the lack of well-preserved craters larger than 400 km in imaging data. Interestingly, most of the low crater density terrains are found in the vicinity of the three largest, well-preserved impact craters ranging from ~160 to ~290 km in diameter. These low crater areal density terrains expand over a greater distance than observed for large craters on rocky bodies and icy satellites, which typically are confined within one crater radius from the rim. To assess the collisional history of Ceres we developed a Monte Carlo model that tracks the timing, size and number of collisions throughout the history of the solar system. The model shows that Ceres' collisional evolution should have resulted typically in a factor of 10 more craters than observed, with some ~10 craters larger than 400 km expected to have formed over the last 4.5 Gyr ago. While small craters may have reached an equilibrium level, which does not allow then to further increase in number, the lack of evident large craters is a puzzle. A possibility is that the scars of large craters have been obliterated by topography relaxation due to an ice-rich crust. Here we will present an overview of the Ceres' crater spatial distribution and compare it to other siblings (such as the asteroid Vesta), and collisional evolution models. We will also discuss how these results pose important constraints on the internal structure of the dwarf planet in conjunction with surface composition and gravity data acquired by Dawn.

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Session: Vesta and Ceres as Seen by Dawn and Earth-Based Instruments II Posters

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Day: Friday, 18 December 2015

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