P43A-2869: Stratigraphy and Surface Ages of Dwarf Planet (1) Ceres: Results from Geologic and Topographic Mapping in Survey, HAMO and LAMO Data of the Dawn Framing Camera Images

Thursday, 14 December 2017
13:40 - 18:00
New Orleans Ernest N. Morial Convention Center - Poster Hall D-F

Since March 6, 2015, the surface of dwarf planet (1) Ceres is being imaged by the FC framing camera aboard the Dawn spacecraft from orbit at various altitudes [1]. For this study we focus on images from the Survey orbit phase (4424 km altitude) with spatial resolutions of 400 m/pxl and use images and topographic data from DTMs (digital terrain models) for global geologic mapping. On Ceres' surface cratered plains are ubiquitous, with variations in superimposed crater frequency indicating different ages and processes. Here, we take the topography into account for geologic mapping and discriminate cratered plains units according to their topographic level – high-standing, medium, or low-lying – in order to examine a possible correlation between topography and surface age. Absolute model ages (AMAs) are derived from two impact cratering chronology models discussed in detail by [2] (henceforth termed LDM: lunar-derived model, and ADM: asteroid-derived model). We also apply an improved method to obtain relative ages and AMAs from crater frequency measurements termed Poisson timing analysis [3]. Our ongoing analysis shows no trend that the topographic level has an influence on the age of the geologic units. Both high-standing and low-lying cratered plains have AMAs ranging from 3.5 to 1.5 Ga (LDM), versus 4.2 to 0.5 Ga (ADM). Some areas of measurement within these units, however, show effects of resurfacing processes in their crater distributions and feature an older and a younger age. We use LAMO data (altitude: 375 km; resolution 30 m/pxl) and/or HAMO data (altitude: 1475 km; resolution 140 m/pxl) to study local geologic units and their ages, e.g., smaller impact craters, especially those not dated so far with crater measurements and/or those with specific spectral properties [4], deposits of mass wasting (e.g., landslides), and mountains, such as Ahuna Mons. Crater frequencies are used to set these geologic units into the context of Ceres' time-stratigraphic system and chronologic periods [5].
References: [1] Russell C. T., et al. (2016), Science 353, doi:10.1126/science.aaf4219. [2] Hiesinger H. H. et al. (2016), Science 353, doi:10.1126/science.aaf4759. [3] Michael G. G. et al. (2016), Icarus 277, 279-285. [4] Stephan K. et al. (2017), submitted to Icarus. [5] Mest S. C. et al. (2017), LPSC XLVIII, abstr. No. 2512.

Plain Language Summary

Results from geologic mapping and surface ages using crater counts on dwarf planet Ceres are presented in this study. Images of the framing camera aboard NASA's Dawn spacecraft in orbit around Ceres area used.

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