Title: First Geological Mapping Investigation of the Occator Hemisphere of Ceres (180°-360°E), from NASA's Dawn Mission

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Abstract

The Dawn Science team divided the surface of Ceres into quadrangles, in order to facilitate systematic geological mapping, which is a tool used to methodically observe and interpret the surfaces of planetary bodies. Here we present a geological map from 180° - 360°E longitude of Ceres, which we assemble from a combination of quadrangle-scale geological maps. Geologic units are characterized based on physical attributes such as albedo, morphology, structure, color, and topography, and are related to geologic processes such as volcanism, tectonism, impact cratering, deposition, and weathering. This hemisphere is dominated by a heavily cratered terrain, with both fresh-looking and putatively-relaxed craters evident. Also evident is Occator crater and the feature known as Spot 5, the brightest of the “bright spots” on Ceres. Linear structures are prevalent, but whether they are formed due to impact stresses or by internal activity has not yet been determined. However, the numerous polygonal craters suggest significant sub-surface fracturing. Color data indicates considerable compositional diversity, specifically around Spot 5, as well as around some of the other craters and associated with some of the linear structures. Variations in crater abundance in different parts of this hemisphere suggest that some type of resurfacing might have occurred. Domical, positive relief features are present in some of the craters; a 5 km high feature informally known as “the pyramid” is also identified. Determining the processes by which these topographically high features formed is of major interest in this mapping effort. Ongoing work will include the development of a detailed geological history and the use of crater morphologies to infer the composition and physical properties of the sub-surface. Currently, our geological mapping is based on Approach (~1.3 km/p) and Survey (~400 m/p) mosaics of clear and color filter data from the Dawn spacecraft’s Framing Camera. In addition, shape models derived from Framing Camera data are used as a mapping aid. Dawn will begin the High Altitude Mapping Orbit (HAMO) in mid-August, and our geological mapping will then incorporate the higher resolution HAMO mosaics (~140 m/p).

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