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Geological Mapping of the Ac-H-9 Occator Quadrangle of Ceres from NASA Dawn Mission

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As was done at Vesta [1], the Dawn Science Team is conducting a geological mapping cam-paign at Ceres during the nominal mission, including iterative mapping using data obtained dur-ing each orbital phase. We are using geological mapping as a method to identify the geologic processes that have modified the surface of dwarf planet Ceres. We here present the geology of the Ac-H-9 Occator quadrangle, located between 22˚S-22˚N and 216-288˚E.

The Ac-H-9 map area is completely within the topographically high region on Ceres named Erntedank Planum. It is one of two longitudinally distinct regions where ESA Herschel space telescope data suggested a release of water vapor [2]. The quadrangle includes several other notable features, including those discussed below.

Occator is the 92 km diameter crater that hosts the “Bright Spot 5” that was identified in Hubble Space Telescope data [3], which is actually comprised of multiple bright spots on the crater floor. The floor of Occator is cut by linear fractures, while circumferential fractures are found in the ejecta and on the crater walls. The bright spots are noticeably associated with the floor fractures, although the brightest spot is associated with a central pit [4]. Multiple lobate flows are observed on the crater floor; these appear to be sourced from the center of the crater. The crater has a scalloped rim that is cut by regional linear structures, displaying a cross-section of one structure in the crater wall. Color data show that the Occator ejecta have multiple colors, generally related to changes in morphology.

Azacca is a 50 km diameter crater that has a central peak and bright spots on its floor and within its ejecta. Like Occator, Azacca has both floor fractures and circumferential fractures in its ejecta and crater walls. Also like Occator, the Azacca ejecta is multi-colored with variable morphology.

Linear structures - including grooves, pit crater chains, fractures and troughs - cross much of the eastern hemisphere of Ceres. Some of these structures appear to be radial to the large basins Urvara and Yalode, and most likely formed due to impact processes. However, a set of regional linear structures (RLS) do not have any obvious relationship to impact craters and may represent internally driven tectonics [5]. In the Ac-H-9 map area, many of the longer RLS are comprised of smaller structures that have linked together, suggestive of en echelon fracturing. Also, many of the RLS are crosscut by the linear features radial to Urvara and Yalode, indicating they are not fractures formed due to stresses released during those impact events.

Kirnis is a 115 km diameter crater with a degraded rim deformed by one of RLS pit crater chains. A dome-like feature on the floor of Kirnis might represent uplifting of the Ceres surface.

References: [1] Yingst et al. (2014) PSS, 103, 2-23. [2] Küppers, M., et al. (2014) Nature, 505, 525-527. [3] Li J.Y. et al. (2006) Icarus, 182, 143-160. [4]Schenk, P. et al. (2015) EPSC2015-527. [5] Buczkowski D.L. et al. (2015) GSA, abstract #261709.