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Geological Mapping of the Ac-H-12 Toharu Quadrangle of Ceres from NASA Dawn Mission

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The Dawn Science Team is conducting a geologic mapping campaign for Ceres similar to that done for Vesta [1,2], including production of a Survey- and High Altitude Mapping Orbit (HAMO)-based global map and a series of 15 Low Altitude Mapping Orbit (LAMO)-based quadrangle maps. In this abstract we discuss the surface geology and geologic evolution of the Ac-H-12 Toharu Quadrangle (21-66°S, 90-180°E). At the time of this writing LAMO images (35 m/pixel) are just becoming available. The current geologic map of Ac-H-12 was produced using ArcGIS software, and is based on HAMO images (140 m/pixel) and Survey (400 m/pixel) digital terrain models (for topographic information). Dawn Framing Camera (FC) color images were also used to provide context for map unit identification. The map (to be presented as a poster) will be updated from analyses of LAMO images.
The Toharu Quadrangle is named after crater Toharu (86 km diameter; 48.3°S, 156°E), and is dominated by smooth terrain in the north, and more heavily cratered terrain in the south. The quad exhibits ~9 km of relief, with the highest elevations (~3.5-4.6 km) found among the western plateau and eastern crater rims, and the lowest elevation found on the floor of crater Chaminuka. Preliminary geologic mapping has defined three regional units (smooth material, smooth Kerwan floor material, and cratered terrain) that dominate the quadrangle, as well as a series of impact crater material units. Smooth materials form nearly flat-lying plains in the northwest part of the quad, and overlies hummocky materials in some areas. These smooth materials extend over a much broader area outside of the quad, and appear to contain some of the lowest crater densities on Ceres. Cratered terrain forms much of the map area and contains rugged surfaces formed largely by the structures and deposits of impact features. In addition to geologic units, a number of geologic features – including crater rims, furrows, scarps, troughs, and impact crater chains – have been mapped.
The Toharu Quadrangle predominantly displays impact craters that exhibit a range of sizes – from the limits of resolution to part of the Kerwan basin (280 km diameter) – and preservation styles. The quad also contains a number large (>20 km across) depressions that are only observable in the topographic data. Smaller craters (<40 km) generally appear morphologically "fresh", and their rims are nearly circular and raised above the surrounding terrain. Larger craters, such as Toharu, appear more degraded, exhibiting irregularly shaped, sometimes scalloped, rim structures, and debris lobes on their floors. Numerous craters (> 20 km) contain central mounds; at current FC resolution, it is difficult to discern if these are primary structures (i.e. central peaks) or secondary features.
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References: [1] Williams D.A. et al. (2014) Icarus, 244, 1-12. [2] Yingst R.A. et al. (2014) PSS, 103, 2-23.