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Geological Mapping of the Ac-H-5 Fejokoo Quadrangle of Ceres from NASA's Dawn Mission

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NASA's Dawn spacecraft arrived at Ceres on March 6, 2015, and has been studying the dwarf planet through a series of successively lower orbits, obtaining morphological & topographical image, mineralogical, elemental abundance, and gravity data. Ceres is the largest object in the asteroid belt with a mean diameter of ~950 km. The Dawn Science Team is conducting a geologic mapping campaign for Ceres similar to that done for the asteroid 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 present the LAMO-based geologic map of the Ac-H-5 Fejokoo quadrangle (21-66 °N and 270-360 °E) and discuss its geologic evolution. At the time of this writing LAMO images (35 m/pixel) are just becoming available. Thus, our geologic maps are based on HAMO images (~140 m/pixel) and Survey (~400 m/pixel) digital terrain models (for topographic information) [3, 4]. Dawn Framing Camera (FC) color images are also used to provide context for map unit identification. The maps to be presented as posters will be updated from analyses of LAMO images (~35 m/pixel). The Fejokoo quadrangle hosts six primary geologic features: (1) the centrally located, ~80 km diameter, distinctly hexagonal impact crater Fejokoo; (2) Victa crater with its large exterior dark lobate flow feature, and interior lobate and furrowed deposits; (3) Abellio crater, which exhibits a well formed ejecta blanket and has an arcuately textured infilled floor whose morphology is similar to those of homologously sized craters on some of the icy Saturnian satellites [5]; (4) Cozobi crater, whose floor is filled with an unusually bulbous and smooth deposit, thin sheeted multi-lobed flow-like features that are reminiscent of fluidized ejecta as seen on Mars are also observed to be emanating outwards from the N and S rims of this crater [6]; (5) the peculiar Oxo crater on the eastern border whose strange bright ejecta and mysterious "missing block" are unlike anything else seen on Ceres; and (6) the numerous tholi that occupy the central region of the quadrangle. Based on our current geologic mapping of the Fejokoo quadrangle, we have developed the following preliminary geologic history: (I) The background cratered terrain was emplaced and represents the oldest geologic unit in the quadrangle, (II) the growth of tholi and emplacement of undegraded craters Takel, Cozobi, Abellio, Victa, Fejokoo, Dada, and Roskva happened subsequent to the development of the cratered terrain, and (III) most recently Oxo crater and its undisturbed ejecta was emplaced. Before EGU, we will: (i) explore the possibility that the Fejokoo tholi are intrusive structures, (ii) examine the different types of mass wasting in this quadrangle and their relationship to ground ice, and (iii) investigate the morphological and compositional nature of Oxo crater.

References: [1] Williams et al. (2014) Icarus. [2] Yingst R.A. et al. (2014) PSS. [3] Roatsch et al. (2015) Planetary and Space Science. [4] Preusker F. et al. (2016) LPSC XXXXVII. [5] Schenk P. M. (1989) JGR. [6] Senft & Stewart (2008) Met. & Planet. Sci.