CRATER-RELATED CRYOVOLCANISM ON CERES

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Introduction: During the Dawn mission, observations at Ceres reveal numerous interesting post-impact modifications in and around craters. These modifications contain the deposition of extended plains material with pits, multiple lobate flows, and widely dispersed deposits that form a diffuse veneer on the preexisting surface [1,2].

Data: For the analysis of cryovolcanic features Dawn Framing Camera (FC) data (monochrome and color ratio images) from the Low Altitude Mapping Orbit (LAMO) with a spatial resolution of 35 m/px as well as a Digital Terrain Model (DTM) [3] derived from the High Altitude Mapping Orbit (HAMO) orbit data have enabled an initial characterization of the surface.

Observations: The craters Haulani, Occator, Ikapati and Kupalo show the most distinctive forms of the observed features mentioned above. Especially Haulani and Occator show discrete feeding sources of flow features within the crater and on the crater flanks. All of the craters reveal a bluish spectral signature. We measured the drop height-to-runout length ratio of several flow features and obtain a coefficient of friction of < 0.1.This implies a higher flow efficiency for flow features on Ceres than for similar features on other planetary bodies with similar gravity, suggesting ductile material [1]. Therefore, we propose a ductile material for the formation of those flows. Furthermore, the suggestion of the occurrence of ice within the Cerean crust [4], as well as possible salts incorporated into a regolith layer [3,4,5] indicate similar geological processes as seen on other icy bodies. Latest results by the Dawn Spacecraft indicate that Ceres is a weakly differentiated body containing a shell dominated by an ice-rock mixture [6] and ammoniated phyllosilicates [7]. Recent observations also show that hydrated salts could be warm enough to be mobile at a depth of 1.5-5 km below Ceres´ surface and would explain the buoyancy of ice and salt-enriched crustal reservoirs [8]. Therefore, it is likely that impacts hitting such reservoir layers triggered mobility and could have formed cryovolcanic features. Moreover, we assume that the plains and flow materials also originate from the subsurface and their release is triggered by impacts [3]. Additionally, the bluish material is mainly associated with the youngest impact craters on Ceres [9]. Thus, the post-impact modifications of the observed craters are formed by one of the youngest geologic processes on Ceres. We conclude that the compositional differences of the observed flows, their probably relatively young age [9], and their discrete feeding sources, suggest a cryovolcanic origin.

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