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TOPOGRAPHY AND GEOMORPHOLOGY OF THE INTERIOR OF OCCATOR CRATER ON CERES

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Introduction: The potential presence of ice within Ceres' crust [1] raises the prospect of geological processes similar to differentiated icy bodies [2]. Dawn's spectral observations suggest some aqueous alteration, including the formation of clay materials [3,4], and possibly salts incorporated into a regolith layer characterized by small-scale compositional variations [5]. Thermal models suggest that Ceres is at least partially differentiated and could have undergone tectonic and cryovolcanic processes [1]. With a diameter of 92 km, Occator is one of the most prominent impact craters on Ceres. Its depth ranges from 4.8 km along the crater rim to -1.1 km at the crater floor with respect to a geodetic reference ellipsoid. Occator shows a set of specific features such as post impact formation crater filling, including multiple flow features, a central pit with a dome in its center, extensional tectonics expressed as linear radial and concentric graben, and spectral variations indicating a complex formation process.

Low Altitude Orbit Stereo Observation: We processed 550 LAMO stereo images from Cycle01 - Cycle11 with a resolution of ~ 35 m/pixel to generate a high-resolution digital terrain model (DTM) of the Occator impact structure. The image scale is 256 pixel per degree (~32. m/pixel) grid space. 1.8 billion surface points (~15 points per DTM grid) yield a calculated mean intersection error of +/- 2.8 m resulting in ~1.5 m height accuracy.

Materials in Occator: Occator shows a significant color variation between crater walls that havea reddish spectral slope, crater interior with a bluish spectral slope, and a whitish central part (Fig. 1) [5,6,7,8]. In general, blue to red color differences on Ceres are related with age [9] with blue units being younger than red ones and white material seems to be youngest. The white material of the dome and a deposit E of the center is composed of salts, mostly carbonates [5]. The bluish and reddish material seems to be composed of the same ammoniated phyllosilicates [3,4] but indicate a change in physical

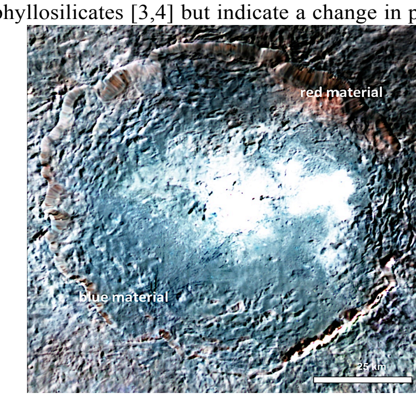


Fig. 1. Spectral contrast in Occator. Reddish crater wall material and bluish inner-crater plain material.

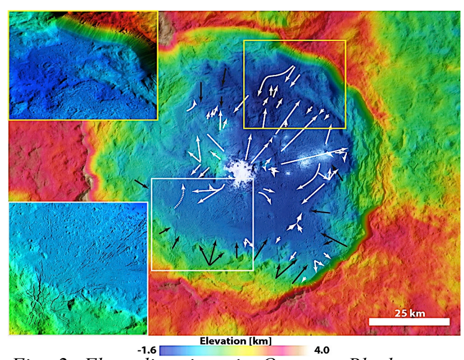


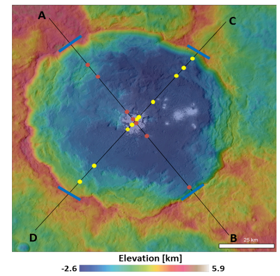
Fig. 2. Flow directions in Occator. Black arrows indicate mass wasting from walls and white arrows indicate bluish plains material originating from the center. Inlets: Flow features in the NE inner-crater plains. Tectonic extension features in the SW.

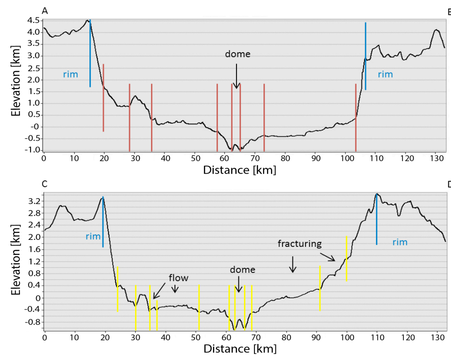
properties, mostly particle size [7,8].

Occator crater has mass wasting deposits origi-nating from the crater rims and walls and extending into the crater for 10 to 20 km. However, in the SE and NE these mass wasting deposits are completely covered by crater floor plains material that extends from the crater center to the rim, ponding against the crater walls (Fig. 2). The flows also superimpose the mass wasting deposits from the rims [9]. Furthermore, crater densities on Occator's interior deposits are slightly lower than on its ejecta blanket, indicating post-impact formation or target parameter variation between consolidated melt and unconsolidated ejecta deposits [6,10,11]. The terrain NW of the central area is very rough, shows mass wasting deposits, and is about 2 km thick w.r.t the rim of the central pit. The plains to the SE are smooth, pond against the crater wall, and are less than 500 m thick w.r.t. the rim of the central pit (Fig. 3). Assuming that the plains material superimpose the rim mass wasting in this area, the mass wasting deposits should be thinner in this part of the crater or the crater floor is tilted as possibly indicated by a 2 km lower crater rim in the SE. The central pit is about 3.5 km wide and 600 m deep while the dome rises 250 m within the pit [12]. In the NE, multiple flows approach the crater rim very closely. These flow plains are also less than 500 m thick w.r.t. the rim of the central pit. Some of the flows seem to have been superposed on the lower parts of the crater wall and then flowed back into depressions of the plain (Fig. 2). The flows to the NE appear to originate from the central region and move slightly uphill. This indicates either a feeding zone that pushes the flows forward by supplying low-viscosity material or an extended subsidence of the crater center, possibly after discharging a subsurface reservoir [6,9], or lateral oscillations of an impact melt sheet during emplacement. The SW crater area is also characterized by plain material ponding against rim wasting deposits with a complex and radially extending tectonic graben system about 50-100 m deep that reaches out to the central pit (Fig. 2). The plain material covers an area of about 4750 km^2 with an average depth of about 250 m resulting in a body of plains material of about 1200 km^3.

Conclusion: Mass wasting deposits resulting from the impact crater modification phase are mostly exposed in the W part while extended plains material about 500 m thick fills the crater interior from SW to NE superimposing the rim wasting deposits in these areas. Both materials are different w.r.t. their topography, geomorphology, and spectral characteristics, indicating a different genesis. The plains material seems to originate from the bright central pit/dome area and also exhibits extensional tectonic features and bright material deposits, indicating post impact processes in the plains material. In addition, the plains material is slightly younger than the impact event and the bright deposits are even younger than the plains material. Subsidence of the crater floor, the central depression, flows on the crater floor, the orientation and age of

Fig. 3. Cross sections through Occator crater





tectonics indicating post impact processes such as emplacement of flow materials, evaporation and hydrothermal processes which might be due to a long lasting impact melt pool or contact to subsurface cryo-magma.

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