Small mounds and frost heave-like morphologies within Occator crater, Ceres[1]

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Introduction

• Occator crater (Fig. 1) is one of the youngest and most prominent geologic structures on Ceres [2,3].

• Home to the largest of Ceres' carbonate deposits, Cerealia and Vinalia Faculae [4], Occator was imaged at ~3 m/px resolution by the Dawn spacecraft.

• Dawn imaged possible ice related features, including fractures, central pit craters, and many small mounds.

• Here we identify, categorize, and examine the small mounds and frost heave-like morphologies in Occator, and test the hypothesis that they may be generated by ground ice and hydrological processes.

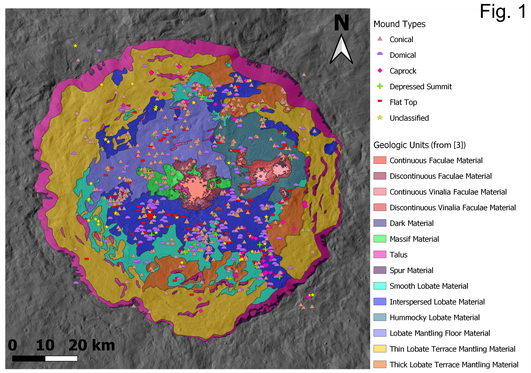
Methods

• We employed 1:10,000 scale geologic mapping to identify all small mounds larger than 40 m in diameter.

• Mounds were classified based on common characteristics, such as: angularity, flatness, cliff forming layers, and summit depressions.

• We performed a geospatial analysis of the mounds using unit intersection and density-based clustering.

Fig. 1



Results

• We identified 922 small mounds within Occator.

• The mounds are divided into six classifications (Fig. 2).

• Conical, domical, and depressed summit mounds are the most frost heave-like in character.

• 49% of mounds are found within Interspersed Lobate Material (ILM). This unit comprises 16% of Occator.

• The majority of statistically significant mound clusters are also found on ILM.

Discussion

• Occator has a large number mounds that appear independent of small craters and boulder fields.

• Many mounds have features such as fractures, pits, and conical-to-trapezoidal profiles, which are common among pingos (Fig. 3,4).

• The mounds have a strong affinity for ILM. This supports the hydrologic hypothesis as ILM is interpreted as an impact melt rich slurry [2].

• The morphological clustering of mounds on specific units may be indicative of increased hydraulic conductivity and historic melt reservoirs.

Frost Heaves and **Pingos** may exist on **Ceres**.

Their **shapes** and **distribution** could help characterize **groundwater systems** on frozen worlds.

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Additional Figures & Tables

Fig. 2

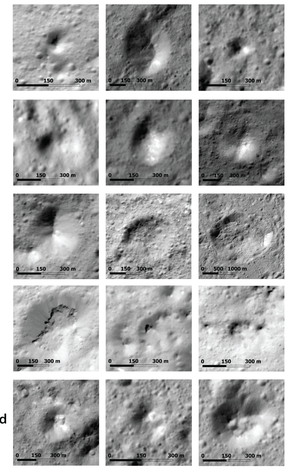


Fig. 3

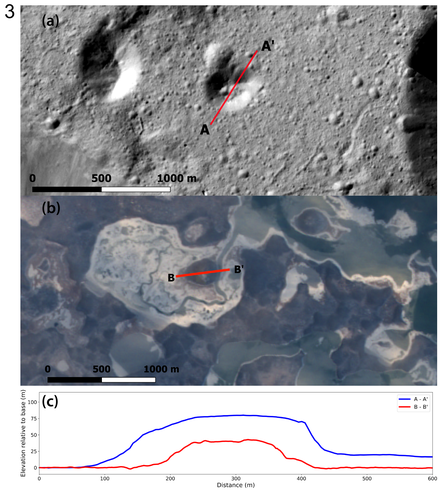


Fig. 4

Fig. 5

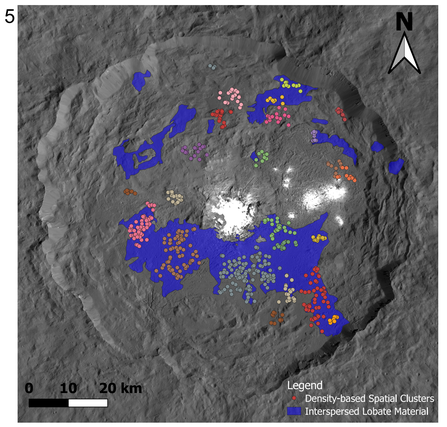
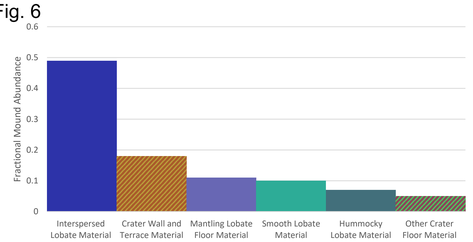


Fig. 6



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