

Topography of the Martian Impact Crater Tooting. P. J. Mouginis-Mark¹ H. Garbeil¹ and J. M. Boyce¹, ¹Hawaii Institute Geophysics and Planetology, Univ. Hawaii, Honolulu, HI 96822.

Introduction: Tooting crater is ~29 km in diameter, is located at 23.4°N, 207.5°E, and is classified as a multi-layered ejecta crater [1]. Our mapping last year identified several challenges that can now be addressed with HiRISE and CTX images, but specifically the third dimension of units. To address the distribution of ponded sediments, lobate flows, and volatile-bearing units within the crater cavity, we have focused this year on creating digital elevation models (DEMs) for the crater and ejecta blanket from stereo CTX and HiRISE images. These DEMs have a spatial resolution of ~50 m for CTX data, and 2 m for HiRISE data. Each DEM is referenced to all of the available individual MOLA data points within an image, which number ~5,000 and 800 respectively for the two data types.

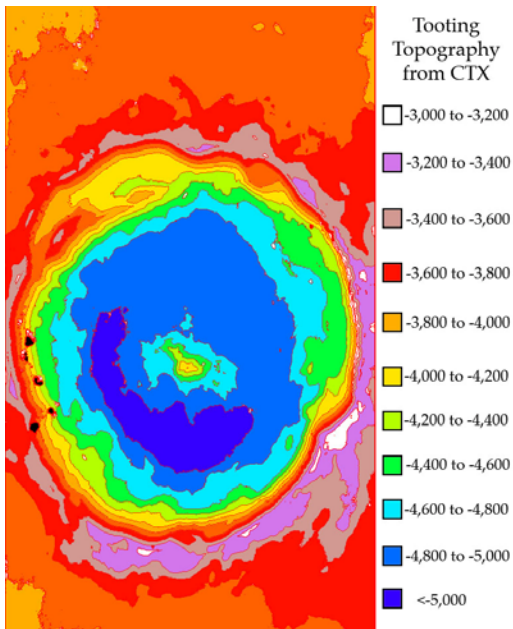


Fig. 1: DEM of Tooting crater (referenced to Mars datum) that we have produced from the stereo coverage provided by CTX images P01_001538_2035 and P03_002158_2034.

Mapping from DEMs: The young age of Tooting crater [2] permits the distribution and structure of the terraces to be investigated in

detail. We illustrate the advantage of the digital topography to recognize the vertical extent of individual wall units (Fig. 2) and the surprisingly large amount of relief of the terrace blocks (Fig. 3).

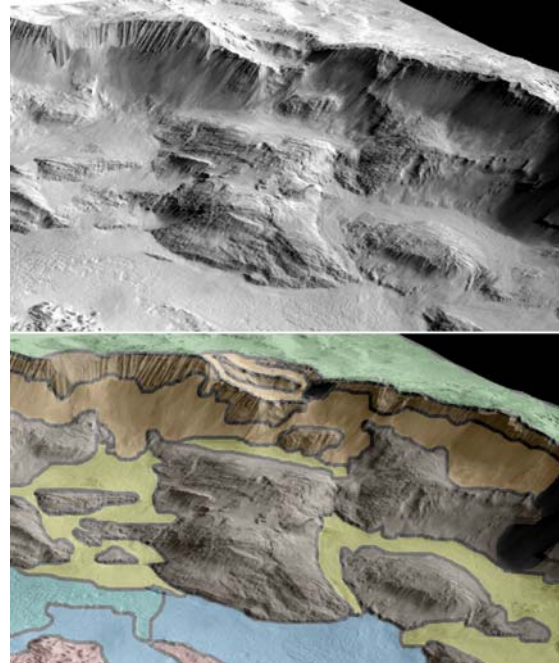


Fig. 2: Perspective view (looking south) of the southern wall of the cavity (top image). Remobilized sediments (in yellow, in bottom image) are found as high as 750 m above the crater floor. Rim is ~1,800 m high. CTX image P01_001538_2035.

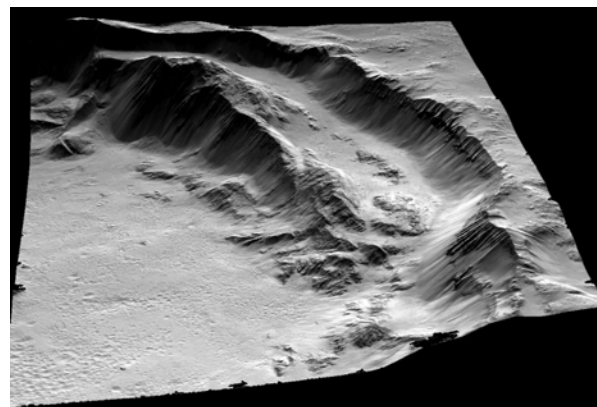


Fig. 3: Perspective view (looking west) of the terrace block on NW side of the cavity. Highest point on block is >560 m higher than ponded sediments on top of block. CTX image P01_001538_2035.

Topography of lobate flows. Although we are producing a 1:100K scale geologic map of Tooting crater, much of our attention this past year has focused on mapping at considerably higher resolution (>6 m/pixel) to better understand the origin of the different units. As an example, we show in Fig. 4 a series of lobate flows on the southern inner wall that superficially resemble pyroclastic flows but are here interpreted to be granular flows.

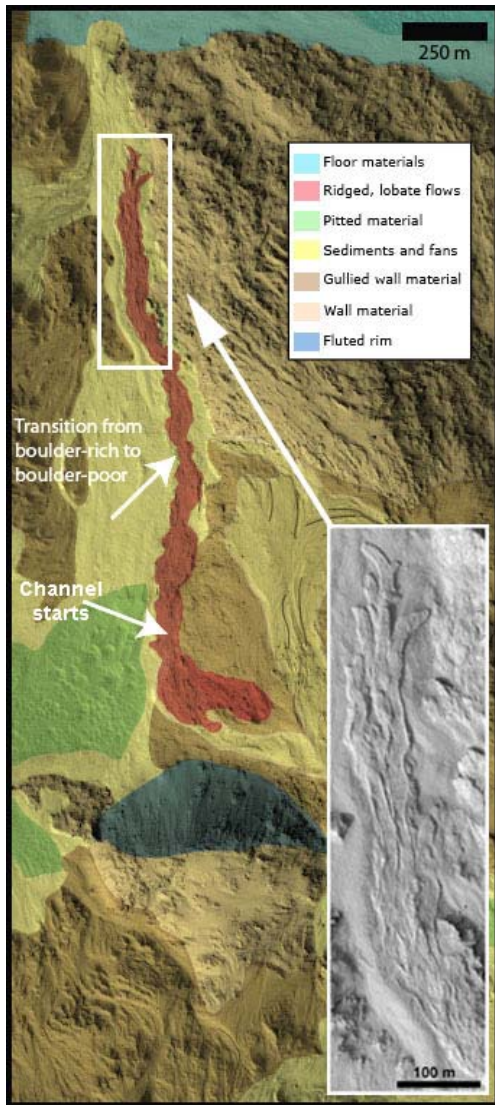


Fig. 4a: Geomorphic units on the SW inner wall of Tooting crater, mapped at a resolution of 3 m/pixel. See Fig. 4b for our derived topography of this area. Inset shows HiRISE subscene of flow, which has numerous channels and overlapping flow lobes.

Several outcrops of gullied and fluted wall material (Fig. 4a) occur at elevations between -4,600 to -4,350 m (Fig. 4b). Water appears to have been released from these outcrops and subsequently fed the identified ridged and lobate flows, and indicates that several layers of the target were wet at the time of impact. We are currently studying the topography of the rest of Tooting crater to gain a better understanding of the target stratigraphy.

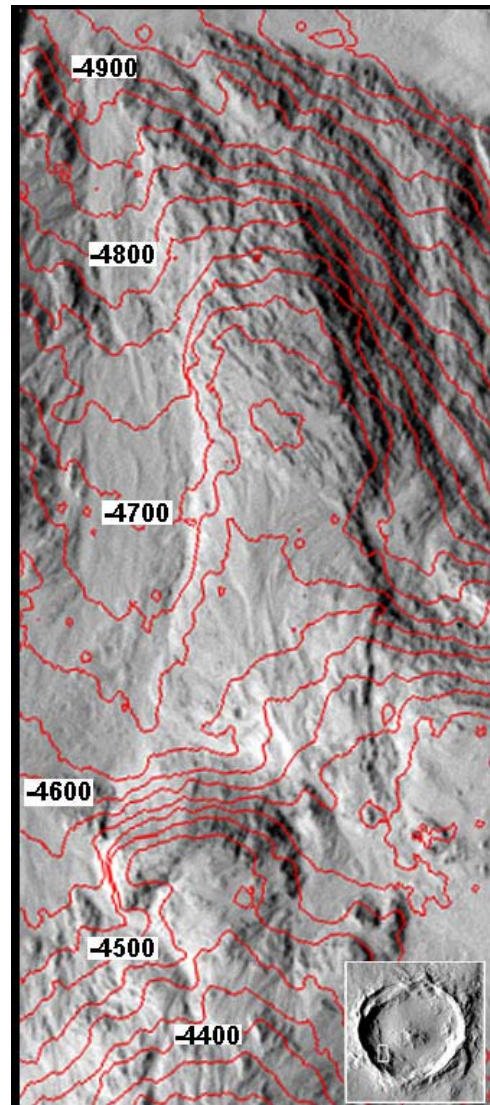


Fig. 4b: Inner wall topography of Tooting crater, derived from stereo CTX data. Contour interval is 25 m, referenced to Mars datum. Inset shows location.

References: [1] Barlow et al. (2000). *JGR* 105: 26,733 – 26,738. [2] Mouginis-Mark, P. and H. Garbeil (2007). *Meteoritics Planet. Sci.* 42: 1615 – 1626.