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Observations of Marcia Crater from Dawn's Low-Altitude Mapping Orbit

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Framing Camera (FC) images acquired from the Dawn spacecraft's low-altitude mapping orbit (LAMO, ∼210 km altitude, ∼20 m/pixel) provide new observations of Marcia, an irregularly shaped crater ∼62 km across from east to west and ∼77 km in the north-south direction. Marcia is host to a number of geologic features that have thus far not been observed elsewhere on Vesta; here we describe the geology of Marcia and present preliminary interpretations. Along Marcia's southern wall, an area of relatively smooth, lower-reflectance material is observed. Where the slope is steep, the deposit is marked by discontinuous channels ∼300-450 m wide and lobate flow fronts are observed down gradient of the channels where the crater wall meets the relatively flat crater floor. Material with similar reflectance properties is observed on the crater floor, and ranges in texture from smooth to pitted. Depressions in the pitted areas range in size from <30 m (not resolved at 18 m/pixel) to just over 1 km in diameter, and some have no obvious rim. The smallest depressions are concentrated mainly around the perimeter of the crater floor and increase in diameter toward the center where they coalesce and overlap. Evidence for subsidence or drainage is seen around and within several depressions. A positive-relief feature near the center of the floor is interpreted to be an incipient central peak, and it is surrounded by a relatively shallow, flat-floored, irregularly shaped depression 5-6 km across. The Marcia impact event largely resurfaced the surrounding region within one crater radius. Smooth material blankets much of terrain and partially fills topographic lows. Within this continuous ejecta unit, the morphologies of some craters are shallow and dimple-like, consistent with the presence of a hard-rock veneer of impact melt. Clusters of small craters are also observed. Features within the crater and ejecta suggest the presence of impact melt, and we are investigating what fraction is melt vs. granular material. One possible mechanism for the formation of the depressions on Marcia's floor is through low-velocity, self-secondary impacts. However some depressions lack a raised rim and secondary cratering does not provide a ready explanation for the observed size gradient of depressions (small at margins). This size gradient may correlate with the depth of a melt-rich or pulverized granular layer that occupies the floor, which would be expected to be thicker near the center and feather toward the walls. The general lack of linear chains of pits on the floor suggests the depressions did not form via collapse into subsurface fractures, though evidence for drainage or subsidence is observed in some areas.