Mineralogy of the Marcia crater on Vesta

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The Marcia crater displays several interesting features and terrain types, including pitted terrain and smooth terrain (Denevi et al., 2012), exposure of relatively fresh bright and dark material in Marcia's inner wall (McCord et al., 2012; Williams et al., 2014), dark ejecta and lobate material (Williams et al., 2013), and enrichments of hydrated material in the ejecta (De Sanctis et al., 2012a). The crater Marcia is a 68-km long (N-S) by 58-km wide (E-W) crater (Williams et al., 2013) and it is located in a howarditic-eucritic rich region on Vesta (De Sanctis et al., 2012b, Ammannito et al., 2013). While a detailed geological investigation of Marcia was performed (Williams et al., 2014), no detailed mineralogical analysis of the Marcia crater was done. The abundance and diversity of the geological and spectral features could tell us about the origin of this peculiar crater. Several questions arise about the origin of the dark material (exogenic material vs. impact melts) and the smooth and pitted terrains. The pitted terrains, beside their appearance, show also thermal anomalies, being colder with respect to the surrounding terrains. Here we describe the results of the spectral analysis of the Marcia crater. The dataset considered in this work was acquired by VIR, the mapping spectrometer of the Dawn mission (Russell et al. 2011, De Sanctis et al. 2011). VIR measures spectra between 0.25–5.1 micron. The high spatial (IFOV=250 microrad/pixel, FOV=64 × 64 mrad) and spectral performances allow for the identification of spectral features at very small spatial scales. The VIR's imaging capability combined with an extensive spectral range provides the geological context for mineralogical investigations: spectra and derived spectral parameters can be mapped on the surface of Vesta with a resolution never achieved before. The main spectral parameters derived from the VIR spectra and used here to gather information on the Marcia region are band centers, band depths, band areas, FWHM, asymmetry, spectral slopes, etc. These spectral parameters are compared with the HED meteorites, pyroxenes, and mixtures of pyroxenes with other minerals, to infer the mineralogy of this interesting area on Vesta.

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