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Mineralogical Mapping of the Av-8 Marcia and Av-9 Numisia Quadrangles of Asteroid 4 Vesta

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Asteroid 4 Vesta is currently observed by NASA's Dawn orbiter. The Dawn Team is conducting mineralogical mapping of the surface in the form of 15 quadrangle maps, and here we report results from the mapping of the two adjacent quadrangles Marcia (Av-8) and Numisia (Av-9). The mapping is based on a Framing Camera (FC) color band ratio and Visible and InfraRed (VIR) hyperspectral images. Av-8 Marcia Quadrangle covers 144˚-216˚E longitude while Av-9 Numisia extends from 216˚-288˚E longitude; both quadrangles are located in the equatorial region from $\pm 21^{\circ}$ latitude. Av-8 Marcia is dominated by a cratered regions, which is a low-albedo ejecta field containing craters Marcia, (68 km by 58 km), Calpurnia (54 km by 52 km), and Minucia (26 km by 23 km). A hill with a dark-rayed crater, named Aricia Tholus, is also nearby (size about 42.5 km and 28 km). Av-9 Numisia is dominated by Vestalia Terra, a distinct region of Vesta. Many of the impact craters in Av-9 have both bright and dark layers in their walls and also distinct ejecta lobes. The largest feature in Av-9 is the 33 km diameter Numisia crater which is centrally located at 7ºS, 247ºE. The other significant feature is the 15 km diameter Cornelia crater. Cornelia, smaller than Numisia is apparently more interesting has it shows a greater color diversity and an extensive ray system. In particular FC color data show an inner dark albedo region surrounded by an extended light colored ray system, this is also shown in the VIR images.
Both FC color ratio images and VIR images show compositional variations within the Marcia quadrangle (De Sanctis et al., LPSC2012). The band depth distribution is uneven in this region and associated with the geological structures present in the quadrangles. On average the dominant terrains are the so called ET (Equatorial Terrains) characterized by intermediate band depths, but associated with Marcia we see also terrains with very deep band depth similar to the ST (Southern Terrains) and deep band depth as the MLT (Mid Latitude Terrains). The low albedo ejecta field, derived from the Marcia and Calpurnia craters (located in Av-9), mantles underlying older terrains and is associated with the CET (Copious ejecta Terrains): the band depth are very shallow.
VIR data show strong 1 μm and 2 μm absorptions exposed within the walls and floor of impact crater Marcia, suggesting excavation of pyroxene-rich material and/or variations in particle sizes. FC color ratio images, as well as VIR color ratio (Red:750/430 nm; Green :750/920 nm; Blue:430/750 nm) show color differences in Marcia and Calpurnia. The color and spectral data show the difference between the eastern side of the Marcia and Calpurnia ejecta field from its western side. Moreover it appears an unusual diffuse deposit surrounding an unnamed crater on the western side of the quadrangle. Further study is underway to investigate the significance of these color variations.

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