VESTA BEFORE ARRIVAL AT CERES: REGIONAL SURFACE COMPOSITION.

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Introduction: Analysis of the spectral band parameters observed on Vesta by the Visible and Infrared (VIR) spectrometer was carried out during Dawn's cruise to Ceres. These most recent results appear in Icarus[1].

Results: The dominant surface composition of Vesta is a mixture of minerals of eucritic and diogenitic compositions comprising howarditic material. The results using data from both high and low-altitude orbits of the Dawn spacecraft include detailed analyses of spectral band parameters and incorporate albedo measurements, elemental abundance, topography, geology and gravitational maps. Vesta's regolith, while predominantly of howardite, eucrite and diogenite compositions varies across its surface. At high spatial resolution the remnants of Vesta's ancient crust can be seen in discrete areas of high elevation[2]. There is evidence of a regolith component of regional extent that is dark and is associated with the presence of a 2.8 μm absorption band related to OH-minerals[3,4,5]. Only a limited area associated with a crater in the northern hemisphere, named Bellicia shows evidence of olivine [6], and mixtures of pigeonite, hypersthene and diopside are also consistent with this spectrum [5]. Some regions are mostly free of contamination of dark material, the Pinaria region for example[7]. Other regions have discrete areas also of low albedo and relatively stronger absorption bands at 2.8 μm, suggesting that the dark carbonaceous component is concentrated beneath a fresh crater and also mixed with brighter HED- regolith[2]. Walls of a number of prominent morphological features including impact craters and graben have spectral band parameters that differ from surrounding areas suggesting that mass wasting exposed pre-impact surfaces. [8,9,10] Unexpected findings include a dark region with relatively weak OH absorption[11], and uplifted regions of ancient eucritic crust possibly indicating different episodes of regional magmatic activity[12].

References: [1] McCord, T.B. and Scully, J.E.C. 2015. Icarus, in press. [2] DeSanctis M.C. et al. Icarus in press. [3] McCord et al. 2012. Nature 491, 83. [4]DeSanctis. M.C. and Combe, J.-P. et al. 2012. Ap.J. Lett. 758, L36. [5]Combe, J.-P. et al. 2015. Icarus, in press. [6] Ammannito, E. et al. 2013. Nature 504, 122. [7] McFadden et al. 2015. Icarus submitted. [8] Stephan et al. 2015. Icarus in press. [9] Longobardo et al. 2015. Icarus in press. [10] Tosi et al. 2015. Icarus, in press. [11] Zambon et al. 2015, Icarus submitted. [12] Frigeri et al. 2015. Icarus, submitted.