Macro vs. micro: relating the spectral properties of Vesta and the HED meteorite.

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We present the main results obtained comparing the visible-near infrared (VIS-NIR) spectra Vesta's surface with howardites, eucrites, diogenites (HED). HEDs are commonly associated with Vesta's composition based on spectral similarities. Because of such association, much effort is being made to merge the information from HEDs – as well as Vestoids – with that from Vesta to characterize the lithologic diversity of the surface of this asteroid and to infer clues regarding its thermal history. However, while the HEDs are a class of meteorites well studied in the laboratory, the only spectral data available for Vesta until now were telescopic observations which are limited in terms of observation conditions, spatial resolution and Signal to Noise Ratio. The Dawn spacecraft, orbiting around Vesta since July 2011, is performing detailed observations of this body and thus improving our knowledge of its properties. Dawn's scientific payload includes an imaging spectrometer, VIR-MS, sensitive to the VIS-NIR spectral range. VIR-MS began acquiring spectra during the approach phase started in May 2011 and will continue its observations through July 2012 when the spacecraft will depart Vesta to travel to Ceres. The VIR-MS spatial resolution depends upon the mission phase (approach, survey, high altitude, low altitude). However, spectra acquired by VIR-MS have already exceeded the spatial resolution of ground-based telescopic observations, with resolution in the approach phase ranging from 2.5 up to 0.8 km/pixel. Moreover, the observations are uniformly distributed in latitude and longitude allowing us to have a global view of Vesta's crust spectral properties. Using the information provided by VIR spectra, we studied the distribution of the spectral heterogeneities on the surface and we used our findings to perform a comparison with HEDs spectra in the VIS-NIR spectral range searching for analogies and/or incompatibilities. In our analysis, we focused on a method to compare the results obtained at microscopic scale on HEDs samples and the one obtained at macroscopic scale on the surface of Vesta. Finally, we discuss our results in the context of vestan thermal history. The intent of this study is to improve our understanding of the connection between Vesta and the HED samples, which is one of the primary Dawn scientific objectives. This work is supported by an Italian Space Agency (ASI) grant and by NASA through the Dawn project and a Dawn at Vesta Participating Scientist grant.