**LOCAL AND GLOBAL LITHOLOGIES ON VESTA.** M.C. De Sanctis[1], E. Ammannito[1], M.T. Capria [1], F. Capaccioni [1], F. Carraro [1], S. Fonte [1], A. Frigeri [1], G. Magni[1], S. Marchi[2], E. Palomba [1], F.Tosi [1], F. Zambon [1], C.A. Raymond[3], C.T. Russell[4], D. T. Blewett[5], R. Jaumann[6], L.A. McFadden[7], H.McSween[8], D. W. Mittlefehldt[9], and Dawn Team. [1]INAF, Istituto di Astrofisica e Planetologia Spaziale, Area di Ricerca di Tor Vergata, Roma, Italy, mariacristina.desanctis@iasf-roma.inaf.it, [2]NASA Lunar Science Institute, Boulder, USA, [3]Jet Propulsion Laboratory, Pasadena, CA 91109, USA, [4]Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA 90095, USA, [5]Johns Hopkins University, APL, Laurel, MD 20723 USA, [6]DLR, Berlin, Germany, [7]NASA, GSFC, Greenbelt, MD, USA ,[8]Department of Earth and Planetary Sciences, University of Tennessee, Knoxville, TN, USA, [9]NASA Johnson Space Center, Houston, TX 77058 USA

**Introduction:** The Dawn mission has completed its Survey and High-Altitude Mapping Orbit (HAMO) phases at Vesta, and is currently taking data in its Low-Altitude Mapping Orbit (LAMO). Data from the Dawn Visible InfraRed Mapping Spectrometer -**VIR** (1) characterize and map the mineral distribution on Vesta, strengthen the Vesta – HED linkage and provide new insights into Vesta's formation and evolution.

VIR acquired data during Approach, Survey, HAMO, and LAMO orbits that provided very good coverage of the surface. Data of high quality, from 0.2 to 5 µm, have been acquired in 864 spectral channels. The coverage obtained allows a near global study of Vesta's surface mineralogy at different spatial resolutions.

**Vesta global mineralogy:** Dawn VIR spectra are characterized by pyroxene absorptions near 0.9 and 2.0 µm. Thermal emission dominates Vesta's spectrum beyond 3.5 µm (2,3). Although almost all of the surface materials exhibit howardite-like spectra, some large units can be interpreted to be material richer in diogenite (based on pyroxenes band centers) and some others like eucrite-rich howardite units (4).

In particular, these data have provided unprecedented views of the south polar impact structure, Rheasilvia, and provide clues to the compositional diversity of Vesta's surface and the role that large impacts have played in excavating materials from deeper in its crust. The Rheasilvia basin has its own spectral characteristics: deeper and wider bands, average band centers at shorter wavelengths. These spectral behaviors indicate the presence of Mg-pyroxene-rich (diogenite-rich) terrains in Rheasilvia. By contrast, on average, the equatorial areas have shallower band depths and band centers at slightly longer wavelengths. VIR spectra indicate the presence of diogenite-rich material within and surrounding Rheasilvia, although the distribution is not symmetric (4,2).

**Vesta local mineralogy**: Vesta' s surface shows considerable diversity at local scales, in terms of spectral reflectance and emission, band depths, centers and spectral slopes. Many bright and dark areas were identified on Vesta from VIR and FC (5,6,7,8). These areas are associated with various geological features and show remarkably different forms. Dark areas are spectrally characterized by bands near 1 and 2 µm that are shallower with respect the surrounding terrains, while the bright materials appear to have high reflectance and are associated with deep pyroxenes bands (8). Bright areas appear to be dark at thermal wavelengths near 5-µm, confirming that their brightness is dominated by high albedo rather than topography. The deeper absorption could be consistent with differences in both grain size and degree of space weathering. The spectral differences of the dark materials are subtle and suggest a composition similar to the Vestan average surface, with a small amount of a moderately darkening agent.

Vesta presents complex geology/topography (9) and the mineral distribution is often correlated with geological and topographical structures. Some ejecta from large craters have distinct spectral behaviors, as well as some materials exposed in the craters showing distinct spectra on floors and rims. VIR reveals the mineralogical variation of Vesta's crustal stratigraphy on local and global scales.

**Conclusions:** The hypothesis that Vesta is the HED parent body is consistent with the geologic and spectral context for pyroxene distribution provided by VIR . The overall stratigraphy of different lithologies on Vesta could indicate the presence of a lower crust rich in diogenite (or diogenite in subsurface plutons) and of basaltic eucrites in the upper crust, in accord with inferences made from meteorite studies [10]. The composition distribution indicates that Vesta is a small body that underwent to a very complex evolution different from the other asteroids visited so far.

**References:** [1] De Sanctis et al., SSR, 163, 2011. [2] De Sanctis et al., LPSC (2012). [3] Tosi et al., (2012), LPSC. [4] Ammannito et al., LPSC, (2012). [5] Capaccioni et al. (2012), LPSC, [6] Li et al., (2012), LPSC. [7] McCord et al., (2012), LPSC [8] Palomba et al., (2012), LPSC, Jauman et al., LPSC 2012, [10] McSween H.Y. Jr. et al. (2011) SSR.

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