MINERALOGICAL COMPOSITION OF THE DIFFERENT TYPES OF BRIGHT DEPOSITS ON VESTA.

F. Zambon[1], F. Capaccioni[1], M. C. De Sanctis[1], E. Ammannito[1], J.-Y. Li[2], A. Longobardo[1], D. W. Mittlefehldt[3], E. Palomba[1], C.M. Pieters[4], S.E. Schroeder[5], F. Tosi[1], H. Hiesinger[6], D. T. Blewett[7], C. T. Russell[8], C.A. Raymond[9], M. T. Capria[1], F. Carraro[1], S. Fonte[1], A. Frigeri[1], G. Magni[1] and the Dawn Team, [1]INAF, Istituto di Astrofisica e Planetologia Spaziale, Area di Ricerca di Tor Vergata, Roma, Italy, (francesca.zambon@iaps.inaf.it), [2]Department of Astronomy, University of Maryland, MD, USA, [3]Astromaterials Research Office, NASA Johnson Space Center, TX, USA, [4]Department of Geological Sciences, Brown University, RI, USA, [5]Max-Planck-Institut für Sonnensystemforschung, Lindau, Germany, [6]Institut für Planetologie, Westfälische Wilhelms-Universität Münster, Germany, [7]Johns Hopkins University Applied Physics Laboratory, MD, USA, [8]Institute of Geophysics and Planetary Physics, Department of Earth and Space Sciences, UCLA, CA, USA, [9]Jet Propulsion Laboratory, California Institute of Technology, CA, USA.

Introduction: VIR-MS, Dawn's Visible and Infrared Mapping Spectrometer, obtained hyperspectral images of a wide part of Vesta's surface at a variety of spatial resolutions [1]. Vesta spectra are similar to those of the howardite-eucrite-diogenite (HED) meteorites. Moreover, they are characterized by the two iron-bearing pyroxene bands at 0.9 (band I) and 1.9 μm (band II). Vesta surface's is dominated by eucrite/howardite with some diogenitic regions situated in the southern hemisphere near the Rheasilvia basin [2].

The surface is heavily craterized and impacts can expose fresh material, thus generating the Bright Material Deposits (BMD) observed within and surrounding certain craters. BMD can be classified into six different types based on their morphological characteristics: Crater Wall/Scarp Material (CWM), Radial Material (RM), Slope Material (SM), Patchy Material (PM), Spot Material (SpM) and Diffuse Plains Material (DPM) [3].

The most widespread BMD are CWM, SM and RM. CWM, SM, RM originate from impacts. CWM is situated on the edge of the craters. Mass wasting from the crater walls and generates the SM, while RM is associated with the ejecta of the craters [4].

BMD are characterized by albedo greater than that of the vestan average, 0.38 [5]. Therefore the different types of deposits present distinct levels of reflectance respect to the Surrounding Regions (SR), in particular: the CWM and SM is ~40% brighter, the RM is ~30-40% brighter; the SpM is about 20-25% brighter and the PM is about 20% brighter. Near the edge of the Rheasilvia basin it is possible to find some extremely bright areas ~80% brighter than the vestan average [6].

Spectral Analysis of the CWM, SM and RM: In order to analyze the spectral characteristics of the different types of BMD, we chose 10 areas containing more than one type of BMD. The deposits are located in various regions of Vesta's southern hemisphere. The data analyzed are from the HAMO1 and HAMO2 (High Altitude Mapping Orbit) phases of the Dawn mission. The BMD spectra exhibit greater band depths than their SR. Band depth is a function of the abundance of the absorbing minerals, but can also be affected by other factors such as the grain size and the presence of opaque minerals [7]. In Figure 1, average continuum-removed spectra for the BMD and for the SR are shown.

The study of the mineralogical composition of the BMD was done using the band center I vs. band center II plot (Figure 2) of the deposits considered discriminating among the various types.

Conclusions: The band center analysis reveals that almost all the BMD considered are howarditic/eucritic, except for the CWM deposits in Aelia and in Dep5 and the CWM, SM and RM deposits in Dep1 which are all diogenitic (Figure 2).

The band depth of the BMD is in general higher than that of the SR. Among the BMD types the bands I and II of the CMW deposits are deeper than those of the SM and RM deposits (Figure 1). The RM deposits, instead, have a shallower bands. Observing the plot in Figure 2, we can conclude that the mineralogical composition of the different types of deposits is related to their location and not to their morphological type, except for Aelia and Dep5. It is planned to extend the present study on other BMD, in order to have a better knowledge of the connection between their different characteristics.

Acknowledgements: The authors acknowledge the support of the Dawn Science, Instrument and Operations Teams. This work was supported by the Italian Space Agency (ASI), ASI-INAF Contract.

References: [1] De Sanctis et al. LPSC 2013. [2] M.C. De Sanctis et al. (2012), *Science 336*, 697-700. [4] D.W.Mittlefehldt et al. LPSC 2012, [4] Li et al. LPSC 2012, [5] J. Li et al. (2010), *Icarus 208*, 238–251. [6] Schroder et al. LPSC 2012, [7] Capaccioni et al, LPSC 2012.

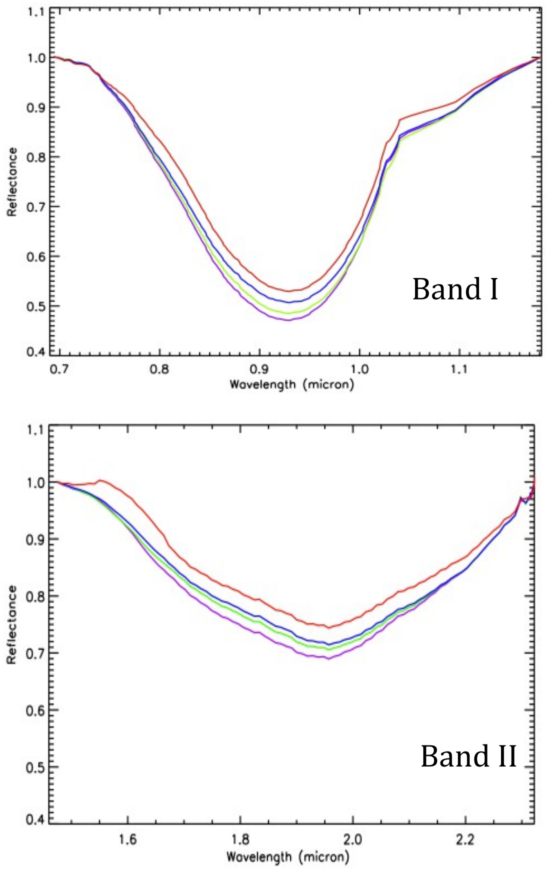

Figure 1: Band I and II mean continuum-removed spectra for the different types of deposits considered. In violet are indicated the CWM, the green spectrum is relative to the SM, the blue spectrum represent the RM while the red one refers to the SR.

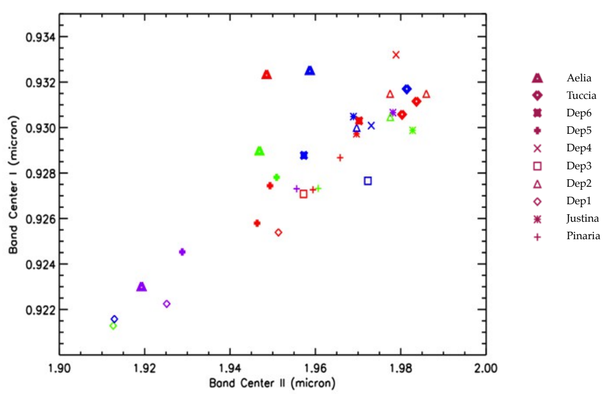

Figure 2: Plot of the Band Center I vs Band Center II for 10 BM deposits. The symbols represent the deposits located in different areas, while the color are relative to the type of deposits (CWM: violet, SM: green, RM: blue, SR: red).