COMPOSITIONIAL MAPPING OF VESTA QUADRANGLE V22. E. Palomba[1], M.C. De Sanctis[1], A. Nathues[2], K. Stephan[3], E. Ammannito[1], A. Longobardo[1], A. Frigeri[1], F. Zambon[1], F. Capaccioni[1], R.A. Yingst[4], R. Jaumann[3], F. Tosi[1], C.M. Pieters[5], C.A. Raymond[6], C.T. Russell[7] and the DAWN team. [1]INAF-IAPS, Via del Fosso del Cavaliere 100, I-00133 Rome, Italy, ernesto.palomba@ifsi-roma.inaf.it. [2]MPI for Solar System Res., Katlenburg-Lindau Germany [3]DLR Berlin Germany. [4]Planetary Science Insititute, Tucson AZ USA. [5]Dep. Geol. Sci., Brown University, Providence, RI USA. [6] Cal. Inst. Tech Jet Prop. Lab. Pasadena CA USA. [7]UCLA, Los Angeles CA USA.

Introduction: The Dawn spacecraft [1] is orbiting and mapping 4 Vesta since July 2011 by using the Framing Camera (FC) and the Visible and InfraRed Imaging spectrometer (VIR) [3]. VIR acquired hyper-spectral images of Vesta's surface in the wavelength range from 0.25 to 5.1µm during Approach, Survey and High Altitude Mapping (HAMO) orbits that provided very good coverage of the surface (>65% of the complete surface). The VIR nominal pixel resolution ranges from 1.3 km (Approach phase) to 0.18-0.15 km (HAMO). The coverage allowed a near global study of Vesta's surface mineralogy and the development of a series of four quadrangle maps [4]. Here we present the results of the spectroscopic analysis achieved for the quadrangle V22, which covers Vesta's surface between 57°N-57°S and 0°-180°.

Spectral characteristics: Vesta's spectra are dominated by the prominent pyroxene absorption bands centered at 0.9 and 1.9µm, while thermal emissions control Vesta's spectrum beyond 3.5 µm [4]. Despite the absence of other spectral signatures, we observed significant variability of spectral parameters (e.g. band depth, band centers and spectral slopes) at regional and local scales. These differences are frequently associated with geological/morphological features. In particular, impact related features, such as ejecta or mass wasting in craters are characterized by strong albedo and band depth variations. Because of this, surface features can be easily identified by combining different spectral channels or band ratios into color images [6] (Fig. 1).

Based on some spectral parameters, Vesta can be divided very broadly into different terrain types [2].

This quadrangle, similarly to the QV23, contains primarily the following type of terrains:

- *MLT - Mid-Latitude Terrains*: These are located mainly in the southern hemisphere at mid latitude between -20 ° and -50°. Similar terrains are found in the northern hemisphere in correspondence with specific geological structure. These terrains are characterized by <u>deep pyroxenes bands</u>
- *ET - Equatorial Terrains*: These terrains are mainly in the equatorial regions and their <u>pyroxenes band depths are intermediate</u>
- *CET-Copious Ejecta Terrains:* These terrains are located in locations where copious crater ejecta are found. These terrains are characterized <u>by low reflectance in the VIS and shallow pyroxenes bands</u>

Different kinds of terrain are shown in Table 1.

Terrain	MLT	ET	CET
Latitude	-45/-35	-18/-16	-28/-22
Longitude	25/35	145/155	136/144
Geology	bright ejecta	no feature	dark ejecta
BDI	0.45-0.50	0.40-0.42	0.38-0.41
BDII	0.22-0.25	0.18-0.21	0.16-0.18
BAR	1.8-1.9	1.7-1.9	1.8-2.1

Table 1. Spectral properties of a Mid-Latitude Terrain, an Equatorial Terrain and a Copious Ejecta Terrain. BDI and BDII are the band depths of the 1 and 2 µm pyroxene bands, while BAR is the Band Area Ratio.

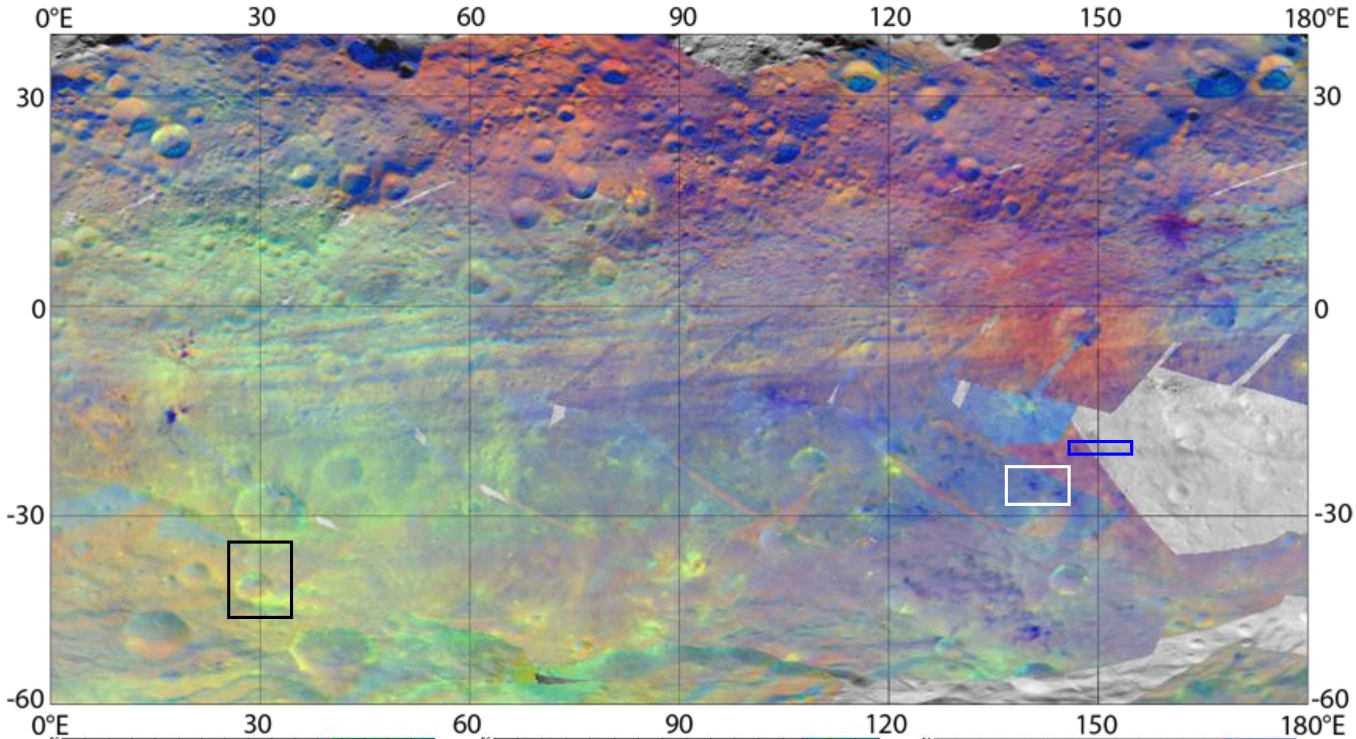
The analysed MLT and CET regions are associated with bright and dark ejecta, while for the ET albedo features are not found. Band depths of the 1 and 2 µm pyroxene bands are deeper in the MLT and shallower in the CET, while the Band Area Ratio (BAR), defined in [7], is quite similar for the three regions.

Discussion: Spectral properties of the bright (MLT) and the dark (CET) ejecta are shown in Fig. 2. The dark ejecta corresponds to the D12 region of the DMD's (Dark Material Deposits) catalogue [8] and is characterised by typical spectral properties of Dark Materials, i.e. low albedo in the visible (@0.55-0.60 µm) and high thermal emission at 4.9-5.0 µm. In fact the visible I/F is 20% lower than the bright ejecta one (on average), while the thermal I/F can be also two times larger (1.5-2.6 vs 2.7-3.1, respectively).

In the bright ejecta, pyroxenes are very important components, as evidenced by the high value of BDI and BDII.

References: [1] Russell, C.T. et al. (2004) *PSS*, 52, 465–489. [2] De Sanctis, M.C. et al. (2011) *SSR, 163*. [3] Greeley, R. and Batson, G. (1990) *Planetary Mapping, 32*; [4] De Sanctis, M.C. et al. (2012) this session; [5] Tompkins, S. & Pieters, C.M. (1999) *Meteor. & Plan. Sc*., 34, 25-41. [6] Jaumann, R. et al. (2012) *this session*; [7] Cloutis, E. *et al.* (1986) *JGR* 91, 11641; [8] Palomba, E. et al. (2012), *this session*.

Fig. 1 Ratio Color Composite of Vesta's surface for quadrangle V22 using the Ratios of the VIR channels at 438nm/749nm, 749nm/917nm and 749nm/438nm. The analysed MLT, ET and CET are enclosed into the black, blue and white square respectively.



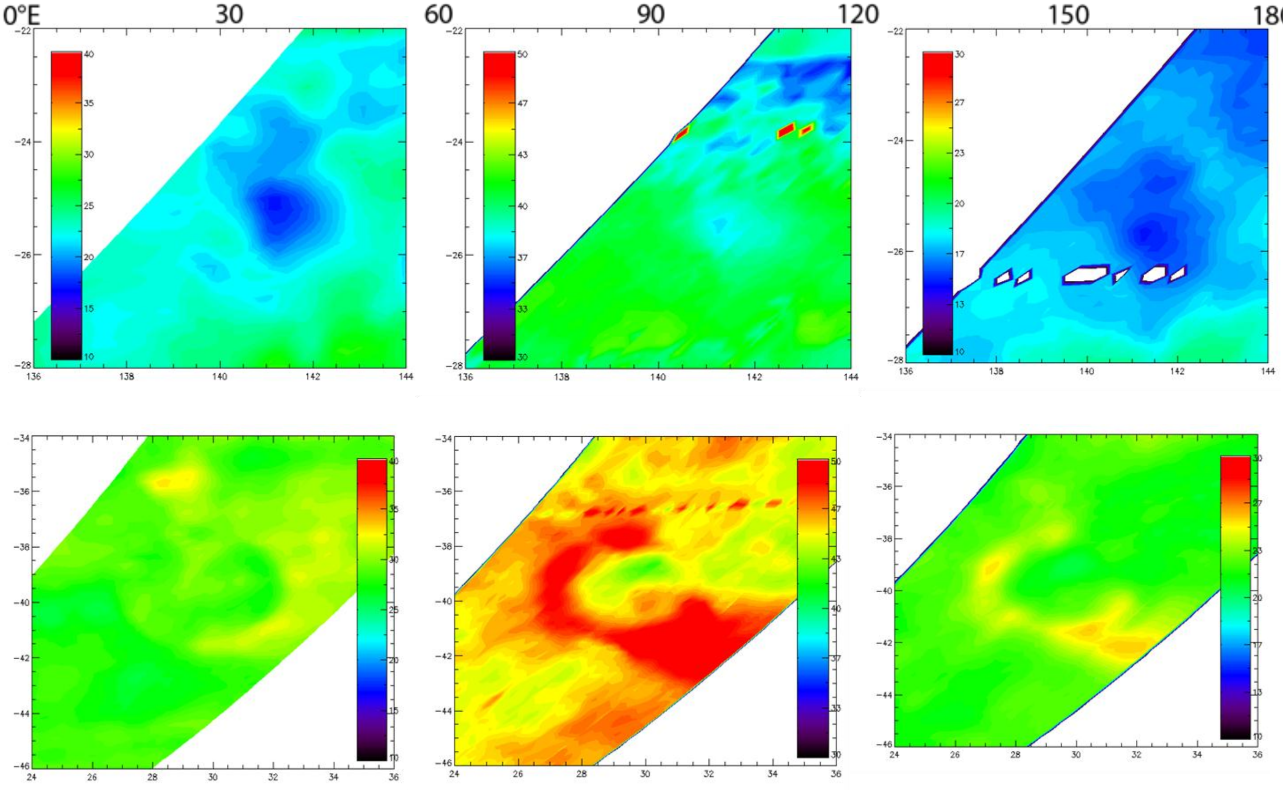


Fig. 2. I/F at 550-600 nm (left), BDI (center), BDII (right) of bright (above) and dark (below) ejecta.