SPECTRAL IMAGES OF HEDS: A STATISTICAL APPROACH TO SELECT SPECTRAL TYPES. E. Ammannito[1], M.C. De Sanctis[2] and A. Coradini[1]. [1]INAF-IFSI Via Fosso del Cavaliere, 100, 00133, Roma, Italy, eleonora.ammannito@ifsi-roma.inaf.it, [2]INAF-IASF Via Fosso del Cavaliere, 100, 00133, Roma, Italy.

Introduction: The purpose of the work is to perform a spectral characterization of a set of slab meteorite samples (eucrite and diogenite) using the same spectral range and spectral resolution of VIR, the imaging spectrometer of the Dawn mission [1] in order to find spectral markers to discriminate the compositional nature of the two meteorite family. The outcome of this work will be used during the analysis of the spectral data from the Dawn mission to go through the details of the interpretation of the spectra with a particular attention to the relation between Vesta and HEDs meteorites [2].

Measurements: We have acquired a spectral image in the visual range (0.25–0.95µm) of two samples: a Eucrite (LEW88005) and a Diogenite (EETA79002) from the Antarctic Meteorites Collection managed by the US Antarctic Meteorite Program. The images, acquired with the Sp-Im facility [3], have a spectral resolution of 2.5nm and a spatial one of 0.25nm.

Analysis: We have applied a statistical method to extract spectral types from each sample and then we have identified markers to discriminate between eucritic and diogenitic spectral types.

The spectral images of the two samples were analyzed applying an unsupervised classification integrated into ENVI (ISODATA Classifier). We have resized the data-set spatially, in order to exclude the pixel not related with the sample, and spectrally, in order to avoid false classification due to the low s/n ratio in the first 40nm of the spectrum. More than 30000 spectra were analyzed for each spectral image. We considered two cases:

Case 1. In this case we didn't perform any kind of processing thus the classification will enhance mostly the differences in the reflectance of the sample (albedo). In fig. 1 and fig. 2 there are the outcome of the classification for the eucrite and diogenite respectively. Analyzing the results we conclude that:

- the two surfaces of each sample have the same behavior;
- the identified classes in the image are strongly related with sample reflectances;
- the albedo is a gradually changing parameter, thus each class is characterized by different values of the reflectance;
- pyroxenes seem to be present everywhere in both samples, thus, any inclusion of different materials should have a spatial extension less then 0.25mm (spatial resolution of the images);
- the percentage of pyroxenes changes along the sample (1 µm band strength variations);
- the purest pyroxene is found in the center of the bright clasts and finally there is a gradual increase of the impurities going toward the dark matrix;
- eucrite and diogenite types have clearly different behavior at wavelengths shorter than 650 nm. Further analysis is required to investigate the possibility to discriminate the eucritic and diogenitic spectral type at longer wavelength.

Case 2: In this case the spectra have been normalized at 550 nm: the classification will enhance mostly the differences along the samples of the spectral features properties. In fig. 3 and fig. 4 there are the outcome of the classification for the eucrite and diogenite respectively. Analyzing the results we conclude that:

- The identified classes in case 2 do not correspond to the classes identified in case 1.
- No correlation between the spectral classes and sample clasts can be recognizable;
- Samples have similar spectral behavior: one high contrast class and other ones with moderate contrast;
- Pyroxenes seem to be present everywhere in the sample (always present the beginning of the 1um band) but the percentage of pyroxenes changes along the sample as already noted in the results of the case1 classification;
- Slightly differences in the shape contrast relation: in the eucrite the high contrast spectrum has a concave shape in the 550-700 region. Then, gradually, the shape change to neutral when the contrast get lower. On the contrary, in the diogente the high contrast spectrum has a concave shape in the 550-700 region. Then, gradually, the shape change to convex when the contrast get lower.

Conclusions: In case 1 there is a difference in the spectra of the two samples at wavelengths shorter than 650 nm but, since the normalized spectra doesn't show the same difference, that seems to be related more to the general brightness of the samples than a spectral characteristic. At the present stage of this work it was not possible to identify quantitative index to discriminate between eucritic and diogenitic spectral types. However, since qualitative differences were identified, further analysis will be performed.

References: [1] Russell, C.T. et al. (2007) *Earth, Moon, and Planets*, 101, pp.65-91. [2] Binzel, R.P. and Xu, S. (1993) *Science*, 260, pp 186-191. [3] Ammannito et al. (2008) LPS XXXIX Abstract #1391.

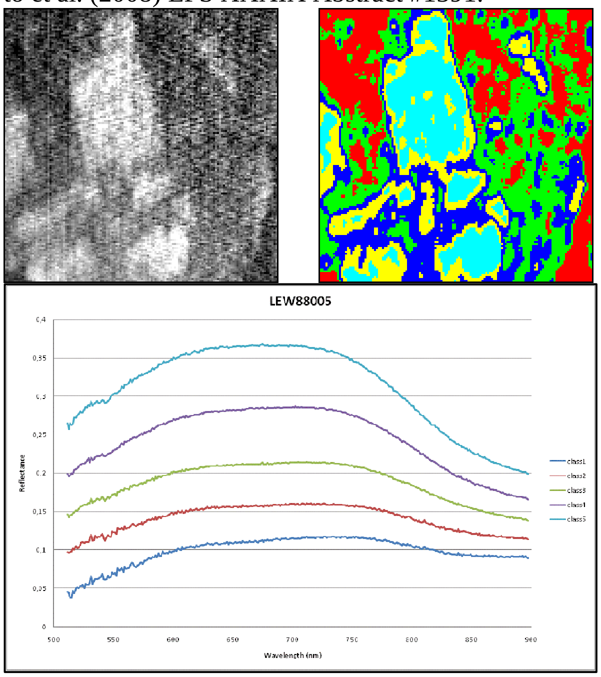

Fig. 1. Eucrite case1: top left monochromatic image of the sample, top right the outcome of the classification, bottom averaged spectra of the selected classes.

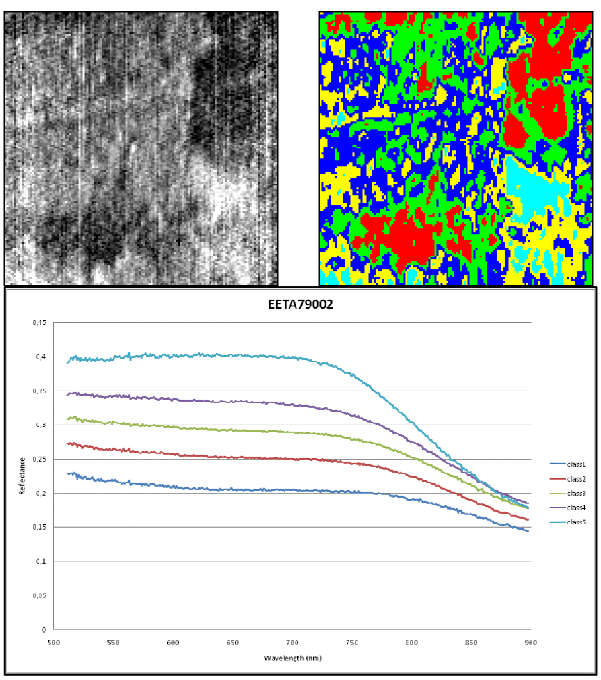

Fig. 2. Diogenite case1: top left monochromatic image of the sample, top right the outcome of the classification, bottom averaged spectra of the selected classes.

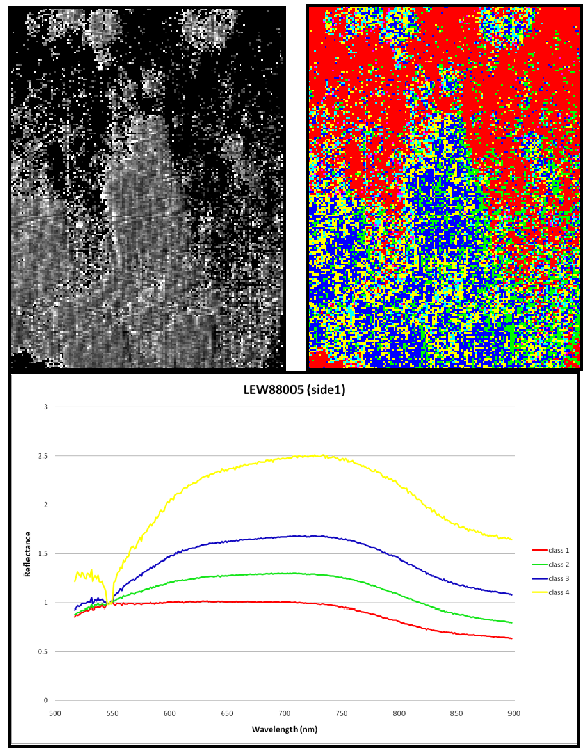

Fig. 3. Eucrite case2: top left monochromatic image of the sample, top right the outcome of the classification, bottom averaged spectra of the selected classes.

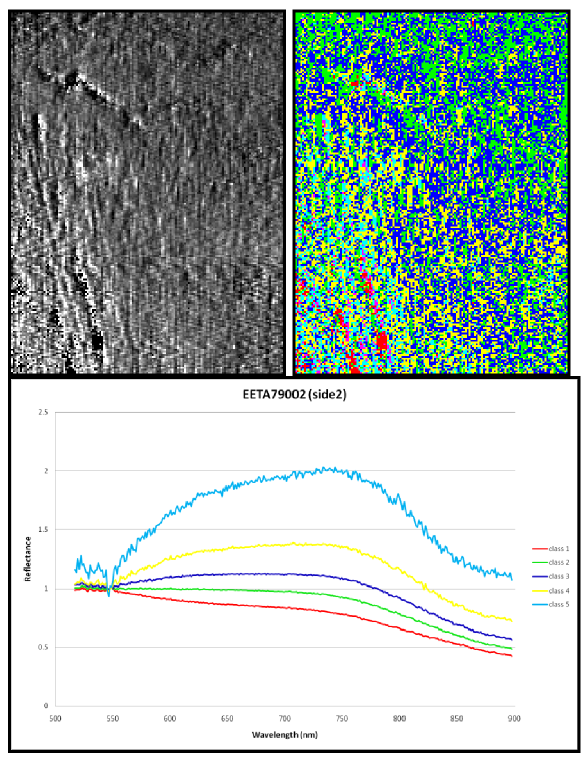

Fig. 4. Diogenite case2: top left monochromatic image of the sample, top right the outcome of the classification, bottom averaged spectra of the selected classes.