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Imaging spectroscopy of HED meteorites

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Imaging spectroscopy is an important and efficient tool to measures spectral characteristics of meteorites and terrestrial rocks. We have applied this technique to a suite of HEDs (Howardite, Eucrite and Diogenite) meteorites of the Antarctic Meteorites Collection managed by the US Antarctic Meteorite Program. This activity was done to support the scientific interpretation of the hyper-spectral data produced by VIR-MS, the imaging spectrometer aboard the Dawn mission to small bodies 1 Ceres and 4 Vesta. The majority of meteorites are believed to be derived from parent bodies in the asteroid belt, even though there are few specific asteroids identified as sources. One of the exceptions is the association of Vesta with the Howardite, Eucrite, Diogenite class of achondrites (HEDs). HEDs are a clan of achondritic meteorites that have continuous variations in mineralogy and chemistry. Pyroxenes are the dominant mafic mineral present in HED meteorites and provide multiple clues about how the parent body evolved.

VIS reflectance spectroscopy techniques has been applied to slices extracted from the Eucrite meteorite LEW88005 and we are measuring the diogenite EET A79002.

We acquired a hyperspectral image in the visual spectral range (0.25–0.95 μm) of both side of the sample. In the data cube are clearly recognizable clasts and regions with different reflectance value. In many of the spectra can be recognized the 1 μm band, typical of pyroxenes. Some others, especially the dark regions, are spectra typical of glasses even if a little percentage of pyroxenes is still present. In a first analysis we can say that pyroxenes seem to be present everywhere in the sample, at the resolution of 0.25 mm (spatial resolution of the images). The distribution and the percentage of pyroxenes changes along the sample: we have measured different band strengths in different regions of the sample. The larger amount of pyroxenes is found in the center of the bright clasts and we have recognize a gradual increasing of the impurities going toward the dark matrix. This work is still going on, in particular we are analyzing the spectra in order to extract quantitative information that can help understanding of the thermal history of the sample and thus the one of Vesta, the possible parent body of the Eucrites. Furthermore, we are now measuring the other HED slabs, in order to found differences and analogies.