Geophysical Research Abstracts
Vol. 14, EGU2012-4876, 2012
EGU General Assembly 2012

Characterization of Mineralogy across Vesta

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Data from the Dawn VIR (Visible InfraRed mapping Spectrometer) characterize and map the mineral distribution on Vesta, strengthen the Vesta – howardite, eucrite diogenite (HED) meteorite linkage and provide new insights into Vesta's formation and evolution.VIR data acquired during Approach, Survey and High Altitude Mapping (HAMO) orbits have provided very good coverage of the surface (> 65% of the complete surface and nearly all the illuminated portion). Additional data are now being acquired in the Low Altitude Mapping Orbit. Data of high quality, from 0.2 to 5 microns, have been acquired for a total of about 8.5 million spectra in 864 spectral channels. The VIR nominal pixel resolution ranges from 1.3 km (Approach phase) to 0.18-0.15 km (HAMO).
The coverage allows near global-scale investigation of Vesta's surface mineralogy.

VIR spectra are characterized by pyroxene absorptions, but no clear evidence for other abundant minerals is observed at the scale of the present measurements of hundreds of meters. Even though Vesta spectra are dominated by pyroxenes, spectral variations at regional and local scales are evident and distinct color units are identified. Although almost all surface materials exhibit howardite-like spectra, some large units are interpreted to be richer in diogenite (based on pyroxenes band depths and band centers) and some others are eucrite-rich .
VIR data strongly indicate that the south polar region (Rheasilvia) has its own spectral characteristics, indicating the presence of Mg-pyroxene-rich terrains (diogenite-like), while the equatorial areas have swallower band depths and average band centers at slightly longer wavelengths, consistent with more eucrite rich materials.
Vesta surface shows considerable diversity at smaller scales (tens of km), in terms of spectral reflectance and emission, band depths and slopes. Many bright and dark spots are present on Vesta. Dark spots have low reflectance at visible wavelengths and are spectrally characterized by shallower 1 and 2 micron bands with respect the surrounding terrains. Bright materials have high reflectance and are often spectrally characterized by deep pyroxenes absorption bands.
Vesta presents complex geology/topography and the mineral distributions are often correlated with geological and topographical structures. Ejecta from large craters have distinct spectra, and materials exposed within the craters show distinct spectra on floors and rims. VIR reveals the mineralogical variation of Vesta's crustal stratigraphy on local and global scales. Maps of spectral parameters show surface and subsurface unit compositions in their stratigraphic context. The hypothesis that Vesta is the HED parent body is consistent with, and strengthened by, the geologic and spectral context for pyroxene distribution provided by Dawn.

The authors gratefully acknowledge the support of the Dawn Instrument, Operations, and Science Teams. This work is supported by an Italian Space Agency (ASI) grant and by NASA through the Dawn project and a Dawn at Vesta Participating Scientist grant.