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 obtained allows a near global study of Vesta's surface mineralogy.

Dawn VIR spectra are characterized by pyroxene absorptions and no clear evidence for abundant other minerals are observed at the scale of the present measurements.

Even though Vesta spectra are dominated by pyroxenes, spectral variation at regional and local scales are evident and distinct color units are identified. Although almost all of the surface materials exhibit spectra like those of howardites, some large units can be interpreted to be material richer in diogenite (based on pyroxenes band depths and band centers) and some others like eucrite-rich howardite units.

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 distribution is often correlated with geological and topographical structures. Ejecta from large craters have distinct spectral behaviors, and materials exposed in 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.

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