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Mapping the global mineralogical composition of Vesta

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The Dawn spacecraft has acquired hyperspectral data for Vesta in more than 850 spectral channels from the ultraviolet (UV) to the infrared (IR) (0.25-5.1μm) allowing us to map the mineralogy of the surface. VIR has acquired data covering > 65% of the surface and FC covered more than 80%, permitting a nearly global view of Vesta's surface. FC color ratio images from Survey orbit with a spatial resolution of $\sim$250 m/pixel and VIR hyperspectral images from Approach and Survey orbits with spatial resolutions of 1300 and 700 m/pixel, respectively, provided information on surface mineralogical and lithologic distributions and were used to define terrains and unit boundaries.
We present a first attempt at constructing a global mineralogical map of Vesta , based on data from the Survey orbit. This map is part of an iterative mapping effort; the map will be refined with each improvement in resolution. Dawn VIR hyperspectral data show that Vesta's surface is dominated by pyroxenes. FC color data reveals that Vesta shows the largest color variation of any asteroid visited so far. Although the spectra are dominated by pyroxenes, variations at regional scale are evident and distinct color units have been identified. Both color and spectral variations are often correlated with geological, morphological and topographic features, demonstrating that Vesta has had a long and complex geological history. Several spectral parameters can be measured and evaluated to infer mineralogical composition, including band centers, depths, spectral slopes, and band ratios. Vesta's surface exhibits clear differences in the shape, depths and widths of pyroxene bands on a regional scale. Spectral parameters show that Vesta can be divided very broadly into several major terrain types. Here we report the distributions of such parameters and their use in mapping the mineralogy of the asteroid's surface.

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