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VIR Experiment onboard of Dawn mission: Vesta spectral investigation

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The VIR experiment aboard the Dawn mission [1] is an advanced VIS-IR imaging spectrometer. VIR mapping spectrometer combines two data channels in one compact instrument. The visible channel covers 0.25–1.05 μm and the infrared channel covers 1.0–5.0 μm. These characteristics make it an appropriate instrument for determining the Vesta's global surface composition [2].
One of the main goals of Dawn is to determine the mineral composition of the surface and to place it in geologic context. Several diagnostic absorption bands for key minerals occur in the visible and near-infrared regions and can be identified with spectroscopic measurements. Common rock-forming minerals in both meteorites and asteroids exhibit distinctly different and diagnostic absorption bands. The wavelength, shape and strength of various absorption features are determined by the minerals and molecules possibly present on the first micrometers of the surface. Each parameter must be measured accurately to make identifications and derive relative abundances.
The asteroid surface composition can be identified thanks to visual and infrared spectral features. Moreover the instrument can discriminate compositional classes through the identification of these features on the surface, thanks to the imaging capability. The nature of mineralogical composition of the Vesta surface can be identified by visual and infrared spectroscopy using high spatial resolution imaging to map the heterogeneity of asteroid surfaces and high spectral resolution spectroscopy to determine the composition unambiguously. Simultaneous spectral resolution and spatial resolution are needed to investigate surface geology, making possible the identification of mineralogical provinces, and producing compositional maps. Such maps will provide information on the relationship between global and local spectral characteristics.
The VIR excellent image capability will give important information on surface geology through the production of mineralogical maps, to be associated with the morphological information of the surface given by imaging generated both by VIR and by the DAWN camera.VIR will produce maps at different resolutions, depending on the height of the orbits, therefore global mineralogical characteristics of the surface will be complemented by local detailed information gathered on lower orbits.Maps of the surface mineralogy lead to the understanding of the surface evolution and determination of the processes affecting it.

[1] Russell, C. T. et al. (2007), Earth, Moon, and Planets, 101, Issue 1-2, pp. 65-91. [2] M. C. De Sanctis (2010), SSR, 10/2010, doi: 10.1007/s11214-010-9668-5.