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A fistful of howardite: Elemental Composition of Vesta

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Abstract

Following four and a half months in Low Altitude Mapping Orbit (LAMO), Dawn's Gamma ray and Neutron Detector (GRaND) has achieved its objectives at Vesta. We present global abundances, abundance ratios, detection limits, and maps for selected elements. Implications for Vesta's evolution and regolith processes are described.

Summary

The relationship between Vesta and the howardite, eucrite, and diogenite (HED) meteorites and implications for Vesta's thermal evolution is well-established.[e.g., 1-3] How does the composition of Vesta's regolith measured by Dawn compare to the meteorites? We use the data acquired by GRaND [4] to determine the distribution and proportions of diogenite and eucrite in Vesta's regolith. We also look for sub-lithologies, such as cumulate eucrite and harzburgitic diogenites,[5] which may be exposed in large impact basins, such as Rheasilvia and Veneneia. Are evolved, K-rich lithologies present on Vesta? [6] Is Vesta the source of the mesosiderites? [7] What is the distribution of H on Vesta and how was it delivered to Vesta's surface?

The chemical information provided by GRaND will help answer these questions. Elemental abundance data will be combined with other data sets, including maps of mineral abundances, albedo, shape, gravity, and topography. The compositional data acquired by Dawn will provide a better understanding of Vesta's thermal history and evolution, supplementing HED meteorite studies. GRaND's decimeter depth sensitivity and elemental specificity provides a new view of Vesta, complementing data acquired by Dawn's other instruments.

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