

CHARACTERIZATION AND MAPPING OF KIMBERLITES AND RELATED DIATREMES USING AVIRIS

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ABSTRACT

Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data are being used to study the occurrence and mineralogical characteristics of kimberlite diatremes at several sites in Utah and in the State-Line district of Colorado/Wyoming. The Utah kimberlites are well exposed and provide an excellent case history of mineralogical mapping of kimberlite mineralogy and abundant xenoliths of country rock. Two different mineral associations have been observed; 1) dolomite, minor calcite and illite, and an association of kaolinite and goethite at the Mule Ear and Cane Valley diatremes, and 2) serpentine matrix with dolomite xenoliths at the Moses Rock Dike site. The Moses Rock Dike appears to be spatially zoned. The State-Line kimberlites are deeply weathered, poorly exposed, and the AVIRIS data are dominated by green and dry vegetation, presenting a challenge to remote sensing technology. Identification of characteristic kimberlite minerals is difficult except where exposed by current mining, however, sub-pixel analysis methods have been successfully used to map the mineralogy of exposed mine areas, to locate similar areas, and to map the distribution of potential new exploration targets. Minerals identified in the State-Line district using the AVIRIS data include dolomite, calcite, phlogopite, and kaolinite. This work is in progress, with the goal of determining methods for characterizing subtle mineralogic changes associated with kimberlites and developing exploration models valid for a variety of geologic terrains.