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Exploration applications of laboratory, field, and airborne imaging spectrometer data collected from the Orange Hill copper porphyry deposit, east-central Alaska, USA

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Using imaging spectrometers at multiple scales, hyperspectral data have been collected and interpreted for assistance in identifying large-tonnage, base metal-rich deposits in remote regions of Alaska. Passive optical remote sensing of high latitude regions faces many challenges, including a short acquisition season and poor illumination. Additional complications are encountered in the identification of surface minerals useful for resource characterization because minerals of interest commonly are exposed on steep terrain, further challenging detection of mineral signatures. Laboratory-based imaging spectrometer (Corescan* Pty Ltd, Australia) measurements of hand samples and field-based HySpex imaging spectrometer (HyLab, University of Alaska Fairbanks) scans of outcrop have been analyzed to support and improve interpretations of remotely sensed data collected with the HyMap2 airborne imaging spectrometer (HyVista, Sydney, Australia).

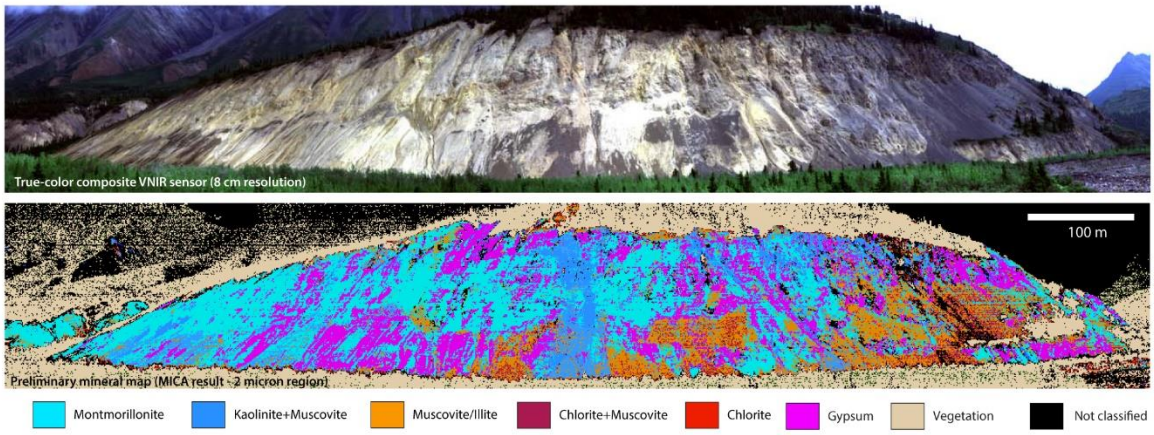

Figure 1: Mineral map from HySpex for the western-most exposure of the Orange Hill Deposit.

Altered rock associated with porphyry Cu-Mo-Au mineralization at Orange Hill in the eastern Alaska Range mapped with HyMap2 data is dominated by kilometer-scale zones of predominantly muscovite (sericite/white mica). Conspicuous clay-bearing zones (montmorillonite or kaolinite) were also mapped throughout the area. Finer-scale mapping of minerals derived from Hyspex data identifies a similar suite of minerals with more extensive gypsum and chlorite abundances (figure 1). These imaging results are generally consistent with existing geologic information determined during past regional mapping. Initial analysis of the Corescan imagery identifies the same minerals distributed within multiple hand samples

collected across the zone of altered rock. Refinements in the mineral identification algorithm are being carried out in conjunction with x-ray diffraction data collected from rock and soil samples. Analyses of spectral data with geochemistry of hand samples better constrains the host rock mineralogy and the alteration mineral assemblages. The interpretation of hyperspectral data at widely different scales should aid in the identification of the central versus more distal parts of the Alaska Range porphyry systems.

[*] *Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.*