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**Characterization of the Lead-Zinc mineralization of Aggeneys, South Africa, by VNIR-SWIR and TIR hyperspectral airborne data**

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Remote sensing technology based on the VNIR-SWIR wavelength range is a well-known method to support exploration and mining activities to map hydrous silicates, carbonates or sulfates. Modern and operational hyperspectral imaging systems in the longer infrared wavelength range are capable to identify and map anhydrous silicates, which enormously increases the range of detectable minerals by remote sensing. This study investigates the synergetic use of VNIR-SWIR and TIR hyperspectral airborne data to characterize the mineralization zone and geological setting to map the comprehensive spatial distribution of mineralogy at Aggeneys lead-zinc mineralization. The geology at Aggeneys, Northern Cape South Africa consists of metasediments and metavolcanites with massive sulfite mineralization (lead, zinc and copper), surrounded by 2 to 1 Ga old gneiss rocks (Stalder & Rozendaal 2005).

Hyperspectral data have been acquired during a flight campaign in July/August 2015. The spectra cover a wavelength range from the visible light, near infrared to shortwave infrared (VNIR-SWIR) 0.4 – 2.5  $\mu\text{m}$  as well as the longwave infrared (LWIR or thermal Infrared – TIR) from 7 to 11.6  $\mu\text{m}$ , together with a Lidar based DEM. Data preprocessing included radiometric, geometric and atmospheric correction. In addition, temperature emissivity separation was applied on the TIR based on the emissivity normalization method.

The mineral mapping is based on a multi feature extraction approach using a gauss approximation and spectral libraries of reference spectra to define the mineral diagnostic spectral features. The VNIR-SWIR and TIR wavelengths were analyzed separately. The individual results were used for cross validation and a combined wavelength range analysis was applied to minimize ambiguities. This study presents the mineral distributions at Aggeneys and demonstrates the improvement by a combined VNIR-SWIR and TIR analyses. It thematically discusses the identified mineral phases and describes their spatial distribution in context of the mineralization at the locations Swartberg and Gamsberg.

STALDER M. & ROZENDAAL A. 2005. Distribution and geochemical characteristics of barite and barium-rich rocks associated with the broken hill-type Gamsberg Zn-Pb deposit, Namaqua Province, South Africa. *South African Journal of Geology* **108**, 35-50.

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