

ALTERATION MINERAL DETECTION VIA ETM+ AND HYPERION DATA: BAU GOLDFIELD, SARAWAK, MALAYSIA

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Abstract: The area under investigation is the Bau gold mining district in the State of Sarawak, East Malaysia, on the island of Borneo. It has tropical climate with limited bedrock exposures. Bau is a gold field similar to Carlin style gold deposits. Geological analyses coupled with remote sensing data were used to detect hydrothermally altered rocks associated with gold mineralization. The Landsat Enhanced Thematic Mapper⁺ (ETM⁺) and Hyperion data were used to carry out mineral mapping of mineralized zones in the study area and surrounding terrain. Directed Principal Components Analysis (DPCA) transformation of four appropriate ETM+ band ratios were applied to produce DPC images, allowing the removal of the effects of vegetation from ETM+ data and the detection of separate mineral images at a regional scale. DPC3 image revealed the lithology of the background and detected clay-rich zones. DPC4 image identified moderate iron oxide soils and iron-oxide-rich rocks or gossan. Linear Spectral Unmixing (LSU) was used to produce image maps of hydroxyl-bearing minerals using Hyperion data at a district scale. Results derived from the visible and near infrared and shortwave infrared bands of Hyperion represented iron oxide/hydroxide and clay minerals rich zones associated with the known gold prospects in the Bau district. Field reconnaissance and laboratory studies, including accurate GPS surveying, XRD analysis and spectral reflectance measurements of collected rock samples verified the optical remote sensing results. Many of the mapped iron-rich (gossan) and clay mineral zones coincide spatially with the known prospects and mines, and few of them coincide with probable non-vegetated ground. The results show that the known gold prospects and potentially interesting areas are recognizable by the methods used, despite limited bedrock exposure in this region and the constraints imposed by the tropical environment. The approach used in this study can be more broadly applicable to provide an opportunity for detecting potentially interesting areas of hydrothermal gold mineralization using the ETM⁺ and Hyperion data in the tropical/sub-tropical regions.

Key words: ETM⁺; Hyperion; Bau gold mining district; Mineral Detection, Tropical climate.