

Mapping Hydrothermal Alteration for Gold Prospecting in British Columbia, Canada: Integrating Multispectral Remote Sensing and Geophysical Data

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Advanced remote sensing techniques and geophysical data were integrated to identify prioritized targets and their associated hydrothermal alteration zones as potential indicators of gold and copper mineralized rocks. The study area is located in northern British Columbia, Canada, near the border of the Stikine and Peace River Regional Districts. This region lies within British Columbia's Toodoggone district, part of the "Golden Horseshoe" area in the world-renowned Golden Triangle of the Omineca/Liard mining division.

The Feature-Oriented Principal Component Selection (Crosta technique) was applied to Landsat 8 multispectral data. A critical alteration zone was identified where intensely argillized rocks are heavily iron-stained. This zone was used to train machine learning algorithms to detect other regions with similar multispectral signatures. Four specific pixels were selected for training to ensure the models remained focused on these spectral characteristics. This approach successfully identified 47 points across 16 potential alteration zones rich in clays and iron oxides.

The original airborne magnetic survey data, acquired by Precision GeoSurveys Inc., were reprocessed using modern techniques to enhance interpretative value. Using Oasis Geosoft software, the reprocessing refined the magnetic data, with the 2nd Vertical Derivative Map highlighting shallow magnetic features. Gradient and inclination maps, along with their derivatives, confirmed contacts and defined major magnetic domains based on their "worm" patterns. Key interpretations include:

A prominent fault with an NNW-SSE strike along the western ridge.

A mylonitic zone in the hanging wall of the Kutcho Fault.

Low-magnetic sedimentary rocks and moderate- to high-magnetic marine volcanics, interpreted as interbedded units of the Hazelton Group.

These structural and lithological patterns, combined with alteration mapping, helped confirm prospective geological domains and mineralization targets.