AIRBORNE EM AND GROUND RESISTIVITY METHODS IN PLACER GOLD MINING

Isaac Fage, GroundTruth Exploration Inc.; Shawn Ryan; Amir Radjaee, GroundTruth Exploration Inc.

Application of geophysical methods in mineral exploration is common practice. Compared to direct sampling methods (i.e. drilling, trenching), subsurface data can be acquired with much wider coverage at a lower cost by geophysical investigations. However, to date for placer deposits, such techniques have been predominantly limited to localized surveys using ground based geophysical methods. The main purpose of geophysical studies in placer deposits is to identify bedrock depth and topography, alluvial sedimentation stratigraphy and outline of permafrost. The use of airborne systems is unusual in placer gold exploration. Regardless of the vast scale of the airborne geophysical surveys, the cost saving potential of the technique is obstructed by difficulties in modeling efforts. As a new approach in study of placer gold mines, airborne frequency domain electromagnetic method (FDEM) using RESOLVE system along with ground resistivity were applied to map the topographic surface of the bedrock and sedimentary stratigraphy of placer deposits. The approach was tested for several exploration sites in Yukon, Canada. After QC/QA of data, the resistivity data were modeled using 2D and 3D inversion codes. The airborne FDEM data were inverted for 1D conductivity model with different smoothness constraints. The resistivity model inverted from ground resistivity data was also used for estimation of starting and reference conductivity models in inversion of airborne FDEM data. Despite the measurement resolution limitations, by using airborne FDEM in an early phase, we could identify zones where deep bedrock is likely to be, determine areas of locally anomalous in bedrock topography, estimate the spatial boundaries of bench, and approximate outline and depth of permafrost. The degree to which this approach is feasible is likely site dependent and directly influenced by the contrast between resistivity values. It seems this approach could be widely applicable for engineering and environmental projects where similar studied are required.