Correcting airborne gravity data for overburden thickness when exploring for targets under cover

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A challenge with the airborne gravity method used for mineral exploration occurs when the target mineral body is located under cover; sometimes gravity anomalies created by variations in the thickness of the overburden can be confused with anomalies of similar shapes and amplitudes that are created by mineral deposits. In an effort to correct for this, we propose a methodology that uses helicopter transient electromagnetics (HTEM) data to map the interface between the overburden and the bedrock. Most HTEM systems have been designed for deeper targets, here we will investigate the use of such systems in resolving the near subsurface (depth < 100 m) through a series of laterally interpolated 1D inversions. When the overburden thickness is known, its effect can be subtracted from the gravity data in an approach comparable to a Bouguer correction but where an additional layer is used to represent the overburden. To demonstrate our new approach, we have selected a study area where both HTEM and airborne gravity data were available, and where the glaciolacustrine overburden is varying in thickness. The study area is located within the Nechako Plateau of the Interior Plateau in British Colombia. Several mines operate in the area, including the Blackdome gold mine, the Gibraltar copper-molybdenum mine, and the Endako molybdenum mine. The plateau has a high mineral potential area but exploration efforts have been hampered by the overburden which covers 90-95% of the bedrock. The bedrock geology of the area is predominantly volcanic with some occurrences of igneous and sedimentary rocks. The overburden is glaciolacustrine in origin and is extensive. It covers 90-95% of the bedrock and is known to be highly variable in both thickness and composition. It is typically composed of a diamicton morain-deposited basal till underlying poorly sorted sandy or gravely glaciofluvial or glaciolacustrine sediment, with some occurrences of glaciolacustrine derived sand, silt, and clay. Topography within the plateau is complex and characterized by its glacial history; it is formed by eskers, melt water channels, drumlins, glaciofluvial deposits, alluvial fans, and glacial lakes. We selected a 72 km long line and inverted the HTEM data using an unconstrained 2-layer earth model, and found that the overburden is varying in thickness from 5 m to over 200 m. We will show a 4 km portion of this line where the overburden was modelled in 3 dimensions to apply a bedrock topography correction to the airborne gravity data.