Darijani M, Farquharson CG, Vallée MA, 2019, Calculating the terrain correction for gravity gradiometry data using 3D forward modelling and unstructured tetrahedral meshes, Abstract, PDAC-SMC, Toronto, ON

Gravity gradiometry method gives the gradients in the three orthogonal directions of the three components of the acceleration due to gravity. Gravity gradiometry data can be strongly affected by topography. To remove this effect leaving only the contributions from density variations in the subsurface, a terrain correction can be calculated and subtracted from the observed data. The terrain correction is typically computed using a Fourier-based technique. Such approaches can be efficient. Here, we investigate the use of 3D forward modelling that incorporates accurate topography as a means of more accurately computing the terrain correction. For this purpose, the components of the gravity gradiometry tensor are synthetized using forward modelling for a model of the Millennium area in the Athabasca Basin. A uniform density of 1 g/cc is used in the modelling, and the gravity gradient data computed for this density model at the same locations as the real data (HeliFALCON). The forward modelling is done using an unstructured tetrahedral mesh, the advantage of which is that it can honour the topography to as fine a resolution as the topography is known. The model uses a 10x10 m dense, refined topography of the study area. These synthetized gravity gradiometry data can be considered as the terrain effect. The synthetized data are compared with the terrain effect calculated using a Fourier-based technique by CGG also using a terrain density of 1 g/cc. The results show some differences (up to 8%) for the components. In order to apply the terrain correction, the terrain effects calculated for a density of 1 g/cc can be multiplied by a chosen appropriate density and then subtracted from the real data. In this research, the glacial sediments (overburden) of the Millennium area have a density of 2 g/cc. Thus, synthetized data are multiplied by 2. The resulting terrain effects are subtracted from the real data in order to obtain the terrain-corrected data. The results are compared with CGG's terrain-corrected data. The data corrected using the forward modelling approach have less of a remnant topography signature that the data corrected using the Fourier-based approach.

NSERC-CMIC Mineral Exploration Footprints Project Contribution 202.