Geophysical modelling of the Bathurst Mining Camp, New Brunswick, using airborne magnetic and ground gravity data

S Kupers, H Ugalde

Department of Earth Sciences, Brock University, St. Catharines, Ontario;

The Bathurst Mining Camp (Bathurst, New Brunswick) is host to over 46 volcanic massive sulphide deposits. Due to the lack of surface outcrops, geophysics has played a large role in constraining the geology of the camp. However, common physical property contrasts between lithologies of different ages do not allow for unique interpretations. The work presented here aims at filling the gap between geology and geophysics by combining geologically constrained modelling of geophysical data. We analyzed a block of approximately 20x20 km^2 in the north-west part of the camp, southeast of the Restigouche deposit. The data involved an airborne magnetic survey flown as part of the Extech III program by the Geological Survey of Canada (GSC) in 1999 with 200 metre line spacing, and a ground gravity survey compilation from data collected by the GSC and other sources. The data were processed and gridded with standard minimum curvature algorithms. From these, a number of data enhancement grids were produced to generate a first pass interpretation of the data. Using rock properties (density and magnetic susceptibility) compiled for the different lithologies present in the area, the geophysical signatures were correlated to lithological units on surface and buried. Subsequently, a number of cross-sections were modelled in 2.5D. The initial interpretation with buried and outcropping lithologies was used as a guideline; the compiled density and magnetic susceptibility values were utilized to constrain the extent and depth of the different modelled units. The resultant sections were integrated into a pseudo-3D model. The resulting model provides another view of the folding and faulting processes of Bathurst Supergroup lithologies, with felsic volcanic rocks overlying mafic volcanic rocks. Large peaks in the geophysical data suggest gabbroic intrusions that do not outcrop, or some more magnetic packages within the volcano-sedimentary sequences. This model can be used to better constrain surface and subsurface lithologies, as well as the geometry of thrust surfaces and contacts at depth. The extension of this work allows for a better understanding of the deformation processes in the Bathurst Mining Camp.