

Investigating the utility of airborne electromagnetic surveys for mapping local and regional hydrogeology in the Edmonton-Calgary corridor



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ABSTRACT

Airborne magnetic and electromagnetic (EM) data were collected between 2007 and 2010 as part of a large-scale mapping program designed to better characterize subsurface lithology in the Edmonton-Calgary corridor (ECC). In this region, it is hypothesized that the contrast in subsurface resistivity can be used to identify boundaries between the sandstone and mudstone portions of the Paskapoo formation manifesting as a transition from higher to lower resistivity. Given these contrasts, significant potential exists for improving the characterization of the regional hydrogeology, which is controlled by the distribution of the two lithologic units that comprise the Paskapoo formation. In order to fully exploit the resolution potential of the airborne dataset, we have selected a 10-km x 10-km subset as a test case for numerical inversion, which will be constrained by ground-based electrical resistivity and electromagnetic measurements conducted within the test area. The resulting 3D volume will be evaluated for its potential in further resolving the spatial distribution of the lithologies that control groundwater flow in this region.

A long (1650-m) resistivity profile and nanoTEM survey were completed in Fall 2016. The survey was centered along a transect that corresponds with a transition in the airborne data from lower to higher resistivity. Preliminary results suggest that the transition evident in the 2D slices of the airborne EM data are consistent with those collected with the ground-based geophysical methods. We will present our findings from ongoing analysis including the inversion of the ground based nanoTEM and airborne datasets, in an effort to quantify the resolution capacity of these methods and their ability to further refine our geologic and hydrogeologic models for this region.