PRACTICAL 3D INVERSION OF AEM DATA FOR ENVIRONMENTAL APPLICATIONS IN COMPLEX REGOLITH SETTINGS

Glenn Wilson, TechnoImaging
Timothy Munday, CSIRO
Andrew Fitzpatrick, CSIRO
Leif Cox, TechnoImaging
Michael Zhdanov, TechnoImaging

This paper presents the application of an innovative approach to 3D inversion of airborne electromagnetic (AEM) data which renders the routine inversion of entire surveys realistic from the computational perspective. The method uses a moving footprint, and is based on the 3D integral equation method for computing data and sensitivities, and the re-weighted regularized conjugate gradient method for minimizing the objective functional. Specifically, we examine results from several well constrained AEM surveys that target the geometry, distribution and water quality associated with palaeochannel aquifers which are developed in contrasting, variably complex regolith settings. The TEMPEST and SkyTEM surveys targeted anastomozing coarse sands and gravels beds in a sandy clay background. The surveys also targeted the abruptly changing and varying basement (due to changes in lithology and structure) which defines the base of the alluvial aquifer and/or the weathered regolith. Results from the 3D inversions are compared against drill hole geological and other geophysical data. The integrated interpretations are able to define the location and groundwater salinity within the palaeochannels. As a result of the surveys and drilling, local farm water and irrigation systems are being developed.