

## COMPARATIVE EVALUATION OF 1D, 2.5D AND 3D INVERSIONS FOR RESOLVING TECTONIC ELEMENTS IN FLOODPLAINS AND NEAR-SURFACE INVERTED SEDIMENTARY BASINS

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This study reports the results of a comparative evaluation of 1D, 2.5D and 3D AEM inversions for resolving hydrostratigraphy and structural elements in two contrasting settings: unconsolidated Quaternary floodplain sediments affected by Neogene deformation; and a tectonically inverted Palaeozoic sedimentary basin.

Previous studies have demonstrated the importance of airborne electromagnetic (AEM) data optimization to ensure that key elements of the hydrogeological system, including geological faults, are appropriately represented in inversion models. In the inverted sedimentary basin study, 1D inversions of AEM data indicated greater structural complexity than previously known. Initially, a suite of equivalent 1D inversion models produced very similar inversion model results. However, 2.5D inversions produced a disparity in solutions in key locations. To resolve these differences, 3D AEM inversion methods have been trialled. In the second study (floodplain setting), 3D inversions have helped resolve the geometry of hydrostratigraphic units and tectonic elements (folds and faults). In both study areas, independent validation of inversion results has involved an inter-disciplinary approach incorporating a range of borehole and ground geophysics techniques (e.g. passive seismic and Ground Magnetic Resonance (GMR)), tectonic mapping and analysis, hydrochemistry and drilling.

In summary, comparative evaluation of 1D, 2.5D, and 3D AEM inversions in two contrasting settings demonstrates the importance of optimizing inversion procedures, taking into consideration all available geological, hydrogeological and tectonic data. The benefits of using 2.5D and/or 3D inversion procedures are particularly evident in areas of structural complexity. Confidence in 3D inversions is maximised when all elements of the system response are modelled appropriately.