EXPLORING INVERSION SOLUTION SPACE: A CASE STUDY OVER A Cu-Ag DEPOSIT IN THE KALAHARI COPPER BELT

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Interpretation of geophysical data remains an extremely challenging task in spite of improvements in instrumentation, acquisition, inversion and visualization. The root cause of this difficulty is well known: different earth manifestations can give rise to the same geophysical response. Given this root cause it is inescapable that any workflow based solely on inverting geophysical data to produce a single earth model is incomplete at best, and at worst, misleading. To reduce this incompleteness we recommend extending the usual process of inversion yielding a single model to include an exploration of the solution space of models all of which give rise to the same geophysical observations. As an illustration we present an inversion case study revolving around a 3D DCIP data set obtained over the recently discovered T3 Dome Cu-Ag deposit in the Kalahari Copper Belt (KCB) in Botswana. We explore the inversion solution space using a suite of models produced by introducing various constraints. In our study standard unconstrained inversion yields a deep smooth chargeability model however drilling results appear to suggest a different chargeability distribution. The exploration question becomes: how robust is the deep chargeable target, is it indicative of new sulfides or is it a manifestation of model equivalence? We demonstrate how to attack such problems which leads us to suggest that by default all geophysical inversion algorithms should produce several equivalent models to help move the exploration community beyond the idea that a single inversion result is "the model".