Development of an automated analysis of TDEM data for the delineation of a finite conductor in a conductive half space.

by

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Abstract

The objective of this work is to find an efficient, preferably automated, algorithm or interpretational procedure that can be applied in real time to localise conductors buried in a host rock, with special attention given to a conductor in a conductive environment. The Time Domain Electromagnetic (TDEM) method is considered and more specifically the central loop configuration which can be found in both ground an airborne acquisition systems. The traditional interpretation approach of decay curve analysis is automated and combined with an adapted S-layer differential transform (Sidorov and Tiskshaev, 1969) to produce conductivity-depth sections with superimposed decay behaviour at every station. The adaptations made to the S-layer differential transform include:

- a noise filter to improve performance on field data
- the S-layer differential transform compatibility (SLTC) filter which only allows data conforming to the basic mathematical assumptions made in the transform to be processed (This "compatible" behaviour is derived through a number of synthetic model studies.)
- a depth correction based on the implications of approximating an infinite number of currents with a single filament.

A remaining concern when implementing the S-layer transform is found in two consecutive numerical differentiations and various approaches are analysed to ensure stable differentiation procedures. The automated algorithm is applied to a variety of synthetic models to validate its accuracy and finally examples are shown of its application to both ground and airborne data sets.

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