AN OPEN-ACCESS PYTHON INTERFACE FOR INVERSION, SENSITIVITY AND EQUIVALENCE ANALYSIS OF TDEM DATA

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Many software for 1D (and sometimes laterally constrained) inversion of Time Domain ElectroMagnetic (TDEM) data already exist. However, most of them lack of sensitivity and equivalence analysis which are generally implemented in non-user-friendly programs that can be used by experts of TDEM only.

With the newly developed Python based interface, calling Fortran based codes and gathering different algorithms presented in the literature, we propose an easy access code which allows geophysicists to make: (1) forward modeling with configurable segmented Tx loop, acquisition altitude, emission waveform, and cut-off frequency for the reception (Butterworth filter), above a layered ground with electrical resistivity, magnetic viscosity, and complex conductivity for polarization (Cole-Cole model); (2) depth of investigation estimation; (3) inversion of single sounding or successive soundings selected on a map (for now only TEMFAST data format handled); and (4) equivalence analysis using a neighborhood algorithm.

Those possibilities allows the use of the program for: preliminary sensitivity analysis prior to a survey for either ground-based or airborne acquisition setup; geometry and acquisition settings design to focus the sensitivity on the target of interest; theoretical analysis of the almost entire equivalence space to evaluate the degree of incertitude on the different ground parameters; the analysis of the combined effects of most of the electromagnetic properties, which become stronger when considering metric TDEM devices; and more generally inversion of single sounding or data sets constituted of tens of soundings.

This Python interface is intended to evolve for handling as many configurations as possible for both qualitative and quantitative analysis of TDEM capacities for any custom acquisition setup.