EIKON TECHNOLOGIES

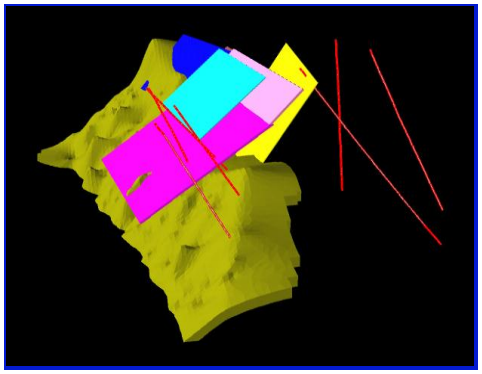
EMIGMA V11.x

EMIGMA for TDEM

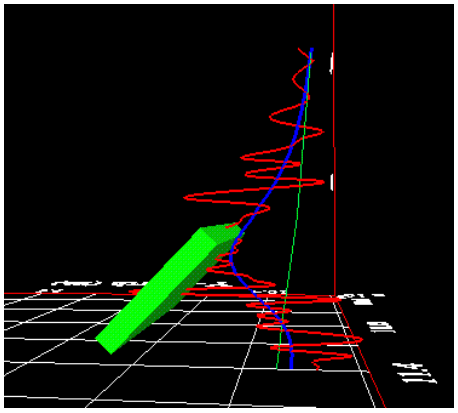
November 2025

The TDEM package allows for Ground, Airborne and Borehole TEM. This license may be purchased as a standalone license or aquired as part of EMIGMA Premium Complete. A license for only ground surveys is also available. There is also an add-on for marine surveys including seabottom surveys.

The EMIGMA for TDEM license is a comprehensive license that offers all the standard features for interpretaton but also a wide array of non-conventional and powerful features to better understand the data through its various display, modeling and inversion tools.



For ground and borehole applications, we offer both fixed and moving loop configurations as well as time domain surveys which are using grounded sources and measuring magnetic fields. Borehole applications are based on a fixed transmitter (inductive or grounded) with measurements down the borehole (with a probe). EMIGMA allows for both single- and multi-component receivers with either induction coils or magnetometers. For moving arrarys, multiple TX-RX separations are allowed. Typical field conventions are used for data components and modeling.



The grounded sources may be grounded on surface, grounded in the borehole or a moving current source in the borehole. EMIGMA is an excellent tool for survey design as well as for interpretation. The user may utilize single loops, profiles or boreholes or integrate multiple loops, profiles or boreholes for design purposes. 3D visualization allows one to view the locations of boreholes in 3-space. ProfileModifier allows for survey design and presentation maps with easy export to a number of formats.

DATA IMPORT

The import procedures do not just import the data but set up survey configurations combined with the location and orientation of receivers ready for interpretation or modeling and inversion.

- Calibrated imports from the manufacturer's formats including Zonge, Geonics Protem and EM61/63, TerraTEM, Phoenix, UTEM, CRONE, SIROTEM, and TEM-FAST.
- Airborne imports include VTEM, SkyTEM, Xcite, Genesis, TEMPEST. Imports are still maintained for archived data from AeroTEM, HeliGEOTEM, MEGATEM /GEOTEM systems
- Generic AMIRA format for equipment such as the SMARTEM, SAMSON, DigiAtlantis and Loupe.

DATA PROCESSING AND CORRECTION

- 1D digital and spatial filters
- Simple and weighted averaging decimation
- Outlier Removal, spatial sorting, vector rotation
- Coordinate transformations, Survey Extraction
- Tools for data editing and correction

DATA DISPLAY AND ANALYSES

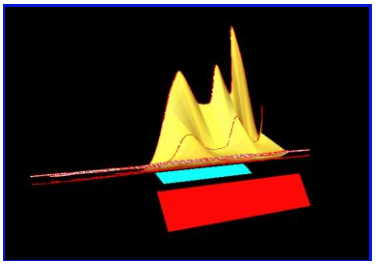
Our plotting tool allows the user to analyze and view their data quickly via unique mechanisms in the plotting app. The software also allowsquick, accurate comparisons of model data and inversion data to the measured data.

- Quick toggles between time channels, profiles, transmitters and TX-RX separations
- Decay plots, decay rate calculations
- 2D representations of geoelectric sections
- Gridding algorithms: Natural Neighbor, Delaunay Triangulation, Minimum Curvature and Thin-Plate-Splines
- Rectangular grid cells which maintain inline data resolution while minimizing crossline artifacts
- Unique Multi-component, multi-window, multi-frequency grids
- Contours: 2D and 3D surfaces
- Time decay contours and other data transforms
- Profile, decay and TX-RX separation plots

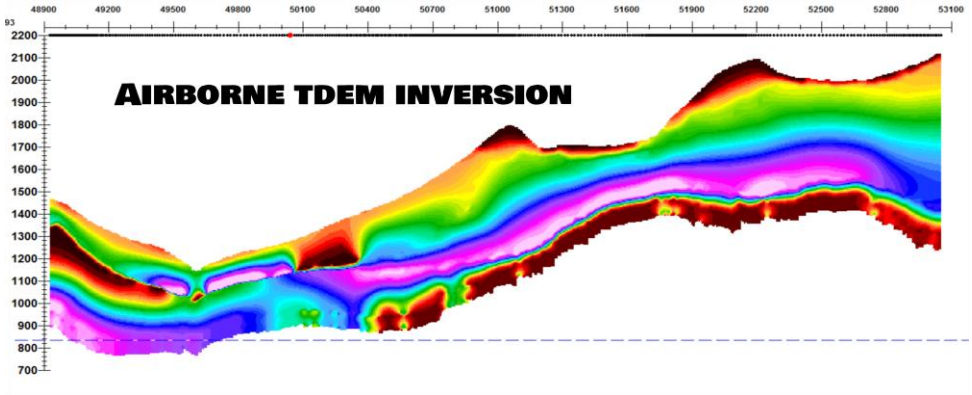
3D MODELING

EMIGMA has an unparalleled ability to model TDEM by offering 5 different algorithms.

- Advanced free space thin-sheet with conductive background
- Thin sheet with background interactions including IP effects
- Current channeling with IP and magnetic effects for prisms and general 3Dpoly
- Inductive extension to current channeling
- Sphere model allowing extreme modeling with most exact solutions available



- Fast and accurate 3D simulations: model suite generation and batch mode
- Unlimited prism, thin-sheet plate and polyhedra targets
  e.g. pipes (hollow cylinders with or without lids), ellipsoids, shells, bullets, landmines, drums, spheres, general polyhedra...
- Multiple body interactions
- Variations in resistivity, susceptibility and Cole-Cole parameters
- Modeling of topography effects – Synthetic Topography and Poly Generator
- Accurate handling of topography and 3D structures within layered-earth models
- Modeling of all of the magnetic effects in EM data both in inductive, galvanic and magnetostatic responses
- Ability to handle full contrast between host and bodies
- 1D and 3D modeling of airborne and borehole surveys
- Interactive 3D model building tool
- CAD model imports and exports

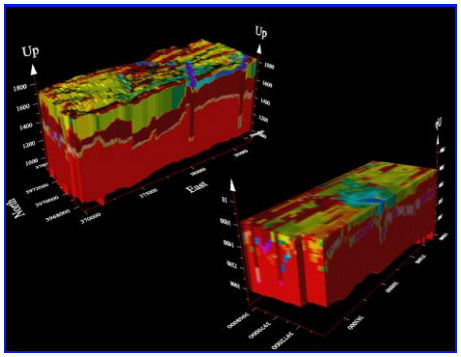


1D INVERSION

- In-Loop or Out-of-Loop inversions for both moving and fixed transmitter survey configurations
- Multi-component inversions allowing joint inversion of
  - In-loop and out-of-loop data
  - Multi-station inversion
  - Multi-component inversion- *e.g. joint Hx, Hz inversion*

1D INVERSION (cont'd)

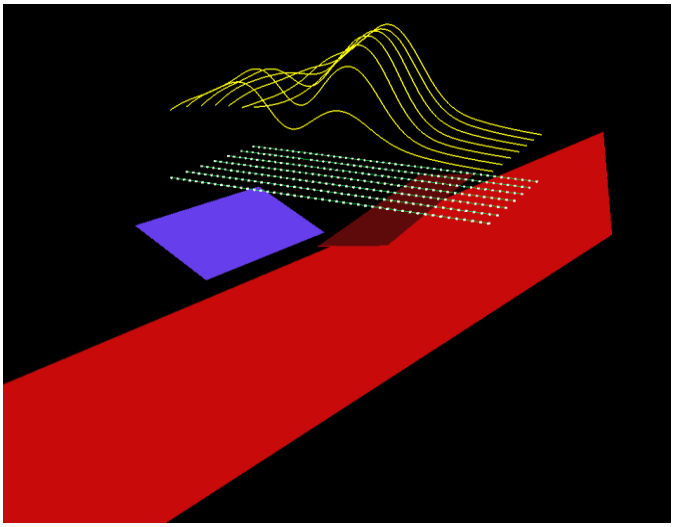
- Multi-separation inversions for moving loop surveys
- User controlled use of time channels
- User control of inversion constraints
- User-specified starting models
- System calibrated inversions with defined system responses including instrument bandwidths
- Smooth Occam technique allowing inversion for multi-layers of uniform thickness with resistivity constraints
- Sharp Trust Region inversion allowing multi-layers with complete thickness and resistivity constraints
- Multi-station inversions for laterally constrained results
- Multi-component options to reduce model ambiguity
- Multiple Survey inversions



3D PLATE INVERSION

EMIGMA offers tools for a constrained inversion of TDEM data to thin-sheet models.

- Inductive response but allowing for a background response
- For ground, airborne and borehole TDEM and FDEM



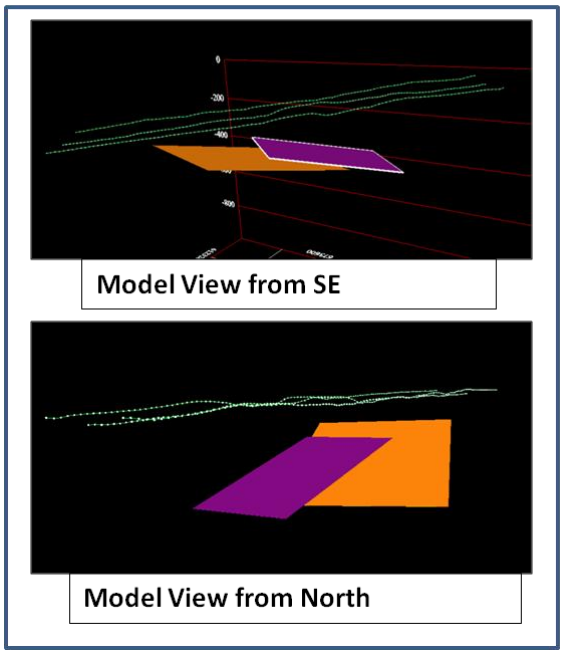
- Fixed loop and moving systems including Slingram data with multiple offsets
- Multi-component inversions
- Multi-loop inversions
- For use with or without a significant background response
- Time window controls for each data component
- Ability to select portions of survey

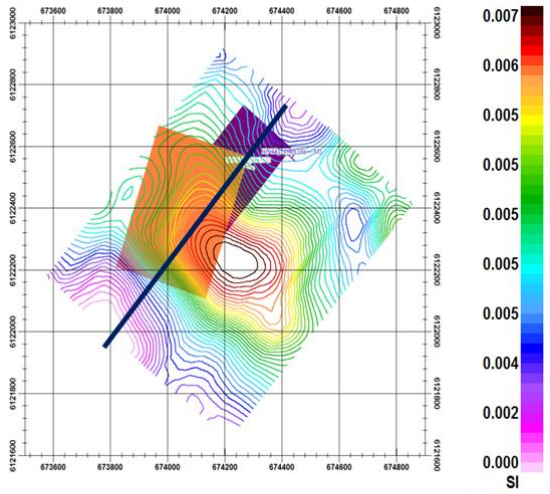
DATA EXPORT

- 3D model export to CAD, DXF, 3D .pdf
- ID inversion Plan and Crosssection export to ASCII file to allow for the geoelectric sections to be utilized in other plotting or printing applications
- 1D Volume exports for CAD and visualization applictions
- Model export to 3D CAD (dxf)
- Model data and processed data exports
- Gridded data exports to georeferenced formats and 2D georeferenced .pdf
- Ability to export maps and underlays to georeferenced raster and vector formats including AutoCAD and KML/KMZ formats
- Export to other EMIGMA database for freeviewer or licensed users

Quality Control, Processing, Mapping

- License includes QCTool for QC/QA
- Allows complete data processing from raw files
- Mapping and integration of maps in both EMIGMA and QCTool
- Full range of filters including





Model Project with TMI underlay