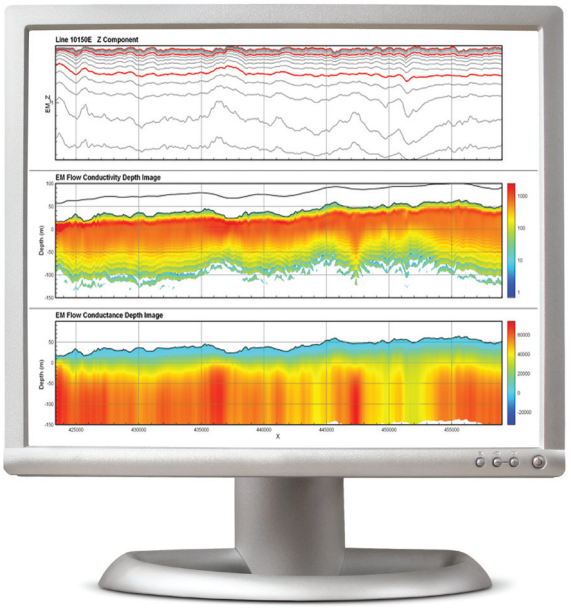
Pitney Bowes
Business Insight

encom emflow

Display & Analysis

EM Flow 3.3 offers display, analysis and interpretation of single or multi component airborne time and frequency EM data. The software is designed to operate on large EM datasets and provide conductivity depth sections plus anomaly identification and analysis tools. The program operation is usually tailored by processing one or two lines and then applying the parameters to the remainder of the survey or specified lines.



Fast Airborne Data Processing

EM Flow provides accurate and fast processing of EM data. Highly optimised routines developed by CRC-AMET researchers have revolutionised the speed at which airborne EM data can be processed to produce a conductivity image of the subsurface.

Integrate with Profile Analyst

Use Encom Profile Analyst to integrate EM Flow results with other data such as magnetic, terrain, spectrometer, remote sensing and drillholes in 1D, 2D and 3D views.

Airborne EM

In recent years the exploration industry has witnessed an unprecedented increase in the application of both time and frequency domain EM techniques for geological mapping, orebody search, salinity and environmental applications.

A typical EM survey will produce 500 line kilometres per day averaging 400,000 transient records usually sampled in 20 to 256 channels. Some 50 million data values can be acquired per day. Manual interpretation of this data volume is slow and previous quantitative inversion techniques using conventional layered earth approximations could take many multiples of the flying time to be processed.

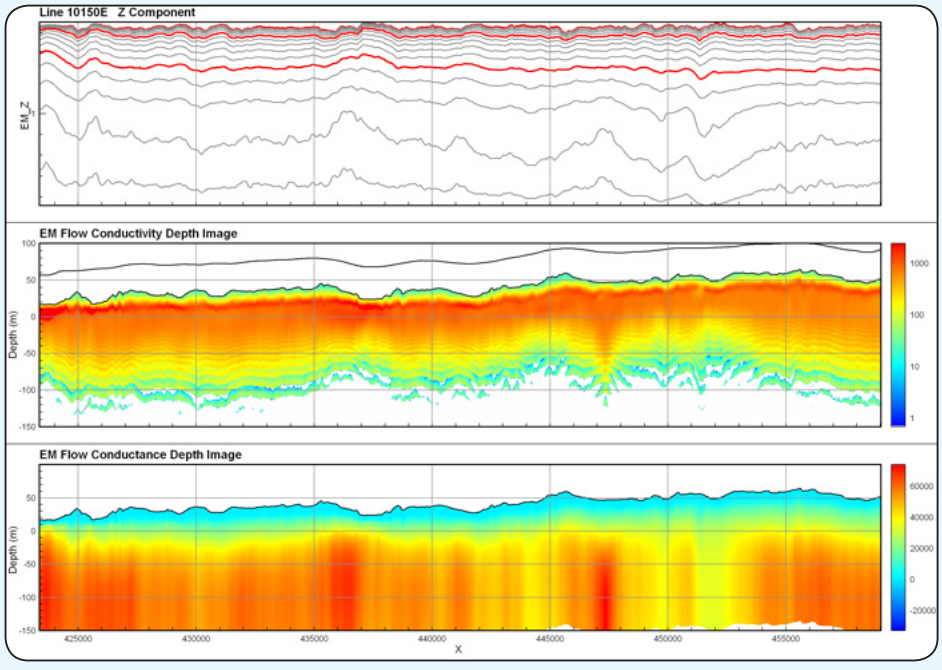
In contrast, EM Flow can process and produce interpretation products from a day's survey data in a fraction of the survey time.

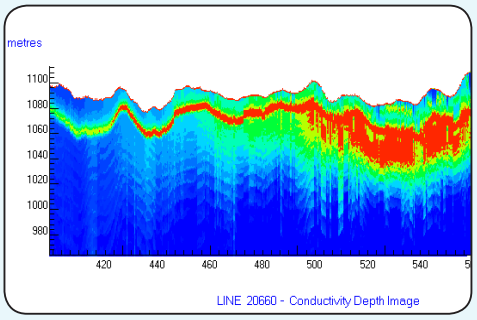
Rapid Depth Sections

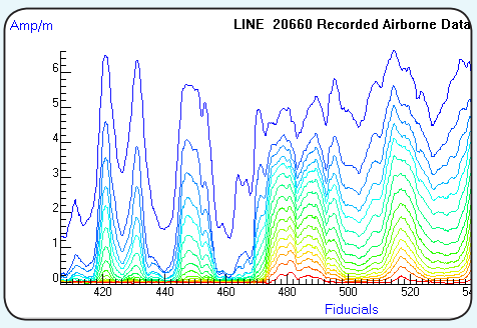
EM Flow uses newly developed EM theory and sophisticated mathematics developed by CRC-AMET. Theoretically defined EM system waveforms or measured waveforms are used to deconvolve the EM multi-component, multi-channel line data. You have full control over the processing and production of conductivity depth images (CDI).

EM System Definition

An interactive editor is provided to allow the EM system, its geometry and the input data to be specified. The initial processing phase of EM Flow requires specification of the EM system geometry, transmitted waveform and data format with different measurement units being allowed. An interactive formatter simplifies input file definition so that waveform specifications from external programs, such as Microsoft Excel, can be easily imported.







EM System Specification

Once the EM system transmitter waveform and recording channels are specified, the waveform is transformed through a complex matrix inversion to a series of basis functions which equate to time constant (Tau domain) equivalents. The waveform is converted into a set of basis functions that can be tuned by the user. This allows for the use of many different waveforms containing different spectral characteristics. An advantage of this approach is that either time or frequency domain EM data can be processed since either type of transmitted signal can be expressed in the Tau domain. The Tau domain data enables rapid inversion and modelling to be undertaken.

Deconvolution

Conversion of observed EM data to the time constant (Tau) domain is achieved by deconvolving the line data with the pre-computed basis functions. The deconvolution is represented graphically so real-time monitoring of the process can be displayed.

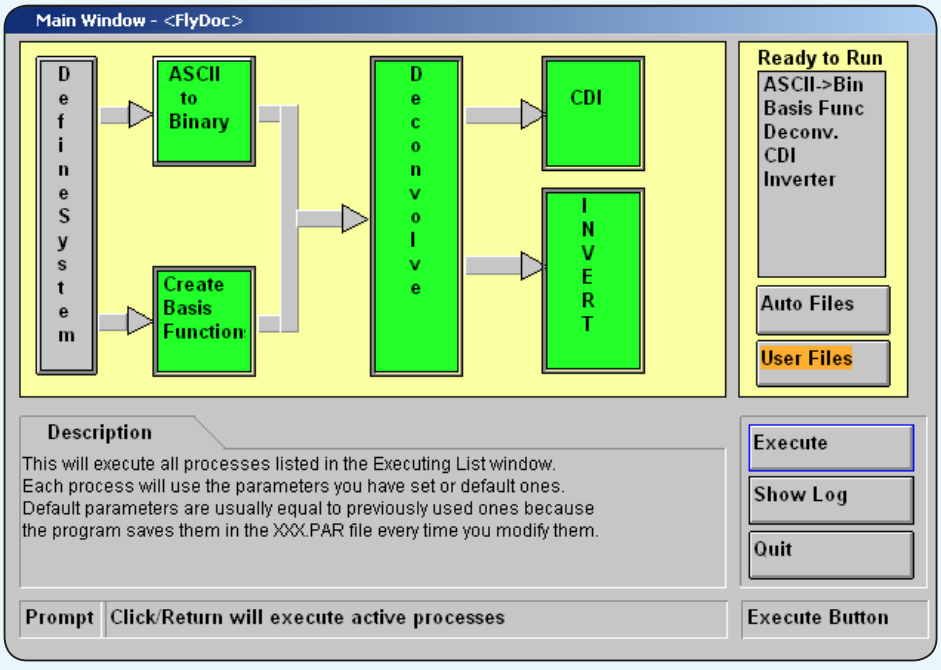
Available choices include fitting algorithms, error tolerances, weighting, normalisation and primary field data inclusion. Noise estimates, multiple components and system specifications are presented for all processed data. Individual record analysis can be undertaken if desired. Display controls can be manipulated to optimise the estimation of noise levels and so provide checks of processing quality.

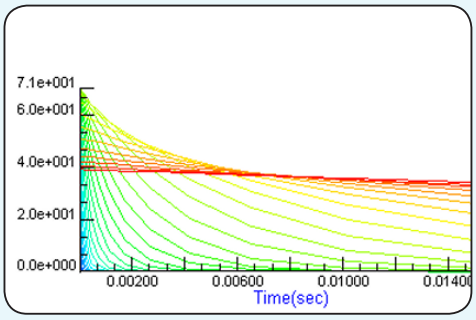
Data Import

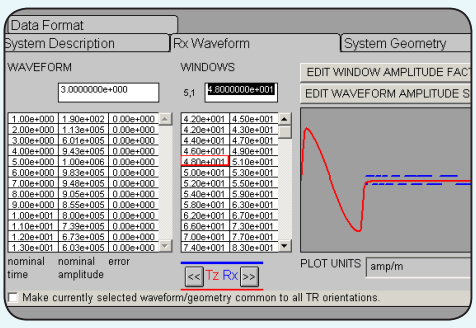
An interactive import utility provides a generic interface for most EM multi-column ASCII file types, including Geosoft. Additional utilities to define the EM system waveform, recorded time windows and transmitter-receiver geometry are also included.

Conductivity-Depth Sections

CDI section processing can be customised using component weighting, selected taus, selected depth ranges and resolutions and by use of discrete conductivities. The result of the CDI processing can be displayed in EM Flow or output to external ASCII files suitable for display in software packages such as Geosoft Oasis montaj™ or ER Mapper. Conductivity depth sections can be presented in coloured log or linear formats. Topography can be taken into account for depth solutions and will form the upper surface of the displays if specified.







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Interpretation Facilities

Individual anomalies based on specific EM response criteria can be identified by an automated Anomaly Picker. Anomaly shape criteria such as peaks, troughs and gradients are used for the anomaly selection and these are indicated by various symbols in conjunction with their location and EM response. Decays for individual anomalies can be displayed to assist in determining conductor characteristics. Anomaly statistics and output to ASCII files detailing the location and nature of the anomalies is available.

Individual anomalies can also be selected and passed with their associated EM data to an interactive modelling tool. A variety of model types is available for analysis using both forward or inverse modelling. Body types available include plate, prism and filament style conductors. Multiple bodies with full EM coupling are accommodated since modelling is undertaken in the Tau domain. Constraints can be applied during inversion to limit the variability of models.

Enhanced Display

The conductivity and depth output of EM Flow can be imported directly into Profile Analyst for enhanced CDI display and 3D voxel gridding. The voxel models can be integrated with other data, models and drillholes.

Reference

Stoltz E.M.G. and Macnae J.C. 1998 Evaluating EM Waveforms by Singular Value Decomposition of Exponential Functions Geophysics 63 pp 64-74

Acknowledgments

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Encom is pleased to be associated with CSIRO and AMIRA.

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