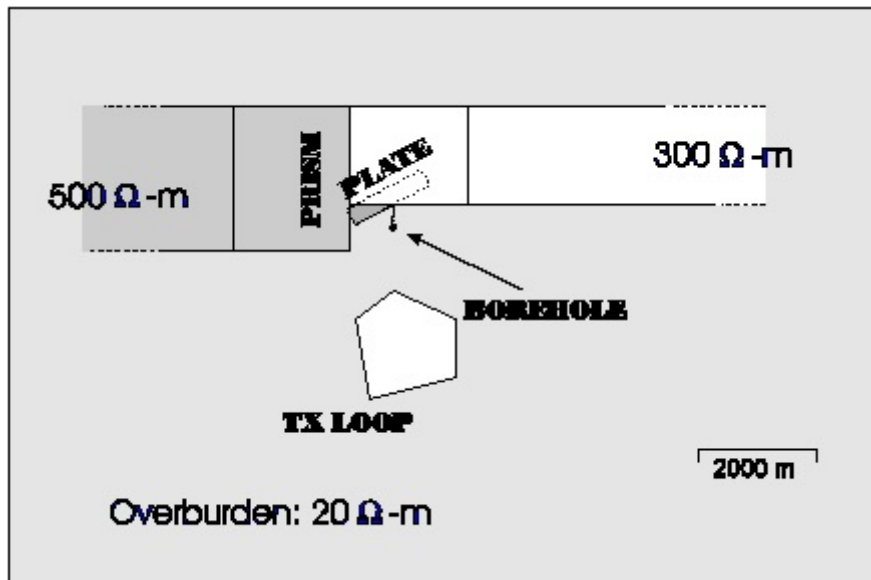# ❋❋❋❋❋❋❋❋ EMIGMA VERSION 3 ❋❋❋❋❋❋❋❋

EMIGMA V3, version three of PetRos EiKon's EMIGMA electromagentic simulation platform has been released, providing the geophysicist a powerful new modelling tool.

EMIGMA V3, *PetRos EiKon*'s comprehensive electromagnetic similation platfrom, was released on schedule to project supporters on July 1, 1995 after one year of development. This release includes the capability to model massive and tabular structures in a layered earth using two separate simulation algorithms. One algorithm, the LN or Localized Non-linear approximation executes orders of magnitude faster than other available modelling algorithms, and is particularly useful for modelling current channelling effects. The other, VHPLATE, is particularly useful when robust solutions containing both galvanic and inductive components of scattering are required.

The response from a large number of different electromagnetic prospecting systems can be simulated, either directly in the frequency domain, in the time domain with *PetRos EiKon*'s companion time domain transform, **FSEMTRS** (Version 2 was released simultaneously with Version 3 of Emigma). The systems which can be simulated in Version 3 include those with either extended loops or bipoles and electric or magnetic dipoles as transmitting antennae. **EMIGMA V3** simulates the received response of either magnetic or electric dipoles, with full extended receiver support now being tested in Version 4 and scheduled for release in September, 1995.

The figure below is intended to provide a flavour for the complexity of models for which **EMIGMA V3** is capable. The synthetic data are displayed on the last page of this news letter.


```
Overburden Thickness:   3m
Plate Conductance:    100S
Plate Strike Extent: 1400m
Plate Dip Extent:     400m
Plate DipAngle:        45°
Plate Strike Angle:   120°
Borehole Length:      565m
Plate Dip Angle:       45°
Plate Strike Angle:   120°
Borehole Dip  Angle:   45°
BoreholeStrike Angle:   0°
Normalization:  Free-Space
```

x-axis up the page
y-axis to left

EMIGMAV3 FEATURES:

LAYERED EARTH BACKGROUND: The background can be specified with a layered earth model, with each layer having it own conductivity, permeability, permittivity and Cole-Cole impedance parameters

MULTIPLE PRISMS: Structures can be built up of one or more prisms, with scattering simulated by the LN approximation. Each prism can have its own conductivity, permittivity and Cole-Cole parameters.

ROBUST SCATTERING FROM A PLATE: A scattering from a tabular structure can be simulated with a thin plate model which accounts for both inductive and current channelling effects. Cole-Cole IP parameters may also be specified for the plate.

COLE-COLE IMPEDANCE MODEL: All structures in the model can be assigned individual Cole-Cole impedances.

MULTI-SIDED POLYGONAL LOOPS: Loop and bipole sources can be multi-sided polygons, providing the capability to simulate realistic field conditions.

MULTI-COMPONENT RECEIVERS: Multi-component surveys, such as three component borehole surveys, can be simulated in a single run.

FLEXIBLE COORDINATE SYSTEMS: A selection of coordinate systems is available to that field are automatically resolved into the components needed to simulate most geophysical prospecting systems.

FLEXIBLE NORMALIZATION: Calculated responses can be either absolute fields, or normalized to the geometry of your choice and output as ratios, percent, or parts per million.

OPTIONAL MAGNETOTELLURIC MODELLING: A magneto-telluric option is available, allowing energization by plane wave fields at arbitrary strike angles. Six component magneto-telluric station responses are generated.

COMPREHENSIVE MANUAL: EMIGMA V3 is distributed with a comprehensive 150 page manual. The manual not only covers aspects of program operation, but discusses when the scattering theory used in the calculations is appropriate to your situation and how to select the model parameters to simulate the system you are interested in.

FSEMTRS V2 FEATURES

SPECTRAL MODE

The addition of a (S)pectral mode which combines both logarithmic and linear frequency sampling can reduce calculation time in **EMIGMAV3** by up to an order of magnitude with virtually no reduction in accuracy even at very early times.

PREVIEWS:

EMIGMA V4: Emigma V4 is currently under testing in our shop. Version 4 allows for full extended source-extended receiver support, and outputs bipole-bipole apparent resistivities in a new *.apr* type file. With version 4, extended source and receiver survey geometries are fully supported.

GUI: *PetRos EiKon* is completing development of a DOS based graphical user interface for use with EMIGMA. The GUI can either be used with or instead of EMIGMA's easy-to-use text based user interface. A WINDOWS development of the graphical package will available in late fall.

NEW THEORY: New electromagnetic scattering theory has been developed and is under test at *PetRos EiKon* which promises to significantly extend the range into which the Localized Non-Linear approximation can be used to simulate inductive effects without sacrificing its speed advantage over other algorithms.

MAGNETOTELLURIC SOFTWARE: Coupled with the release of an MT version of EMIGMA, *PetRos EiKon* has released a version of its decomposition software package (**GBDECOMP**) with associated graphics and analyses programs. Interaction between the data, simulation and decomposition is through the SEG .EDI file standard. The software is available for either DOS or UNIX.
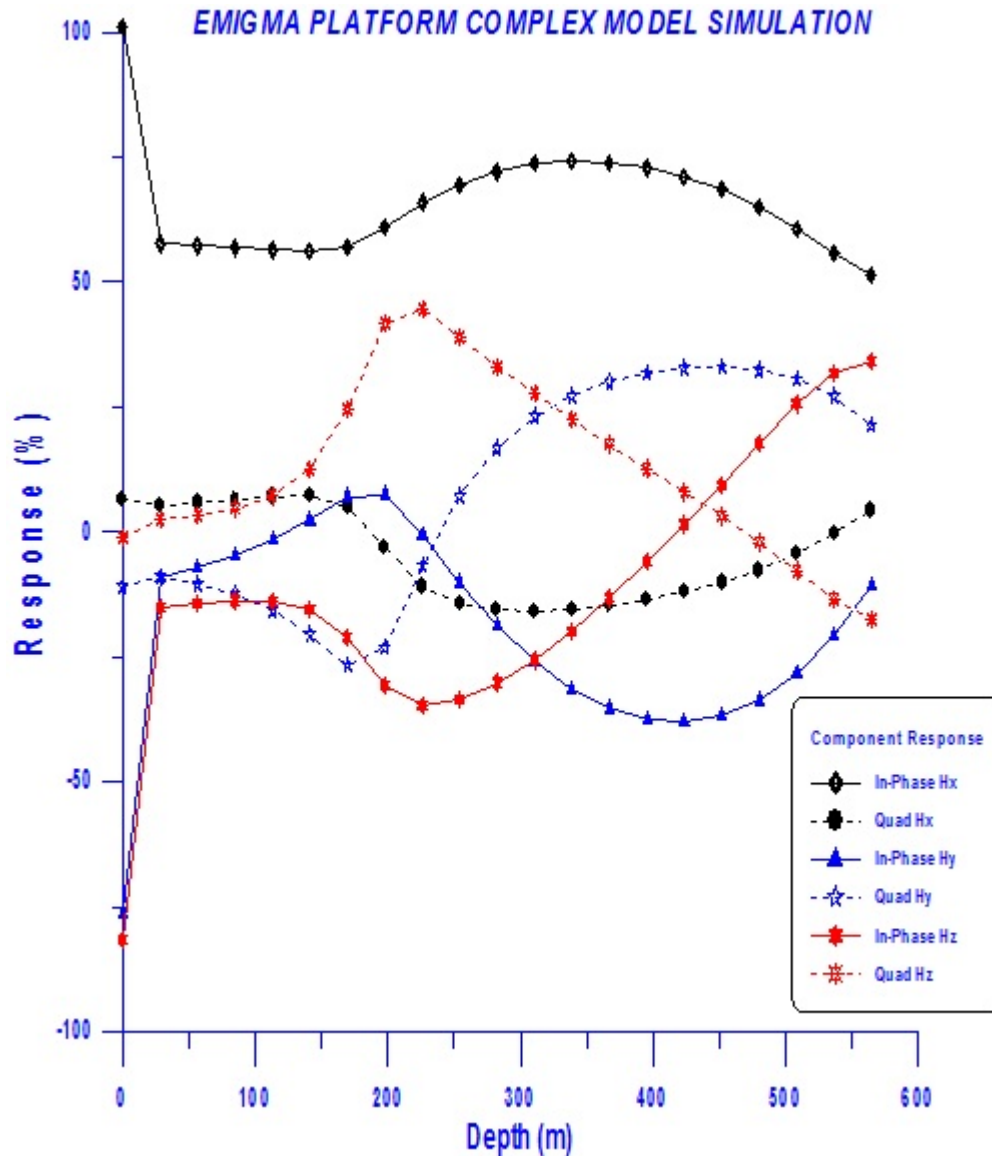
NEW PROJECTS:

AIRBORNE PROCESSING: *PetRos EiKon* begins this September on a project to automate processing of airborne data flown over conducting cover. The purpose of the software will include correct removal of overburden responses, correct flight height levelling, removal of overburden phase and amplitude effects and the automatic picking of significant anomalies.

VISUALIZATION: *PetRos EiKon* also begins on a project to evaluate visualization platforms and techniques for the purpose of building geophysical models for simulation, for display of simulated data against field data, for the visualization of 3D inversion parameters and for appropriate visual representation of geological and geophysical data sets.

New supporters are welcome on both these projects.

Continued from page 1:

The data plotted in the figure above are the total measured field minus the free space field in all three borehole components at 30Hz. The data have been continuously normalized as a percentage to the total magnetic field at the RX station. HZ is the axial borehole component pointing up the hole, HX is horizontal and perpendicular to the borehole while HY is defined according to a right handed system such that z is positive up along the borehole.