BCGS Practical EM Symposium

St. John's College, UBC
Vancouver, BC
October 5, 2007

Sponsored by:

KENNECOTT CANADA
EXPLORATION INC.

Mira Geoscience … *modelling the earth*

Advanced Geophysical Interpretation Centre

Schedule

8:00 - 8:30	Coffee and muffins
8:30 - 8:45	BCGS Welcome statements
8:45 - 10:15	AM Session 1: Airborne EM
10:15 - 10:30	Coffee
10:30 - 12:00	AM Session 2: Non-mineral Applications of EM
12:00 - 1:00	Lunch (in the Dining Hall)
1:00 - 2:30	PM Session 1: Advances in EM Modelling and Acquisition
2:30 - 2:45	Coffee and snacks
2:45 - 4:15	PM Session 2: EM Inversion
4:15 - 4:30	Closing statements
4:30 - 6:00	Host bar with snacks

AM Session 1: Airborne EM

8:45 - 9:15
"Fundamentals of Frequency Domain EM"
Greg Hodges, Fugro Airborne Surveys

Helicopter-borne frequency domain EM systems offer the best resolution (from the air) of discrete conductors, sensitivity to weak conductive targets and near-surface geology, and mapping of resistivity, magnetic susceptibility and dielectric permittivity. This talk introduces the systems and their components, and some fundamentals of understanding and interpreting the data.

9:15 – 9:45
"A Users Manual for Airborne Time Domain EM"
Sean Walker, Aeroquest International Ltd.

Airborne time domain EM has been a main stay in mineral exploration for over 40 years. This talk will provide an overview of the various airborne TEM systems available today. The discussion will include descriptions of the different survey platforms, Tx/Rx geometries, transmitter waveforms, measured and derived data, and potential noise sources. A brief discussion of applications will also be presented.

9:45 – 10:15
Focussed discussion
Notes:

AM Session 2: Non-mineral Applications of EM

10:30 - 11:00
"The MTEM Method for Hydrocarbon Exploration"
Jason Robinson, MTEM

Simply put, application of Multi-Transient EM entails injecting a series of pulse-coded electrical transient signals into the subsurface and measuring the voltage response between pairs of receiver electrodes along the logging profile. The process is repeated multiple times to acquire a detailed lateral and vertical profile. The use of a broadband signal allows recording of a continuous frequency spectrum dataset.

The source and receiver response is removed from the data, yielding the impulse response of the earth, and signal processing techniques are used to produce a resistivity cross section. Because hydrocarbon-bearing rocks are known to show increased resistivity, the zones that appear highly resistive may indicate the presence of hydrocarbons.

11:00 – 11:30
"Detection and Discrimination of Unexploded Ordnance using Electromagnetic Induction"
Leonard Pasion, Sky Research Inc.

Electromagnetic induction surveys are one of the primary techniques used in unexploded ordnance remediation projects. Detection of UXO is achieved by extracting parameters from EM data that reflect characteristics of the buried compact conductive target that generated the measured signal. This talk provides a brief overview of how electromagnetic data are collected and processed for the detection of UXO. Factors that affect successful estimates of parameters from EM data are identified.

11:30 - 12:00
Focussed discussion
Notes:

PM Session 1: Advances in EM Modelling and Acquisition

1:00 - 1:30
"GeoElectromagnetic Modelling with MultiLoop III"
Peter Walker, Geophysical Algorithms

Much of our intuitive understanding of EM interpretation has been built on experience obtained from numerical modelling. This understanding has progressed as the models studied became capable of simulating more complicated geological structures. However, some important examples that are commonly encountered in exploration have only been poorly studied. These include the behaviour of complex curved conductors, conductors with resistive inclusions, conductors in galvanic contact with the overburden and conductors with variable conductivity. In this presentation, MultiLoop III will be used to illustrate some interesting phenomena selected from these examples.

1:30 - 2:00
"The Evolution of the Squid – The Origin of Species by Means of Natural Selection"
Richard Osmond, Cascadia International Resources Inc.

Conventional airborne and ground TEM systems use receiver coil sensors to measure the time rate of change of the induced secondary magnetic fields (dB/dT response) generated by high powered transmitters. It was recognized at an early stage that TEM systems were ideal for the detection of rapidly decaying induced secondary magnetic fields generated in moderate to low conductance sulphide bodies typical of most VMS type deposits but were not as well suited for the detection of slowly decaying induced secondary magnetic fields resulting from high conductance Ni-Cu sulphide deposits. The evolution of the SQUID B-field sensor by natural selection to replace the standard dB/dT coil sensor is demonstrated by its ability to detect slow decaying Ni-Cu sulphide bodies to significant depths.

2:00 - 2:30
Focussed discussion
Notes:

PM Session 2: EM Inversion

2:45 - 3:15
"EM Inversion Progress at UBC-GIF"
Doug Oldenburg, UBC-GIF

The last decade has seen substantial progress in our ability to forward model and invert 3D EM data in both time and frequency domain. In this talk I present a current synopsis of our research as well as synthetic and field examples.

3:15 - 3:45
"Field Examples of EM inversions"
Nigel Phillips, Mira Geoscience AGIC

Examples of frequency and time-domain inversions of airborne, ground, and borehole EM field data are presented. The inversions are produced using 1D and 3D EM non-linear inversion codes developed at the UBC-GIF. Inversions of these data are possible when all system, survey, and processing parameters are understood. Practical steps are employed to make the inversion process tractable which includes using parallel computing and reducing the size of the system of equations being solved. The successes of the inversions are gauged by relating the results to known geologic and physical property information. The results show better definition and resolution of targets than other methods.

3:45-4:15
Focussed discussion
Notes: