Thursday, November 18, 2004

HESS Building • 5430 Westheimer, Houston
Social 5:30 p.m.

Cost: $25
Call or email Dale Bird, by noon Tuesday, November 16
281-463-3816 or dale@birdgeo.com

GSH Potential Fields Group
Dinner Meeting

*by **Bob Lo,** BHL Earth Sciences*
***Petr Kuzmin,** Geotech Ltd.*

AFMAG: Geotech's New Airborne Audio Frequency Electromagnetic (EM) System

Figure 1. AFMAG unit interior showing the three orthogonal coils, damping mechanism and suspension.

An airborne AFMAG (Audio Frequency electroMAGnetic) system has been developed and successfully tested by Geotech Ltd. The system uses proprietary and patent-pending technology to damp vibrations and de-rotate the electromagnetic (EM) fields respectively. Three orthogonal coils are used to measure the horizontal and vertical components of these fields (Figure 1).

The EM source energy is the Earth's natural time-varying magnetic field, in the audio frequency range of 30 to 6,000 Hz. This method is quite similar to MT or magnetotelluric methods; however, electric fields are not measured by AFMAG. Natural EM sources are nearly homogeneous, which allows deep penetration. Typical penetration depths, observed from the system tests, range from zero to hundreds of meters for small test bodies that were hundreds of meters in size. Theoretically, the AFMAG system is capable of detecting large conductive features such as salt water trapped in anticlines as deep as 10 km. Like all airborne systems, this data can be rapidly acquired over large areas, over rugged terrain and over areas where access is difficult.

The development of AFMAG was partially funded by the Ontario Minerals Exploration Technologies (OMET) program and two mining companies. Therefore initial tests, completed in August of 2004, have focused on minerals exploration applications. Airborne field tests are very encouraging and in addition to mineral targets, some large conductive features due to conductive sedimentary units have been mapped (Figure 2).

Geotech is now completing its OMET project report and is seeking suitable petroleum plays for airborne tests to define airborne

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Figure 2 - Geotech's airborne AFMAG system in field trials in Sudbury, Ontario with the principal designer, Dr. Petr Kuzmin.

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AFMAG's performance in petroleum exploration. In addition, current development is now focusing on using the field data collected by the base station to monitor the natural EM fields and perhaps to provide a remote reference for signal processing of the EM fields. The base station data will also be assessed to determine if the number of airborne coils can be reduced to just the vertical dipole receiver coil, providing the possibility of installation onto a fixed-wing platform.

An introduction to the AFMAG method, the system, and its deployment will be presented. Results from the Sudbury test area, characterized by deep conductive targets including conductive sedimentary rocks, as well as several numerical models of typical petroleum target geometries, will also be presented. ■

Biographical Sketch

Bob Lo graduated from the University of Toronto with a Bachelors of Applied Science (geophysics) in 1981 and with a Masters of Science degree in physics in 1986. Bob also obtained an MBA from Laurentian University in 1994. Bob has held positions of Senior Geophysicist for Inco Ltd., Chief Geophysicist for Aerodat Ltd. and Vice President of Scintrex Ltd. Bob currently works as an industry consultant, specializing in advanced geophysical interpretations of electromagnetic data for clients around the world. Bob is active in the geophysical community, having served as KEGS President, reviewing expanded abstracts and chairing sessions at various SEG Annual Meetings. Bob is a Professional Engineer and holder of a Certificate of Authorization from the Professional Engineers, Ontario.