



**THE 4TH GEOLOGICAL CONFERENCE
OF
THE GEOLOGICAL SOCIETY OF TRINIDAD AND TOBAGO**
June 17-22, 2007, Hilton Trinidad & Conference Centre
Port-of-Spain, Trinidad and Tobago

“Caribbean Exploration – Planning for the Future”

ABSTRACT

**MULTI-TRANSIENT ELECTRO-MAGNETISM: AN INNOVATIVE GEOPHYSICAL
EXPLORATION TECHNIQUE**

Bruce Walker, *Ten Degree North Energy Limited* and **Anton Ziolkowski**, *MTEM Ltd*

Seismic surveying has long held a position of pre-eminence in the petroleum exploration business. However, the search for resources in more complex settings has proven a challenge for geophysicists, and has created an opportunity to develop alternative geophysical methods. Electromagnetic (EM) surveying has enjoyed a successful history in petroleum exploration, but primarily as a downhole logging technique. Surface EM techniques have been more commonly applied to mineral exploration and hydrogeology.

The recent surge in interest in surface EM surveying methods has brought a range of different techniques to the forefront. Amongst Active EM methods, the best established is DC resistivity. This basically involve supplying a direct current to a circuit and then recording the return signal; this secondary signal is due to the earth's magnetic discharge when the current is switched off. A more sophisticated technique is to use a single frequency alternating current (AC) supply and again, record the earth's response; this is also known as a Controlled Source Electro-Magnetism (CSEM).

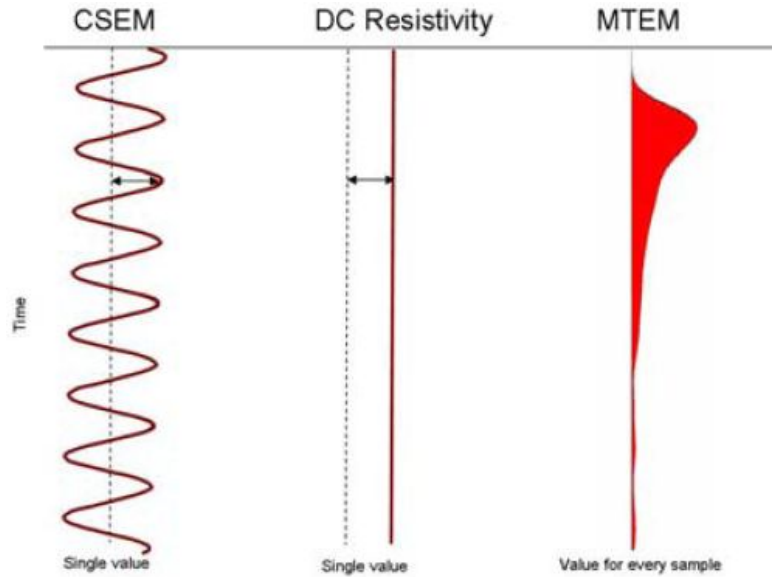


Figure 1. Input signal characteristics for AC, DC and MTEM resistivity surveys.

The Multi-Transient Electromagnetic (MTEM) approach requires a more complex input signal incorporating a range of frequencies (see figure 1). Thus, at a given offset, the MTEM method obtains a range of results corresponding with the range of input frequencies. This is as opposed to a single output obtained at any given offset by the AC and DC methods (see figure 2). This is the great power of the MTEM system – the broadband data stream yields a greater insight into the subsurface. The earth's response is determined by de-convolving the input signal from the output signal of the MTEM circuit

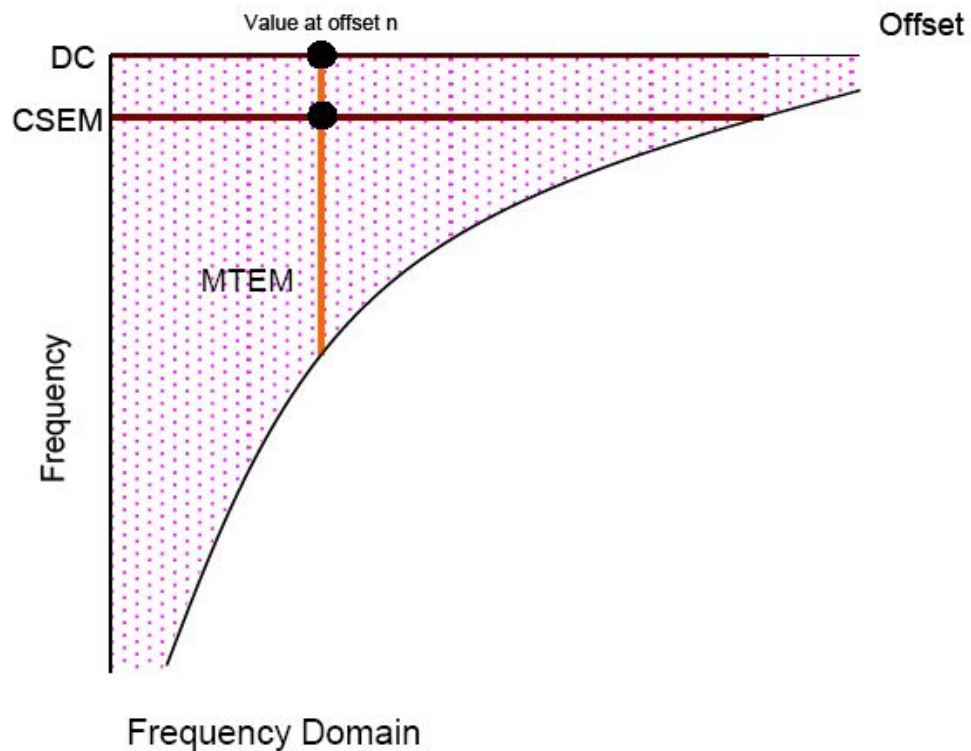


Figure 2. Broadband response of the MTEM method.

Ten Degrees North Energy Limited (TDN) is a partner in a Joint Industry Project (JIP) investigating how practical the MTEM technique is for petroleum exploration. This survey is currently being carried out at a natural gas field in Wyoming, USA, but the results will be presented to the JIP participants later this year. It is the intention of the authors to use these results to illustrate the applicability of this method.