KMS Technologies – KJT Enterprises, Inc.
An EMGS/RXT company

Motionally induced electromagnetic field within the ocean

Bhatt, K. M., Hördt, A., Weidelt, P., and Hanstein, T.

23.Kolloquium Electromagnetische Tiefenforschung
September 28 – October 2, 2009

split over a large lateral distance and the small vertical magnetic filed components at long periods can be explained by a model with anisotropic conductivity in the lithosphere. Generally all impedance phases increase above 45° for periods longer than 2000 s denoting an increase of the conductivity beneath the lithosphere.

V04

The electrical conductivity structure of the Dead Sea Basin derived from 2D and 3D inversion of magnetotelluric data

Meqbel N., Ritter O., Weckmann U., Becken M. and Muñoz G.

V05

Motionally Induced Electromagnetic Field within the Ocean

K. M. Bhatt, A. Hördt, P.Weidelt (Inst. f. Geophysik u. Extraterrestrische Physik, TU Braunschweig),
T. Hanstein (KMS Technologies - KJT Enterprises Inc.)

The contribution of motionally induced electromagnetic (EM) fields at the seafloor is generally considered small, but since the characteristic reservoir signal in marine controlled source electromagnetic (mCSEM) data is also small, the inclusion of the motional induction contribution in modelling estimate will enhance the probability of reservoir detection. Here, we have studied the electromagnetic induction caused by ocean water flow with in earth's magnetic field.

When a charge particle moves with certain velocity in earth's magnetic field, it experiences a Lorentz force. The action of Lorentz force generates a secondary electric field through galvanic and inductive processes. For the mathematical formulation, thus, we considered Lorentz electric field as a source in the corresponding set of Maxwell's equations. First, we solve these Maxwell's equations for a 1D model and velocity structure. Further, we extend our formulation for 1D model and 2D velocity structure. Here, Maxwell's equations are solved by disintegrating them into TM and TE mode. For a vertical earth magnetic field, the TM and TE mode is energised respectively by horizontal and vertical component of velocity.

The simulations indicate that for practical cases at greater transmitter-receiver (T-R) separations, the motionally induced electric and magnetic field contribution is relevant for reservoir detection. For example, a surface wave of height 1 m propagating with velocity 25 cm/s of 0.04 Hz within an ocean of conductivity 3.33 S/m, in an ambient earth's vertical magnetic field of 50000 nT, contributes an electric field of amplitudes 2 nV/m at the seafloor 1000 m below sea-surface. This amplitude corresponds to the signal amplitude measured at 7000 m distance from a transmitter with a dipole moment of 10^4 Am.

V06

”Air waves” in marine controlled-source electromagnetic - The potential of Peter Weidelt's work

Rita Streich

In applications of marine controlled-source electromagnetics (CSEM) for hydrocarbon exploration,

KMS Technologies – KJT Enterprises Inc.
An EMGS/RXT company

6420 Richmond Ave., Suite 610
Houston, Texas 77057, USA
Tel: +1.713.532.8144
Fax: +1.832.204.8418

www.KMSTechnologies.com