Target Detectability of Marine Controlled Source Electromagnetic Method – Insights from 1-D Modeling

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The paper basically highlights a comparative study of detectability of a hydrocarbon reservoir in a marine environment, using controlled source Electromagnetic method (CSEM) on typical benchmark models. The target is a thin resistive body buried at a certain depth under the sea floor. Depth of the seawater, overburden sediment depth, thickness and resistivity of the reservoir are variable model parameters. While transmission frequency has also taken into account. For different sets of these parameters a sets of 1-D models has been generated using a frequency domain forward modeling code by Løseth and Ursin (2007) to show the effectiveness of CSEM in varying geological setup.

Marine controlled-source electromagnetic surveying (CSEM) or Sea Bed Logging (SBL) is now an established technique for hydrocarbon exploration (Eidesmo et al., 2002; Ellingsrud et al., 2002; Srnka et al., 2006). Marine CSEM methods use an electric dipole to probe the subsurface. The technique has proven to be particularly useful for detecting thin highly resistive layers characteristic of the geometry of hydrocarbon reservoirs. The electric and magnetic receivers are placed on the seabed and the electric dipole transmitter is typically towed at an elevation of 30 m. The method was originally viewed as a deep water technique because of the strong contribution to the electromagnetic field due to the air-water interface in shallow water depths. But in the present scenario there is a lot of advancement in the field of CSEM and hence it is also used in shallow water. The paper basically highlights the detectability and resolution power of Marine CSEM for a 1-D hydrocarbon reservoir in a marine environment and under varying geological conditions.