Synthetic 3D CSEM forward modeling for hydrocarbon exploration applications

STEVEN LETHBRIDGE AND COLIN G. FARQUHARSON

Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador A1B 3X5

The Marine controlled source electromagnetic (CSEM) method is an exploration tool that is occasionally used within the oil and gas industry to help delineate possible hydrocarbon reservoirs. Marine CSEM is a geophysical method which utilizes Faraday's and Ampere's laws to induce currents within the subsurface allowing the resistivity of the subsurface to be measured. This is done by deploying receivers on to the seafloor which measure the secondary electric and magnetic fields that are induced due to the currents that are generated in the subsurface by a high current, low voltage oscillatory waveform source being towed above the seafloor. Marine CSEM is an additional de-risking tool that can be used to determine if a possible target reservoir contains gas or hydrocarbons due to different resistivity response between the two. This tool can be helpful as the typical technique used in reservoir mapping is seismic reflection, which is useful for determining possible reservoirs but lacks in determining if the reservoir is hydrocarbon saturated or gas saturated due to similar amplitude response seen in the seismic data.

Three 3D EM forward modeling will be used to determine possible CSEM data based on an Earth Model. My primary focus will be building the appropriate Earth model for a hypothetical hydrocarbon reservoir to be able determine a possible resistivity reading for a typical hydrocarbon reservoir. This Earth model will be designed based on similar reservoirs seen in the Jeanne d'Arc Basin offshore Newfoundland and will be built and refined using the FacetModeller software tool. [Poster]

Atlantic Geology, 2018, Volume 54
Atlantic Universities Geoscience Conference 2018 – 68th Annual Conference, November 1-3, 2018
doi:10.4138/atlgeol.2018.015