GEOPHYSICS POSTER 20

A TOWED EM SYSTEM TEST SURVEY

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A newly developed towed EM system has been tested offshore in the North Sea. We show that the measured electric field data are of sufficient quality and signal-to-noise ratio for successful detection and inversion of the high resistivity reservoir area including distinction of some of the shallow gas accumulations above the reservoir. 1D inversion in the frequency domain is performed on individual common mid points (cmps) along a survey line across the reservoir with robust results as well as 2.5D inversion. A 3D resistivity model is also built from seismic data and interpreted horizons. This model is manually fine-tuned by comparing resulting 3D forward modeling data with the measured data. Finally, the estimated resistivity structure is investigated with respect to available vertical resolution from the data. This is accomplished by reformulating the inverse problem to a boundary value problem with solutions that approximately give the vertical resistivity structure at each cmp.

The motivation for developing a towed EM system is to significantly increase the acquisition efficiency compared to existing stationary systems. Efficient EM data acquisition increases the range of applications as better spatial coverage can be achieved at lower cost. In the test survey, an electric current dipole source and an EM streamer were simultaneously towed along a 12km long survey line from one vessel in a speed of 4 knots.

1D and 2.5D inversions are performed on the frequency response data along the survey line. In both cases, the reservoir is clearly observed, which agrees well with the seismic information. At shallower depths, there is an increase in resistivity above the reservoir, which probably originate from the thin gas pockets above the reservoir. This is also supported by the 3D modeling. The estimated sea-water resistivity also agrees well with the values from in-situ measurements.

The EM towed system has provided electric field data of sufficient quality and signal-to-noise ratio for successful detection and inversion of the highly resistive reservoir area, including distinction of some of the shallow gas accumulations above the reservoir, using an acquisition method of significantly greater efficiency than stationary systems.

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