3D CSEM inversion data at Campos basin Brazil constrained by seismic and well log

A. Benevides[1], N. Meqbel[1], W. Lima[1], S. Fontes[1], G. Egbert[2], P. Werdt[1] and E. La Terra[1]

[1] Dept. Geophysics, Observatório Nacional Brazil, benevidesartur@gmail.com
[2] Oregon State University, Corvallis, egbert@coas.oregonstate.edu

SUMMARY

A set of 3D CSEM inversion runs of a real data in the Campos basin, SE Brazil is presented in this study. The Campos basin was formed during Neocomian (Cretaceous period 145–130 my) and its clastic reservoirs have been the largest oil producer in Brazil for the past three decades. This basin presents challenges in the exploration of clastic reservoirs due to the deeper waters and the complex geological configuration imposed by the tectonics associated with giant salt domes. Electromagnetic (EM) methods are sensitive to subsurface resistive variations and have been frequently used in exploration programs for hydrocarbon (HC). Reservoirs filled with HC are generally more resistive than the host rocks which is an advantage for EM method. Combining resistive models with seismic minimizes ambiguity in the interpretations and considerably improves the resolution of the subsurface structures and the geometry of the reservoir targets. In this study, a set of 40 EM receivers were deployed at the seafloor (water thickness around 1.7 km) in a grid-shape array varying spacing between 5 km to 10 km. The electric field components recorded from an active electromagnetic source towed 50 m above the seafloor was processed and generated signal in four frequencies: 0.125, 0.25, 0.5 and 1.25 Hz. Maximum polarization ellipses parameters obtained by rotating the horizontal electric components for the same transmitter azimuth is used as measured data during the inversion. For the 3D CSEM inversion we have used a modified version of the Modular System for EM inversion (ModEM code) which is under development within a research project at Observatório Nacional – Brazil. Preliminary resistivity model results yielded a good agreement with resistivity well logs. Strategies including seismic features as a-priori information has been analyzed and is showing improvements in resolution of the resistivity models.

Keywords: 3D CSEM inversion, Electromagnetic, Salt Structures, Campos basin