3D resistivity distribution in Wagner Basin, Gulf of California, Mexico.

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SUMMARY

2D inversion of marine magnetotelluric data has been successfully used to study offshore structures and tectonic boundaries. Even though 3D inversion is increasingly used to interpret land data sets, it is still rare to find marine data analyzed in terms of 3D models in the literature. Here, we show a case study using marine data obtained in the Gulf of California in Mexico.

Different factors affect marine data acquisition, such as bathymetry, proximity to the coast, water depth, the position of the sensors when dropped on the ocean floor, etc. Besides, 3D simulations depend on a variety of factors as the mathematical method to solve the forward problem, the mesh design, the resistivity distribution of the initial model, the accuracy of the bathymetry discretization, etc.

In 2015, 13 marine magnetotelluric stations were acquired in the Gulf of California, Mexico. The data present 3D effects at periods greater than 100 s, which forces a 3D interpretation even though they were obtained along two profiles. Moreover, at the time of acquisition, the instrument compasses failed, so the sensors' actual orientation was estimated by comparing the measured magnetic field with the magnetic field of a magnetic observatory.

In this contribution, we show the 3D resistivity model obtained by using the ModEM3D inversion code, considering bathymetry, coastlines, and a model domain oriented parallel to the structural strike dominated by the known trans-tensional tectonics in the Gulf of California. To overcome the uncertainty of the sensors' orientation, we use the invariant impedances Z_+, Z_-, as the off-diagonal of the impedance tensor.

The 3D resistivity distribution obtained shows a conductive structure associated with the sediments filling the Wagner basin - a pull-apart active structure located in the Gulf of California- and agrees with the information provided by several seismic profiles and the existing geological information.

Keywords: 3D inversion, marine MT, Wagner Basin, invariant impedance.