

The utility of marine controlled-source EM in subduction zone applications: Imaging the Nicaragua megathrust plate interface

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Electrical resistivity soundings are ideally suited to map fluids and quantify porosity, and provide important independent constraints that are complimentary to seismic observations. As a result of recent technological advancements in instrumentation and numerical modeling, the controlled-source electromagnetic (CSEM) method is emerging as a reliable tool for imaging offshore tectonic margins. In 2010, we collected CSEM data along a 280 km profile spanning the incoming plate, trench, and forearc slope offshore of Nicaragua, the first large-scale survey at a subduction zone. The results highlight the utility of CSEM for imaging seafloor gas hydrates, fluid pathways along faults, and subducted sediments marking the plate interface. We used the porosity estimates from the resistivity observations to quantify the fluid budget in the incoming oceanic crust and the outer forearc. The data were highly sensitive to the channel of subducted sediments, allowing us to track the evolution of the fluid budget along the megathrust plate interface in the region that ruptured during the Mw 7.7 1992 tsunami earthquake.