Comparison of Direct Current Resistivity Profiles and 2D Seismic Data of an Active Methane Vent in the Gulf of Mexico, Mississippi Canyon Block 118

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A known active methane vent located in Mississippi Canyon Block 118, Gulf of Mexico, is imaged by both single-channel seismic data and direct current resistivity profiling. The single channel, deep-receiver-shallow-source seismic data were acquired by the Gulf of Mexico-Hydrate Research Consortium. This vent area contains both active and dormant vents as well as blocks of methane hydrate outcropping on the seafloor. It has been proposed that methane hydrate also forms as blocks within the hydrate stability zone beneath the vents. The presence of hydrate within sediment is expected to increase both the seismic velocity and electrical resistivity of the medium.

Near the vents, the seismic data are chaotic, likely as a result of the presence of free gas, hydrate, and biogenic carbonate blocks. Hydrate has also been found in shallow cores away from the active vent area. These off-vent occurrences of hydrate appear to be associated with lesser disruptions of the seismic data, associated with small faults or factures; however the seismic data are insufficient in determining the distribution of hydrate.

A Direct Current Resistivity land system was adapted to function on the sea floor. Three Direct Current Resistivity profiles (Gradient, Dipole-Dipole, and Werner) were collected in the venting area. Direct Current Resistivity data is able to resolve the locations of hydrate within the upper portion of the hydrate stability zone. In the inverted Direct Current Resistivity sections, hydrate is found to occur in pockets along vertical vents or fractures, but not in the form of laterally extensive hydrate bearing layers.