

Geophysical Exploration Using Seabed Logging in an Area with Non-Hydrocarbon Resistivity Anomalies

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Marine controlled source electromagnetic (MCSEM) survey termed as Seabed Logging (SBL) can be used for detection of deeply buried hydrocarbons. The method has been verified on known hydrocarbon fields offshore Angola and Norway. Here we present SBL data across an offshore arch in the Norwegian Sea. A horizontal electric dipole source induced increased SBL responses (up to 250% gain in MVO) measured at the south-western part of the study area compared to south-eastern part. This finding satisfies the existence of strong seismic reflectors representing sills with $\sim 300 \text{ } \Omega\text{m}$ resistivity within the depth range between ~ 1100 and 2500 m below the seafloor.

Remote detection of high-resistivity strata shows fairly good agreement with forward 3-D SBL modelling simulation results. A comparatively better match between modelled and measured data was achieved by introducing a moderately high resistive ($10 \text{ } \Omega\text{m}$) layer correspond to moderately strong seismic reflector 1000 m below the seafloor at the central part of the structure. Likely candidates for this layer could either be a HC layer or a thin, highly fractured and discontinuous sill. However this resistivity for the sill layer ($10 \text{ } \Omega\text{m}$) is probably unrealistically low. If the resistivity is kept at $300 \text{ } \mu\Omega\text{m}$, the sill must be very thin and possibly not visible on the seismic section. It therefore, suggests that the measured SBL response cannot be fully explained by the simplified geological model with sills alone.