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Reservoir Characterization and Delineation using Extended Elastic Impedance, Rovuma Basin, Offshore Mozambique

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Summary

The deep-water province offshore Rovuma Basin in Mozambique has become an important focus for petroleum exploration recently. Anadarko, as operator of Rovuma Offshore Area 1, made the first giant discovery in February 2010, followed by several other major discoveries by the operators Anadarko in Area 1 and Eni in Area 4. The giant discoveries in Area 4 were identified and appraised using the extended Extended Elastic Impedance (EEI).

Amplitude variation with offset (AVO) was successfully used to identify gas-sand reservoirs in the study area, located within the Rovuma Basin offshore Mozambique. However, in another case within the study area a dry well was drilled into porous clean water sands that also produce AVO anomaly. In order to re-evaluate the prospectivity in the study area, 3D pre-stack time migrated (PSTM) seismic gathers and generated petrophysical and reservoir parameters such as V_p/V_s ratio, Poisson's ratio λ/μ ratio, porosity and water saturation were used to perform EEI inversion in both wells.

Abstract

Amplitude variation with offset (AVO) was successfully used to identify gas-sand reservoirs in the study area, located within the Rovuma Basin offshore Mozambique. However, in another case within the study area a dry well was drilled into porous clean water sands that also produce AVO anomaly. In order to re-evaluate the prospectivity in the study area, 3D pre-stack time migrated (PSTM) seismic gathers and generated petrophysical and reservoir parameters such as V_p/V_s ratio, Poisson's ratio λ/μ ratio, porosity and water saturation were used to perform extended elastic impedance (EEI) inversion in both wells. The EEI inversion was calibrated using well log data from Chachalote-1. The inverted EEI volumes resembling petrophysical and reservoir parameters above mentioned were scanned in the whole study area for identification of new prospective zones with similar petrophysical and reservoir properties as the gas-sand reservoir in the calibration well. The scanning result of the inverted EEI volumes has shown that there are no prospects in the study area. However, gas anomaly was observed, though insignificant for exploration. On the other hand, the EEI results were tested on the second well (Buzio-1) located approximately 27 km away from the Cachalote-1. As a result the water-saturated sands intervals were highlighted as observed on the interpretation of wireline logs from this well. This observation lead to the conclusion that if EEI inversion had been conducted after drilling Cachalote-1 the targeted prospects in well Buzio-1, identified using AVO analysis could have been de-risked and consequently downgraded.