Abstract

Complexly faulted subsurface configuration is capable of causing erroneous deductions in the absence of a well packaged interpretation approach and workflow for an oilfield exploration programme, thus a well prepared analysis saddled on the use and integration of sufficient data is indispensable to the unraveling of complex field subsurface structure as the search for oil and gas progresses into deeper waters. Suite of signatures from wireline logs and seismic volume was employed to gain more insight into the complexities of the hydrocarbon hosting units within and outside the vicinity of well control in the X-field Niger Delta. Horizons and fault interpretation were carried out to produce subsurface structure maps. Amplitudes of the horizons mapped were extracted and were used to study the distribution of the hydrocarbon sand.

Three hydrocarbon bearing reservoirs were delineated within the study interval, namely: ROJ A, ROJ C and ROJ D. Well to seismic tie revealed that these reservoirs tied direct hydrocarbon indicators (bright spots) on the vertical sections. The structure maps produced revealed a series of NW-SE and E-W trending growth faults and fault echelons, most of which dip to the south. Fault assisted closures were revealed at the southern part of the field, which correspond to the crest of roll over structures and possibly served as the trapping mechanism for the reservoirs.

The reflection amplitude of the studied horizons shows a fine network of anomalies that can be correlated to the prediction of the lateral distribution of the hydrocarbon sand. The conclusion of the study was that the western part of horizon ROJ A is a highly prospective area as bright spots were observed in the region. Also in the adjacent southern direction of this horizon, hydrocarbon accumulations have been confirmed from wells. These gas sands are possibly trapped in anticlinal closures located in the same area. On the other hand, the results from the study of horizon ROJ C suggest development opportunities in the southern area. High amplitude gas sands are seen to spread to the south and stratigraphy was assumed to play a major role in hydrocarbon migration. The study over horizon ROJ D reveal likely geologic features like regional sand pinch outs and channels in the southern part of the field. Spectral decomposition interpretation was suggested to be used further in improving the delineation of the thin reservoir sand bodies and for better outlining of their geometries but was not available on the workstation used.

The study has shown the feasibility of integrating structural interpretation and instantaneous amplitude in prospect identification and reservoir prediction.