

AVA Seismic Inversion as a Tool for Prospect Evaluation

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Abstract

Amplitude-versus-angle (AVA) seismic inversion techniques were used to predict reservoir properties in Sandfish field located at south western part of Nigeria for qualitative and quantitative interpretation that will enhance hydrocarbon discovery in the field of study. The mis-interpretation of subtle features identified in seismic data had resulted to bypass of hydrocarbon zones in the study area. This now informed the integration of 3D seismic data with well data from three wells using simultaneous and elastic impedance inversion techniques with a view to unraveling the uncertainty for detailed prospect evaluation. Five partial angle stacks (6 deg – 42 deg), low frequency models built from the interpolated high cut filtered well logs and extracted wavelets from each angle stacks were inverted using Rock Trace's sparse spike inversion algorithm which was guided by four interpreted seismic horizons. Near (6 - 12) and Far-far (32 - 42) angle stacks were equally independently inverted to compliment the simultaneous inversion products. The quality of inversion products was checked by cross plotting inverted P-impedance with well P-impedance. The P-impedance, S-impedance, density, Near stack and Far-far stack elastic volumes generated reveal vertical and lateral continuity of the reservoirs with variation in their lithology and pore-fluids. The cross plot of the inverted P-impedance with well P-impedance gives 86% correlation coefficient while high quality match was also established between the petrophysical logs and inverted volumes at well locations which indicate high quality inversion products that will sufficiently reduce exploration risk. The correlation of simultaneous inversion products with elastic impedance inversion volumes reveals more prospects. Hence, the results of this study can substantially improve development plans in study area.