

Seismic Reservoir Characterization and Discrimination over 'Aib-EX' Oil Field, Niger Delta

Sunday Olotu¹, Ibukun Olorunniwo¹, Olatunbosun Alao¹, and Adekunle Adepelumi¹

¹Obafemi Awolowo University

Abstract

The correlation between basic seismic reservoir properties, namely Compressional velocity (V_p), Shear velocity (V_s), and Density (ρ) have been studied by means of crossplots of bi-variate, tri-variate domains and functional transformations including rotations of axis using well logs over 'AIB-EX' Oil Field, Niger Delta. The methodology involves reconstruction of geologic lithofacies information from geophysical logs. Three reservoir zones namely A, B, and C were demarcated from the subsurface. Structural and stratigraphic analysis, reservoir delineation and characterization, petrophysical and rock physics analysis, and log inversion were carried out using Kingdom Suite and Statistical Packages. The results of the aforementioned parameters in different domains have successfully characterized and discriminated reservoir element: shale, sandy-shale, shaly-sand, and sand (with respective GR counts and P-wave velocity of 110-130 API and 2400-3750 m/s, 75-110 API and 2100-5000 m/s, 45-75 API and 2200-4750 m/s, and 10-50 API and 2000-4600 m/s). Moreover, the pore fluids such as brine and oil were identified and characterized on the basis of these powerful discriminant tools such as Poisson's ratio versus difference in impedances (I_p - I_s), Poisson Impedance versus Poisson's Dampening Factor (PDF), Acoustic Impedance versus porosity and Elastic Impedance versus porosity. Hence, the result of the research showed that hydrocarbon reservoirs can be discriminated with varying degree of effectiveness in various domains. The obtained result, which can be used to calibrate seismic inversion, also yielded a reliable seismic lithofacies map in the presence of high resolution 3D seismic data.