

Prestack Seismic Inversion of Nile Delta Tertiary Clastics

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In 2003, Apache Egypt embarked on a large-scale inversion project in their West Mediterranean Deep Marine concession in the Nile Delta. The objective was to produce cubes of elastic (compressional/shear impedance and density) and petrophysical (gas saturation, N/G, sand volume) parameters that could be used to optimally place development wells in the most productive sections of the complex reservoirs consisting of channel sands and finely laminated levee deposits discovered in the block. A detailed rock physics study using five wells with extensive log suites was conducted and established that accurate statistical relationships could be used to correlate combinations of elastic parameters to gas saturation and N/G. In addition, a Bayesian probability analysis was conducted in order to predict lithologies and associated uncertainties from the same elastic parameters. The estimation of elastic parameters from acoustic surface seismic data relied on a detailed analysis of amplitude variation as a function of offset using a combination of full waveform prestack inversion coupled with high angle AVO that allowed an estimation of density, in addition to compressional and shear impedance. This presentation will review the workflow involved in the project and show maps and sections of petrophysical and elastic parameters inverted from the 1500 sq.km volume.
