

Case Study of Advanced Seismic Imaging to Illuminate Low Reflectivity Carbonate Reservoirs in Offshore Abu Dhabi, UAE

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Abstract

Obtaining good subsurface images of low reflectivity reservoirs is an important task when processing seismic data from Abu Dhabi. Most of these reservoirs contain large hydrocarbon reserves, both onshore and offshore. The depositional and lithological settings of those formations, in many places, don't exhibit strong velocity and density contrasts, which results in weak seismic reflectivity and, therefore, low signal to noise ratio. This presents significant challenges in interpretation of the data and its use for inversion. Careful design of acquisition and processing parameters is key to ensuring successful interpretation and well planning. In this publication we present a case study of processing two-component OBC data acquired in shallow waters offshore Abu Dhabi, over an area with weak reflectivity at the target level. The dataset contained many challenges associated with the shallow water environment, such as: high-amplitude surface waves; multiples; near surface velocity and amplitude variations. We overcame these challenges by implementing an innovative processing workflow. This workflow made extensive use of well data at every step of signal processing and velocity model building to ensure continuous improvement of the image through the flow. It was observed that, for the target interval, seismic impedance obtained by post-stack inversion was more sensitive to velocity changes than seismic amplitudes. Analysis of post-stack inversions of velocity scans provided optimal velocities in that interval. Q Least Squares Migration improved the low frequency stability and AVA response of the final data. In this publication we present the workflow and the results of this project.