Exploration De-Risking Using Dense Seismic Acquisition and G&G Integration: a Case Study of Lower Cretaceous, Abu Dhabi UAE

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Abstract

Offshore Abu Dhabi have seen a lot of activity in the recent years, especially in terms of seismic acquisition and new exploration blocks. A mega seismic survey in Abu Dhabi waters is being acquired by ADNOC since 2018 aiming at a complete 3D coverage and improvement of the seismic imaging quality. This paper presents the results of an integrated study focusing on the less explored Ceno-Turonian stratigraphy. It aims at highlighting key points that made this study successful. The known processing challenges in this area are related to the recorded seismic wavefields, contaminated with strong multiple energy, due to the ultra-shallow water depth and strong impedance contrasts in the subsurface. In addition, poor dip discrimination between recorded primary and multiples energy due to gently dipping bathymetry and low relief-almost horizontal- sedimentary layers, pose challenges for multiple attenuation. Stability of phase measurement is also challenging, which is important for attribute analysis involving spectral decomposition (RGB Blend for example), which was an important tool in this study. The processing flow applied to the current dense OBN data aimed mainly at resolving the challenges of multiples energy and phase instability in addition to the velocity model and imaging challenges. Up/down deconvolution technology was applied, which is non-trivial in ultra-shallow water environment. This process targets the surface related multiples as well as the de-signature. In ultra-shallow water environment, the recorded data is highly contaminated with guided waves and mud-roll, therefore careful denoising was applied to preserve the water waves Furthermore, signal-to-noise ratio has been enhanced and preserved with a tailor-made processing flow. Upon the reception of early seismic volumes, a comprehensive phase analysis for phase stability was implemented. Then, energy frequency decomposition volumes were generated to create RGB displays. The RGB analysis process was key to the identification of several features related to the environment of deposition, subsequently, helping to prognose reservoir presence distribution. This interpretation was then validated using offset wells. Available information in the vicinity of the block and in same stratigraphy, was also integrated to verify the regional depositional trend observed. Finally, well based modeling, including extensive wedge modeling, was consistent with the depositional interpretation made from the RGB displays, confirming the post-mortem well analysis. The successful integration of comprehensive processing technology combined with robust analysis and reservoir QC tools have been pivotal for the exploration de-risking on this study.