

Diverging 3-D Seismic Attributes Characterize Pores and Fluid Fill of Unayzah-A in Eastern Province, Saudi Arabia

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Unayzah-A is a prolific hydrocarbon bearing reservoir in Eastern Saudi Arabia. Characterizing the variability of this aeolian reservoir and understanding the hydrocarbon fill are crucial in unlocking its gas potential. An integrated analysis and interpretation of 3-D seismic and well data from the eastern province, was carried-out to not only provide a better understanding of the reservoir facies distribution, its paleo-depositional set-up and compartmentalization, but also to address the porous rock distribution and the associated fluid fill.

A multitude of seismic-based attributes such as DETECT and CURVATURE, interval absolute amplitude and acoustic impedance show details that are interpreted as an indication of the presence of porous units and the associated fluid fill that are governed by the structural modifications of the area of interest. DETECT and CURVATURE revealed the presence of four major north-south fault trends that controlled the topography during the Hercynian and resulted in Unayzah sequences filling the paleo-lows.

A minor yet important perpendicular fault further segmenting the reservoir is also observed. Acoustic impedance at Unayzah-A level indicated porosity development in a southerly direction as evidenced by well-driven porosity maps in contrast to the northerly trend in fluid fill type as evidenced by interval absolute amplitude and well results. The diverging result from these two seismic attributes suggests the fluid type and porosity prediction can best be achieved by considering multi-attributes.