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# Seismic Attributes for Fracture Analysis: An Onshore Case Study in the Arabian Peninsula

**Mohammed A. Zagzoog[1]**

[1]Saudi Aramco, Dhahran, Eastern, Saudi Arabia.

## ABSTRACT

Defining natural fracture system in oil and gas exploration workflows is an important step that enables the interpretation of the fluid flow and facilitates the oil recovery as well as optimizes the production. This can be achieved by correlating data from different disciplines such as geology, and geophysics. In this paper, the ultimate goal is to identify fracture density and direction for an onshore carbonate field at the eastern region of the Arabian Peninsula by creating the fracture network map. Among many geophysical techniques for fracture characterization, seismic attributes (e.g., the orientation and the density) can be particularly useful. Since seismic attributes are sensitive to noise, preconditioning the seismic data has been done. Then, number of fracture maps network through post-stack seismic attributes have been generated such as dip-magnitude, dip-azimuth, coherence and curvature. The interpretation of results in the post-stack domain showed a general trend of lineament structure in the area of interest. To further investigate these post-stack results, pre-stack seismic attributes analysis has been applied. For this, in-house developed technique known as Amplitude Variation of Offset and Azimuth (AVOA) ratio method in the Tau-p domain has been deployed. The method removes the effect of the anisotropic overburden and recovers the true fracture parameters. The method involves analyzing AVOA for a reservoir pick and for a reflector above the reservoir. Seismic gathers are transformed to delay time slowness domain and the ratio of the reservoir pick to the layer below the reservoir is taken to remove the transmission effect from the overburden, followed by the fracture orientation and the fracture density inversion. The final step would consist of correlating the resulting maps of fracture networks to the existing geological models including the FMI logs in the area of interest.