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## Waveform Lateral Classification for Regional Facies Prediction

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This study addresses the regional exploration potential of the Unayzah sequences (Permo-Carboniferous) lateral stratigraphic variations and the seismic expressions of reservoir trends. A consistent seismic reprocessing flow, using Residual Amplitude Processing (RAP), was applied over a number of 2D seismic lines covering large areas to maintain a consistent wavelet treatment. Seismic waveform is the main seismic attribute adopted in this regional study of the Unayzah Formation. It recognizes Waveform Lateral Variations (WLV), which are interpreted to be indicative of regional stratigraphic trends and depositional environment transition zones.

The Unayzah Formation is characterized by laterally varying sedimentary facies due to different depositional environments, i.e., Aeolian to Playa Lake to Fluvial. Additionally, structural controls both at the Hercynian Unconformity, and later, affected the distribution of the Lower and Upper Unayzah reservoirs. Neural clustering generated from WLV is consistent with the depositional environment lateral facies variations. Furthermore, transition zones, recognized on the waveform analysis on 2D seismic lines, were consistent with an acoustic impedance model generated from a 3D survey within the area of interest. Other regional geological models, such as Gross Sand, Porosity and Net Sand showed similarity in the lateral variation.

Application of waveform classification on RAP processed 2D Seismic Composites helps the integration of seismic and regional geological models generated from the well data. This is exemplified by the good correlation between the waveform classification results and the well-based geological models in this study. Furthermore, the results suggest that seismic waveform classification could be used as a reservoir prediction tool in a regional geological framework.

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