

Examining Exploration and Production Myths in the Zagros

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ABSTRACT

The Zagros Mountains remain a promising region for petroleum geologists, yet many misconceptions exist regarding the exploration and production geology challenges of the region—the stratigraphy is often regarded as being layer cake; stratigraphic units are considered uniform in character, especially at the field scale; the only effective reservoirs are thought to be tight and fractured carbonates; the petroleum systems are believed to be well understood; and it is assumed that all play ideas have been tested. As a result of these misconceptions, exploration and production opportunities are not fully evaluated. The majority of petroleum system elements were deposited during Permian-Miocene time periods on the initially epeiric but eventually compressive margin of Neo-Tethys. As such, the depositional systems evolved in response to relative sea-level change and typically show marked progradation and retrogradation and consequently marked facies variation, particularly at the scale of the large fields present. Such variation is not captured in simplistic lithostratigraphy and requires a sequence stratigraphic approach to visualize correctly. As well as the implications for development strategies, such depositional systems hold the potential for untested stratigraphic trapping, especially in under-researched lowstand plays (both clastics and carbonates). While fracturing is often the dominant control on reservoir quality control, primary depositional fabrics are important and show porosity and permeability variations related to sequence stratigraphic organization. Furthermore, mechanical stratigraphy and sequence stratigraphy appear to be linked. In large parts of the Zagros, oils are typically heavy and biodegraded. Light oils with low sulphur content would be of greater value if they could be located. An Early Cretaceous petroleum system might offer such promise, as a group of oils is present having different characteristics to those generated by Jurassic, Mid-Cretaceous, and Tertiary source rocks. Basin modeling suggests that Early Cretaceous rocks could have charge potential in the Abadan Plain region and generate light crude. New play concepts include stratigraphic traps (e.g., onlap to emergent highs at key megasequence boundaries), subcrop patterns at the base Jurassic, and lowstand carbonate shelves and lowstand clastic deltas and fans. Erosion and channeling at key sequence boundaries support these lowstand play concepts.