

## **The geologic dynamics of the giant Shah Deniz gas field in the South Caspian Basin.**

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The South Caspian Basin represents an extremely young petroleum system in which over 8 kilometres of sediment have been deposited in the past 6-10 million years. Within the last 1-2 million years up to 3 kilometres sediment were deposited. These high deposition rates pushed the sedimentary section into significant disequilibrium with respect to the evolution of temperature and pore pressure and resulted in generation and migration of hydrocarbons. The basin dynamics are expressed in:

(1) Rapid, vertical and lateral pressure changes in the sediments that limit the capacity of seals to build and preserve petroleum columns and present challenges for well planning and execution.

(2) Low temperature gradients which delay petroleum generation from the source rock intervals and slow down diagenetic processes in the reservoirs.

Shah Deniz is a large structure located 100km offshore in the South Caspian Sea. The giant structure developed during the Pliocene as a doubly plunging anticline over the last 3 Ma, with approximately 2km of vertical relief and 360km<sup>2</sup> of four-way dip closure. The world class reservoir and source rock systems in the drainage area are regionally extensive and focussed fluid flow – water and petroleum – into the overpressured core of the anticline. Seal capacity of petroleum accumulations was restricted and limited column height of stacked pays. A recent regional uplift and erosion event is the likely cause for a large scale depressurization which created pressure regressions in a number of regionally extensive reservoirs. Indications of tilted petroleum contacts in some reservoirs can be interpreted as expression of an active hydrodynamic aquifer.

Integrated regional Petroleum Systems studies provided an understanding of the dynamics of the recent geology and the creation of the giant gas accumulation in the South Caspian. In particular, 3D fluid flow simulation techniques have provided insights into the creation of the complex distribution of petroleum columns and aquifer pressures around the Shah Deniz Structure.