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Dynamics of Mud Diapirs in the South Caspian Basin and Its Influence on the Petroleum System

Mud diapirism plays a special role in the geology and petroleum systems of the South Caspian Basin. Millions of tons of sediments are transported from the depth to the surface and influence sedimentation and structural development. Rising diapirs deform the surrounding beds and create additional faults and fractures.

Mud diapirs are usually connected to the surface by diatremes and faults. Due to the higher relative permeability in a diapir compared to neighboring sediments, fluids and gases move towards the vent. The pressure decreases in the diapir, much similar to a production situation where a development well drops the pressure in the wellbore relative to the neighboring formations. This pressure drawdown then aids the motion of fluids from the more overpressured sedimentary formations into the crestal parts of the diapir. Volcanic eruptions release accumulated overpressure and cause further influx of fluids into the diapiric stock. In this sense a diapir works like a large pump, sucking the fluids from the neighboring formations and releasing them to the surface. The process continues as long as the overpressure in the neighboring formations is sufficient to allow continued inflow and ejection through the surface vents. During a single eruption hundreds of millions of cubic meters of gas can be ejected.

All of these aspects of the diapiric and mud-volcanic activity should be kept in mind for volumetric calculations and play evaluation.