
Hydrocarbon Entrapment Mechanics in the Eastern Mediterranean Nile Delta Cone: Consequences of an Overpressured Environment

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The overpressure in the Nile Delta Tertiary sediments certainly influences the various elements and processes of the petroleum system through geologic time particularly seals/traps integrity. As a result, geopressure analysis definitely becomes part of the holistic discipline to investigate the critical element of risk for the hydrocarbon entrapment mechanics in such environment.

Trap filling can be considered as a dynamic process to maintain constant pressure magnitude and subsequently constant hydrocarbon column at the top reservoir. Leakage of natural gas from traps in Tertiary rocks resulted in gas chimneys which are mostly related to faults in the Nile Delta. Sealing rocks are generally sufficient to hold significant hydrocarbon column, except where structural collapse at crests. It has been mostly found that hydrocarbon column heights (seal capacity) approaching few hundred meters in the area of interest. Meanwhile, the majority of unsuccessful exploration wells show evidences of a residual or paleo-hydrocarbon column. These confirm the possibility of critically-stressed cap rock (seal breaching) with respect to the ambient rock field overpressure and stress developments during or subsequent to the hydrocarbon charge period.

The pressure lateral seal "centroid" is an extra potential risk for hydrocarbon entrapment and drilling hazards in overpressured dipping reservoirs. This does not rule out tectonic fault re-activation as an additional reason for hydrocarbon entrapment failures in the Nile Delta and North Sinai basins.

Key Points: overpressure, Seal Integrity, Centroid, Fault Re-activation and, hydrocarbon column height.
