

Tectono Stratigraphic Framework of Petroleum Systems in Egypt

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Throughout the Phanerozoic, Egypt has been an integrated part of the northeast African passive continental margin of the Tethys. Sedimentary basins have been evolving in a wide range of continental and epicontinental through marginal marine shallow embayments to deep offshore environments. The stratigraphic architecture of these basins was coined by the transgressive/regressive cycles of the Tethys and by the tectonic history of the Afro-Arabian plate, which behaved as a cratonic unity after the Late Proterozoic Pan African Orogeny. Many phases of Paleozoic and Mesozoic extensional tectonics continued until compressional regime took over during the Late Cretaceous and gently crept into the Cenozoic. Consequently some Mesozoic basins were inverted to form margins of the following Cenozoic depocenters. Two phases of Mesozoic extension related to Neotethys and Atlantic opening affected different areas variably but both are superposed in the north Western Desert. Cenozoic extension due to separation of Arabia from African plate opened the Gulf of Suez-Red Sea rift.

According to their geographic location and tectonostratigraphic framework, four petroleum provinces exist in Egypt: Gulf of Suez-Red Sea, Nile Delta-Offshore Mediterranean, Western Desert and Upper Egypt. In the Gulf of Suez Red Sea (oil province) source rocks are proven from pre-rift Campanian limestone and syn-rift Burdigalian marl. Further to the south a very rich source rock of Campanian to Maastrichtian black shale is widely distributed in the Red Sea. Reservoirs are wide range of pre-rift Precambrian fractured Basement, Paleozoic Mesozoic sands and Eocene Carbonates to syn-rift Miocene siliciclastics and carbonates. In Nile Delta and Offshore Mediterranean (Mainly gas/condensate province) Main source rocks are Mesozoic (particularly Jurassic) and Cenozoic (Oligo-Miocene). Biogenic gas is considerable particularly in the Pliocene. Reservoirs in onshore and shallow offshore are Mesozoic and Cenozoic clastics, while the deep offshore reservoirs are all Cenozoic sands. In the Western Desert and Upper Egypt (oil & gas provinces) Jurassic and Cretaceous source rocks charged Mesozoic reservoirs.

Structural Traps are the primary exploration targets. Stratigraphic and combination traps emerged in the last decade opening new plays in Nile Delta and in mature basins like Gulf of Suez. This work aims at synthesizing the current understanding of petroleum systems and hydrocarbon plays in Egypt.