

Un – Explored Giant Sandstone Features In Ultra – deep water , West Mediterranean , Egypt

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Extended Abstract

Nile delta is one of the main gas potential in Africa (62 TCF proven reserve) . Nile delta has two petroleum system which are Pliocene – Pleistocene system , where Pliocene shale has sourced dry biogenic gas and feeding in situ , Pliocene and Pleistocene fans and channels , the other is Oligo-Miocene system , where L. Miocene – Oligocene and Mesozoic shale and Limestone have sourced thermogenic gas , condensates and oil , feeding the Miocene and Oligocene channels , Canyons and fans . The offshore west part of Egypt is situated between the main apron of the Nile Delta and the East Mediterranean Ridge , to the South of the island of Crete . This area of bathymetric low , reaching to little over 3000 m in depth , is known as Herodotus basin . The area includes thick upper Miocene salt section and potential targets include Pliocene deep water sands above or overlapping salt domes and upper Miocene sands beneath or possibly between the salt cycles.

Additional Potential exists in Cretaceous and upper Jurassic reefs formed along the margin of North Africa carbonate platform . The margin of North Africa carbonate platforms an overall transgressive megacycle with reef slope development stepping back through time .

The offshore west part of Egypt are bordered to the NW by toe-thrust margin of the accretionary wedge associated with East Mediterranean Convergence zone due to decoupling within the Messinian salt . The area are bordered to the South by stacked Jurassic Cretaceous slopes of the North Africa Carbonate platform . The stepping back of the platform margin , especially at the beginning of the Cretaceous , led to the formation of isolated reef Complexes . The base upper tertiary time structure map shows the continuation of E – W and NE-SW fault trends from published mapping of deep water blocks to the east . The shelf edge of Cretaceous Carbonate platform is visible along the South margin of the offshore West part of Egypt . The dominant E-W structural trend probably reflects the geometry of the underlying Mesozoic rifts margin in Contrast to the NE-SW and NW-SE trends apparent to the East the upper surface of the Mesozoic shelf has been incised by deep valleys or Canyons . These valleys have supplied Sediment to channelised seismic packages with overall fan geometries situated immediately beneath the Messinian salt . These are presumed to be Miocene age , turbidite – distributary channel Complexes. The Miocene fan system appears to have been routed the faulted margin to the north of the present Nile Delta and to have built out Westward on the upper tertiary basin floor . The periphery of the main accumulation of presumed Miocene subsalt clastics maintains the gently mounded appearance of individual fan Complexes Lower Pliocene channels have been routed between developing salt swells to supply sediment to the Herodotus depocenter , where swells have continued to grow channel sands are closed by on lap and pinchout against the salt highs . Channel formation immediately above the salt shows the lower Pliocene fan system to have followed a similar routing to the Miocene sequences input to the depocenter vice more numerous channel system possibly responsible for sediment transport from SW is also seen . This area is frontier area , contains wide variety of stratigraphic traps include lowstand prograding complex and slope plays . The main exploration targets are distal Miocene turbidites sands that are commonly found filling

basinal channel features , fed by major river systems . In northern part of Nile Delta ultra – deep water , the Pliocene contains slope – basin plain turbidites comprising channel , channel levee , and sheet sand systems in subtle structural closures on the platform , large fault blocks , salt – induced anticlines around diapiric structures . Traps are formed by channel crossing fourway closures or structural noses .

In west part of Ultra – deep water , the Miocene depositional system offers attractive exploration opportunities and may yet prove the prime target in the deep water area due to wide variety of deposition environments (fluvial , shallow marine reservoirs and / or deep water turbidite sands) . The traps varies between channel / canyons which are filled updip by proven fluvio - marine and downdip by turbidite system .

Regional 2D seismic survey shot by Vertias (5500Km , 30-50 Km grid spacing) were acquired in the west Egypt ultra – deep water area . The seismic interpretation have identified late Miocene slope and basin floor fans and huge turbidites fills complex which are significant in size and might yield giant oil and gas fields . These unexplored late Miocene fans and turbidites are extensive lobes , tens of kilometers in width and length . Some of these sedimentary sand features exhibit seismic hydrocarbon indicator as bright and flat spots . Another huge late Miocene basin floor fans or turbidites fill complex are the fore deep gravity deposits of the huge Abu Madi late Miocene Canyon which will be located within shelf Northeast Mediterranean .

Aggressive 3D has been covered most of Nile Delta up to 1500 meter depth . The seismic stratigraphy , stratigraphic interpretation and amplitude anomaly maps led to discovering a lot of Pliocene , Pleistocene and Oligocene fans , late Miocene channels and huge Abu Madi Canyon . AVO analysis and modeling played important role in delineation seismic signatures which are observed and could be considered as direct hydrocarbon indicator . In addition , the Miocene geological setting was favorable for shallow marine carbonate growth on intra highs , as proven in the nearby Erasthenes seamount . Carbonate reef buildup extended east west in west Egypt offshore Mediterranean forming huge ridge which are considered important hydrocarbon reservoir . The best analogy to these unexplored turbidites fill complex are those of West Africa deep water major discoveries . Total reserves of West Africa increased from 14.18 Bbbls at the end of 1996 to 17.34 Bbbls at the end of 1997 , of this total 2.86 are attributable to new , mostly deep water discoveries of turbidites .

West Africa ultra deep water area is now regarded as the world's premier location for ultra deep water prospects and fields . The scale of the potential in other deep water basins such as offshore Brazil and the Gulf of Mexico .

Progradation within West Africa Niger delta led to deposition of good quality reservoirs in deltaic , shallow marine and deep water turbidite large scale sandstone bodies above moderate thickness of marine shale providing mature source rocks .

Accordingly , untested and unlicensed large fan – like mounds of middle Miocene in age are recognized on the 2D Vertias seismic lines .

In summary the area of the study is still at a very immature stage in its exploration for significant reserve addition .

Finally the using of proper acquisition and processing parameters , using most of the updated seismic techniques may enhance the seismic and better image of these sedimentary giant features .