Structural and Stratigraphic Trapping of Hydrocarbons within Late Jurassic to Early Cretaceous Section as Observed from Drilling and 2-D/3-D Seismic in Partitioned/Divided Zone of Kingdom of Saudi Arabia/Kuwait

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Historical work right-lateral and left lateral clay modeling

Structural Tectonics Elements Arabian Peninsula with evidence of left-lateral movement

Structural Tectonics Elements Gulf of Thailand with Evidence of right-lateral movement

Continent-continent collision of India and Asia setting-up left-lateral in Arabian Peninsula (Transpressional) and right-lateral in SE Asia (Transtensional)

Tectono-Stratigraphic Chart for Partitioned Zone

Partitioned Zone Transpressional and Transtensional Examples of structural trapping

Conclusions
Wilcox et al. 1975 Clay Experiments (importance to forward modeling of Wrench Systems)

Modified after Wilcox et al. 1973 (AAPG Bull. 57 vol. 1)
Tectonic Structural Features for Arabian Plate

Modified after (Al-Husseini 2000)
Field Mapping in Dead Sea Area (1959 & 1966 with comparison to forward modeling by Wilcox 1973)

Modified Quennel, 1959 (Asociacion de Sericios Geologicos Aficanos) and Aharoni, 1966 (AAPG Bull v. 50 no 11)
Arabian Plate 3D Seismic Seismic Evidence of Mixed Mode Tectonics (Filbrandt et al 2006 GeoArabia)

Modified after Filbrandt et al 2006
SE Asia Regional Tectonics with Gulf of Thailand current-day stress ellipsoid
SE Asia Patani Basin Example of Mix-Mode with Preponderance Transtensional Tectonics GOT
Arabian Peninsula and Gulf of Thailand with continent-continent Collision of India into Asia
Producing Fields within Partitioned Zone Highlighting Focus Area

- SUG
- South Fuwaris
- Wafra
- Humma

Kinematic Interpretation: Compression, SHmax
Example of Traps within Partitioned Zone “mixed mode” Transtensional and Transpressional Wafra

3D Seismic Grid with Faults

Seismic Section A-A’
Example of Traps within Partitioned Zone “mixed mode” Transtensional and Transpressional Wafra
Example of Traps within Partitioned Zone “mixed mode” Transtensional and Transpressional Wafra

Key Message: In left-lateral strike-slip environment “Arabian Peninsula” with en echelon extensional faults will develop a “pop-up” structure
Compartmentalized Ratawi Validated by Pressure Data
Conclusions

- Within the Arabian Peninsula the influence of left-lateral movement leads to mixed mode deformation with a preponderance towards transpressional tectonics with mixed transtensional “collapse graben” structures
  - Such transtensional faults from collapse graben are confirmed into Marrat sequence (Humma Field)

- En-echelon right-stepping extensional faults leads to structure development or “pop-ups” which are under left-lateral regional tectonic deformation
  - Look for the right-stepping extensional faults for possible ‘pop-up’ structures

- Arabian Peninsula may yield additional play-types as currently exploited in the Gulf of Thailand “high-and-tight” along transtensional fault systems
  - Similarly where identified, GOT transpressional structures may yield larger accumulations of hydrocarbon as currently exploited in Arabian Peninsula

- Defining and the inclusion of the stress-ellipsoid helps towards the prediction of an array fault types and structures for a given field/reservoir
  - Integration of FMI and dipmeter data with bore hole break-outs to determine stress ellipsoid orientation