EAGE

IR05

New Insights to the Implications of Salt Tectonics in the Northern Part of Kuwait Arch: An Integrated Modeling Study

P. Singh* (Kuwait Oil Company)

SUMMARY

An integrated model based approach involving depth converted 2D seismic sections, gravity, magnetic and well data is adopted to map occurrence and spatial limits of Eocambrian Hormuz Salt in the subsurface and to evaluate its influence on the development of structures in North Kuwait. The northeastern Arabian basin shows a poly-phase tectonic evolution that occurred under different stress regimes. Role of Eocambrian Hormuz Salt in evolution of structures on the Arabian Plate as well as Zagros Fold belt is well established. In Kuwait, salt triggered structures are not investigated in view of the fact of its non-piercement to the surface, attenuation of seismic signal at greater depths where the salt bodies are envisaged to be present and presence of multiple events. Additionally, carbonate stringers reported from Eocambrian salts in the adjoining regions generate seismic reflections and add to the problems of salt mapping.

The depth converted seismic sections are used as a bit map for 2¾D modeling to guide the geometry of the density polygons. The integrated models have brought out the presence of salt in the northern Kuwait. One of the deepest well in the northwestern Raudhatain encountered Hormuz Salt at a depth of 20200 feet and corroborated the model. The major faults are also mapped from integrated models.
A diapiric salt structure (Jabal Sanam) having surface manifestation is reported north of the Kuwait border and lends further credence to the model.

Structural analysis of subsurface data from the integrated modeling in the northwestern Raudhatain suggests the presence of the Hormuz Salt Pillow in the core of the anticline. This study is also extended to the Mutriba Structure to cover the northern part of the Kuwait. The role of tectonic events, particularly extensional faulting, and differential loading of sedimentary cover above the mobile salt layer is the main factor in triggering of salt diapirism. It is envisaged that Permo-Triassic Tethyan rifting, Cretaceous-Paleogene obduction and compressive events associated with basement reactivation of north-south Arabian trends could have initiated episodic salt diapir activity in the northern part of Kuwait. The faults probably played a role in weakening and breaking the overburden, and hence producing pathways for the salt movement. The salt pillow might have slowly grown in a compressive regime arising from Zagros Orogeny.

The structure needs to be evaluated in view of its unique structural history and hydrocarbon entrapment avenues.