Evidence of Subsurface Salt and its Influence on Reservoir Structures, Gabes-Tripoli Basin, Western Offshore, Libya

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Abstract

This study focuses on the documentation and analysis of reservoir structures above potential salt in the subsurface of the Gabes-Tripoli Basin offshore NW Libya. Despite the economic importance of the study area and a large number of wells drilled and subsurface data acquired, the presence of salt in the deeper subsurface of the basin remains a contentious issue. This study presents the analysis of a unique state-of-the-art 3D subsurface dataset (~1200 km^2 3D seismic-reflection data) to further discuss the presence of evaporites in the Gabes-Tripoli Basin. We present indirect geological arguments including fold style and gravity-driven tectonics that explain - in places - the formation of reservoir structures above a mobile subsurface salt substratum. The workflow used is specifically designed to enhance the seismic interpretability and identification of potential subsurface salt occurrence; it integrates 3D-seismic data pre-conditioning, structure interpretation, surface and volume-attribute analysis and isochore (TWT) map analysis.A key result of the detailed 3D subsurface seismic-reflection interpretation is the observation that the majority of potential salt structures in the study area has a distinct WSW-ENE orientation. These structures have been proven previously to contain the main hydrocarbon reservoirs offshore NW Libya. Other structures that have potentially formed above a mobile salt substratum are SSE-NNW oriented anticlines probably associated with an early rise of salt stocks (Jurassic? Cretaceous?). The alignment of these structures is approximately parallel to a basement-rooted fault trend, which indicates that potential subsurface salt movement might have been triggered by faulting. The SSW-NNW-oriented anticlines have not been drilled yet for hydrocarbons. The data and interpretations presented strongly indicate that subsurface evaporites likely played an important control on reservoir formation and hydrocarbon entrapment in the western part of the study area; in the eastern part of the study area the role of subsurface salt tectonics is less clear due to lacking salt formation or potential early salt withdrawal.