Reducing Uncertainties of Seismic Interpretation of Salt Structures by Structural Modelling of Onshore Case Studies in the Fars Area

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ABSTRACT

The study area is located in the Fars region at the southeastern tip of the Zagros Mountains. It comprises the onshore and offshore portions of the fold and thrust belt and the adjacent foreland south of the High Zagros Fault. This area is located where the Zagros Range, the Oman Range, and the Makran accretionary prism meet. A wide range of salt-related structures have been observed along the transition from the frontal structures of the Zagros fold and thrust belt and the Oman Ranges, and their boundary with the Arabian Foreland basin to the south and west respectively. We present new interpretations for the evolutional model of selected key structures in this area based on off-shore seismic lines, field data and regional cross-sections. Evidences from seismic data and fieldwork demonstrate the long lasting halokinetic activity of the thick pre-early Cambrian Hormuz salt from early Palaeozoic to recent times (Jahani et al., 2009; Perotti et al., 2016). Diapir activity is strongly affected by the tectonic history of the area and cyclically affects the sedimentary cover. We have found clear evidences of passive diapirism during the relative quiescent early Palaeozoic, and the Mesozoic. The regional uplift and erosion during the Carboniferous and the Permo-Triassic extensional event may have triggered mechanisms for salt activity. Diapir rejuvenation and squeezing occurred during the Oman and Zagros contractional deformation, respectively during late Cretaceous to Paleogene and Oligocene to present day times. The structural and timing relationship between the Oman and Zagros compressional onsets determined the amount of deformation accommodated and the structural style of the diapirs during the shortening. The Oman reactivation is suggested by the presence of numerous Hormuz salt bodies embedded in the Gurpi Fm. and it is especially evident along the Oman Range thrust front. On the other hand all the salt structures were reactivated during the development of the Zagros fold and thrust belt with a general trend of progressive squeezing from foreland to the interior of the Zagros Mountains. The comparison between on-shore and off-shore diapirs reveals geometries in different stages of their evolution and at different scales. The seismically transparent salt formations and the steep geometries and truncation often associated with the diapir-related structures are challenging geophysical interpretation issues and need to be addressed properly. We discuss how non-seismic data from outcrop, analog and conceptual models can be integrated to a more reliable and predictive interpretation.