

A New Insight on the Hydrocarbon Prospectivity of Northern Tunisia

Habib Troudi¹, Aymen Guizani¹, and Makrem Harzali²

¹Entreprise Tunisienne des activités Pétrolières, Tunis, Tunisia

²Water, Energy and Environment Laboratory, Engineering National School of Sfax (ENIS), University of Sfax, Tunisia

Abstract

The exploration of the North offshore and onshore Tunisia has been neglected for many years due to the common perception that the area was tectonically extremely complex, with a very high risk of extreme compartmentalization. The objective of this study was to develop an integrated approach to highlight the best exploration opportunity via the analysis of four fundamental elements: 1) structural analysis based on outcrops and available 2D seismic data, 2) mapping of the major hydrocarbon play segments, 3) basin modeling based on different burial history scenarios, and 4) identification of types leads and estimation of risk and resources. The generated CRS maps based on play assessment, basin modelling, simple but convincing structural model, and closures provides a powerful tool for a better screening of North Tunisia blocks. In this study we adopted a simplified geological model despite some inversion and reactivation of earlier extension as occurred the extent of piggy back thrusting was shown to be less likely and not balanced structurally. This new simplified play concept postulates 4 way closures with moderate wavelength resulting from folding of the autochthonous sediments, salt bounded 3-way dip closures (at salt walls and diapirs), and fault bounded traps formed by reactivation of rift faults. The presence of active petroleum system is proved by a multitude of oil seeps which are correlated to mature source rocks and perfectly validate the very convincing 2D basin model. The principal reservoir targets are the Late Cretaceous and Eocene fractured chalky limestone or tight carbonate; therefore, the long-lived fracturing above the reactive salt diapir is most likely responsible for some productive carbonate reservoirs. The secondary reservoir targets are represented by the clastic turbidite of the Oligocene Numidian flysch and the Early Cretaceous M'Cherga Formation. The abundant seeps and the relative confidence in their range and age distribution bodes well for a regionally active charge system regardless of latest uplift. The kitchens may have been switched off but an active migration and potential trap fill present day is possible. Charge is well served at the regional scale. Prospect scale will be more challenging due to migration shadowing due to structure, and or stratigraphic challenges. The petroleum system work corroborated the oil / source rock correlation and pointed to a nice maturity trend to the north west (increasing maturity). The implications of the new concept are enormous and might change the way to look at the North Tunisia underexplored province. In order to further prove the concept and to have a clear answer about the addressed questions (amount of erosion by major unconformities, trap type and size, migration pathways, breaching,..) a lot of additional seismic is needed; The available seismic is sparse and very poor, much effort is needed to come up with better products.