Somalia – The Last Remaining Exploration Frontier

Douglas Paton[1], Hannah Kearns[2], Roxana Stanca[1], Karyna Rodriguez[2], Neil Hodgson[2], Abdulkadir A. Hussein[3]

[1]University of Leeds, Leeds, United Kingdom.
[2]Spectrum, Woking, United Kingdom.
[3]Ministry of Petroleum and Mineral Resources (MOPAR), Federal Government of Somalia, Mogadishu, Somalia.

ABSTRACT

The offshore Indian Ocean margin of Somalia represents one of the final truly frontier margins globally with little known about either its tectonic evolution or basin-structure configuration. To date this has severely impeded hydrocarbon exploration in the mid-shelf and deepwater areas of the >1500 km long margin. Recently acquired long offset 2D reflection data by Spectrum has revolutionised our understanding of the margin architecture which has significantly de-risked future exploration. In this study we take an integrated basin analysis approach whereby we undertake interpretation of the 2D profiles using a sequence stratigraphic approach to develop the tectono-stratigraphic evolution of the basin. Given the variation and uncertainty in crustal architecture we then calibrate our interpretation with gravity and magnetic modelling to derive a robust understanding of the margin. The results of the study demonstrate a remarkable variation in crustal configuration along the margin. Although there is evidence of volcanism, the margin is on the whole non-volcanic and comprises areas of extended crust, hyper-extension and possibly exhumed mantle. Superimposed upon the crustal architecture is a complex interplay of post-rift structure and sediment remobilisation. This is in part responding to regional scale strike-slip tectonic which is likely to be the northern manifestation of the transtensional system that has been well-documented along much of East Africa. However, the presence of substantial Deep Water Fold and Thrust Belts and shale diapirism also reveal the influence of broader geodynamic/margin uplift processes. These observed features closely replicate many of the successful plays proven in recent discoveries on the offshore East African margin such as the inversion anticlines along strike-slip systems offshore Kenya and the sub-thrust DWFTB offshore Mozambique. Initial thermal modelling of the margin suggests that although heat flows may be low as a function of it being a non-volcanic margin, there is sufficient sediment overburden to place predicted source rock intervals into the oil window. This new data set, therefore, has allowed us not only to revise the tectonic evolution of this unexplored margin, but also to demonstrate the presence of a wide suite of plays that have been proved successful further south on the East African margin.