Unravelling South Africa's Frontier Offshore Areas

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ABSTRACT

To date, most of the vast areas offshore South Africa and beyond the shelf remain undrilled and can be classified as frontier acreage. Good-quality seismic coverage and the recently re-processed ~80,000 km Petroleum Agency SA gravity and magnetic surveys, which have been integrated with Getech's potential field data, have been tied to on-shelf well control. These data sets provide insight into the petroleum potential of the poorly explored to unexplored frontier areas. The region's tectonic evolution was reviewed by means of Getech's new Multi-Sat gravity and magnetic data set, constrained by thirteen 2D modelled gravity and magnetic profiles and integrated with Petroleum Agency SA's seismic and well data. Modelling of the gravity and magnetic data along seismic profiles with key well control has reduced uncertainties in the seismic interpretations. This method was key for the identification and mapping of seaward-dipping sequences, flood basalts and the undrilled pre-drift western wedge of the Orange Basin. The modelled crustal sections allowed us to resolve the crustal architecture of the offshore basins in high resolution. The results contribute to the refinement of our Global Plate Model in Southern Africa, including revised pre-rift fits with conjugate South America and Antarctica, improved syn-rift history and resolved crustal architecture for the Southern Natal Valley and Durban Basins. The region's geological evolution was investigated using elements of Globe, Getech's New Ventures solution. These data sets provide a globally consistent platform of palaeogeographic reconstructions per Stage from the Permian to the Present Day, along with palaeodrainage, climatic and oceanic modelling on which to further investigate the regional prospectivity. The integration of these data sets with the interpretation of Petroleum Agency SA's seismic data enabled an enlightened interpretation of play elements and their distribution in the frontier regions of Southern Africa. Examples addressing key exploration questions in these frontier regions (i.e. the unexplored shelf and deep-water acreages) will be presented in order to better evaluate the hydrocarbon prospectivity of these areas. These examples include source rock types and presence, the potential of the deep-water Orange Basin and the neighbouring unexplored Cape Sub-basin, and sediment input and reservoir distribution within the undrilled Southern Outeniqua Sub-basin.