

Modelling Basin Evolution and Assessing Source Rock Potential Within the Orange Basin, Offshore South Africa

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The Passive continental margin basins, the Orange Basin, offshore the southwestern coast of South Africa is South Africa's largest offshore basin covering an aerial extend of 130 00km². This sedimentary basin is relatively under explored, with only 39 wells drilled up to date. The under explored nature of the basin coupled with proven Hydrocarbon (HC) plays, the Kudu and Ibubeshi gas fields, makes it a good platform for frontier HC exploration.

The current study focuses on the southern part of exploration blocks 3B/4B within the Orange Basin. It encompasses a basin analysis study by integrating 40 seismic lines, petrophysical logs and chemical data from 6 wells to model basin evolution and evaluating the source potential of the area to generate HC.

The seismic interpretation was done on the Cretaceous (post-rift) succession that commenced from the 6At1 sequences boundary, excluding the basement and syn-rift intervals. In total, nine sequence boundaries were mapped, seven within the Cretaceous and two Tertiary based on the stratigraphic framework of Brown et al. (1995) and Weigelt & Ünzelmann-Neben (2003). Well correlation across the six wells identified 3 possible source rocks: 1) Lower Aptian, 2) Upper Aptian and 3) Cenomanian.

The source rocks were modelled with varying heat flow histories to assess source rock maturation and HC proliferation within the basin. The first model assumes exponential heat flow decay, with a heat flow of 80W/m² at the onset of rifting that decays to 55W/m² at present day. The second model takes a constant heat flow of 55W/m² in consideration over the whole evolution of the basin.