Early Cretaceous Carbonate Build-Up Plays, Offshore Namibia and South Africa Margin

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ABSTRACT

The Orange Basin post-rift evolution is characterised by episodic gravitational collapse of the margin in the Late Cretaceous. Gravitational collapse structures are recorded as a series of gravity slide fold and toe-thrust systems, consisting of an up-dip extensional domain that is linked to a down-dip zone of contraction domain along a basal detachment of possibly over-pressured Cenomanian/Turonian source rock. Beneath the gravitationally driven collapse structures, the Early Cretaceous post-rift evolution of the Orange Basin comprised a mixed fluvial-deltaic, carbonate platform/build-up and restricted marine depositional system. The Aptian restricted marine source rocks have been encountered in a number of wells penetrated along the margin including the DSDP 361, South African and Kudu wells, and recent wells drilled by HRT. Albian fluvial channel and fan sands provide a proven play on the shelf in offshore South Africa (e.g. Ibhubesi gas field etc.). The Early Cretaceous carbonate platform and build-up are a key sequence within the Orange Basin especially in the south and centre, restricted in a dip sense to the area between the hinterland (also known as the Inner High) and the younger folded Seaward Dipping Reflectors (SDR) structural high known as the Outer High. The true geometry, large-scale architecture and morphology of the carbonate platform and build-up, is revealed in depth seismic sections. Early Cretaceous carbonate build-ups are associated with the folded structures of the SDR. Two distinctive phases of carbonate build-up are observed and they are fundamentally accommodated by different stages of the folded SDR structural high. The earliest carbonate build-up developed on a Barremian high as part of an early sag phase above a syn-rift SDR sequence, that is now located on the eastern flank of the present-day Outer High. This early carbonate build-up clearly shows prograding platform geometry, although this is probably mixed with later volcanic intrusion in places. The younger carbonate build-up predominantly deposited on the present-day Outer High and it has backstepping platform geometry. In some sections, aggrading platform geometry also observed in the latest stage of the carbonate platform development. A carbonate build-up play has been identified within the Orange Basin, comprising a structural closure of up to 900 sqkm. This carbonate closure could be directly charged from the Aptian restricted marine source rock.