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Upper Cretaceous to recent paleo-submarine channel seismic stratigraphy in the Southern Orange Basin, offshore South Africa

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The internal geometry and regional extent of large scale paleo-submarine canyon systems were mapped on 2D seismic data offshore the Southern Orange Basin. Deep water submarine fan and channel sedimentation are primarily controlled by sediment-type and supply, regional tectonism and sea-level fluctuations according to Stow et al. [3] and others like Reading and Richards [2]. In the Southern Orange Basin these massive submarine canyons shaped the upper, mid and lower paleo-slope and upper shelf during Paleocene though Holocene (recent) times and to a lesser extend during the Upper Cretaceous period, as interpreted on seismic data.

In the study area, most canyon systems are interpreted as being formed mainly by slope failure as a results of a combination of factors including tectonics (episodic uplift during the Miocene), unstable paleo-slope dip (angle), aggradation and the width of the shelf during the Cenozoic era. Judging by the position of the paleo-shelf and slope, these canyons were most probably detached systems, meaning that they breached the paleo-shelf break and did not extend far enough landward to capture fluvial systems.

These steep slope conditions most probably set the stage for rapid deposition via these submarine canyon systems into the proximal basin. Sediments accumulated as basin floor and slope fans within local depressions, some recognizable on seismic data in the study area.

These channel systems transported large amounts of sediment to the deep water and deposited it as relatively mud-rich turbidites. In the northern parts of the Orange Basin where the gradient of the paleo slope is not as steep as in the south, submarine channel systems did not have a mass flow character, causing turbidites to be more sand rich. Studying, mapping and sequential stratigraphic analysis of these canyons systems proves to be very significant in terms of understanding the area for petroleum exploration. The internal geometry of the canyon fill is very well imaged on seismic data due the fact that they occur at relatively shallow depths. Besides the fact that it gives significant insight into how these systems developed in the upper parts of the succession, it also assists with interpreting reservoir facies associated with submarine canyon sediment transportation of the lower Cretaceous succession where there is a lack of well control and where seismic resolution is significantly lower.

References:

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