

Sand Body Thickness Variations in the Outer Fan and Fringe of a Fine-Grained Deepwater Fan: Implications on Reservoir Characteristics of Turbidite Sands

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ABSTRACT

Outcrop studies of the Permian Skoorsteenberg Formation in the Tanqua Karoo subbasin of South Africa yield an applicable example of fan termination characteristics in the outer sheet sands that exhibit a digitate morphology near the fringe. Massive fine grain sandstone deposits of the outer fan are evidence of significant sediment bypassing (70–90%) to the distal fan area. Hydrocarbon reservoirs can be found in all the architectural elements of submarine fan deposits in the Gulf of Mexico and around the world, including the outer fan fringe deposits. Routine examinations of seismic and well log data may not properly delineate these types of reservoirs.

Once the head of a turbidity current becomes higher than the levee crests, overflowing will commence, forming oblong sheet sands. Outer fan architecture shows that the onlapping of sheet sands result in massive sand bodies. Gradual loss of sand forces the current to separate into lobe fingers resulting in irregular seafloor topography.

Examinations of outcrops in the Tanqua Karoo indicate that vertical variations in bed thickness can range from 42 cm (1.4 ft) to 7 m (23 ft). The flat basal contact of sandstone layers in the outcrops, together with the near lack of amalgamation, scouring, and rip-up clasts in the sandstones, suggest that the seafloor bathymetry has a dominant control on the sand body geometry. Onlapping of sheet sands or bifurcation of sand lobes will not be noticed on seismic records unless specific attention is used.