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Reservoir Properties of a Gravitationally Unstable Shelf Edge Dispersal System: Olympen Formation (Upper Callovian-Lower Oxfordian), Jameson Land, East Greenland

Series of rift basins formed along East Greenland during Late Jurassic break-up of the Pangea super-continent. In Jameson Land, sand-rich shelf edge – slope – basin floor systems dominated during the early, Callovian – Kimmeridgian syn-rift stage. These well-exposed systems may serve as useful field analogues for a poorly understood but important type of hydrocarbon reservoir.

The uppermost Callovian – Middle Oxfordian Olympen Formation consists of 1. coarsening-upward cross-stratified sandstone units representing offshore prograding sand-wedges on the shelf edge, 2. elongate or sheet-like massive sandstone bodies representing a variety of sediment gravity flows on the slope and basin floor, and 3. mudstone representing settling from suspension on the slope and basin floor.

Down-slope transformation of sand-grade gravity flows and resultant depositional architecture can effectively be demonstrated from systematic spatial and temporal variations in massive sandstone geometry. Lenticular, down-slope elongate sandstone bodies occur randomly scattered within prograding shelf-edge wedges and slope mudstone. They represent dense, non-turbulent to fully turbulent flows, filling pre-existing gullies that formed by retrogressive slumping on the slope. Sheet-like sandstones encased in mudstone were deposited from unconfined turbidity flows at the base-of-slope and on the basin floor.

The resulting reservoir-analog is bipartite with an upper reservoir-level consisting of up to 150 m thick, well-structured sandstone deposited along the shelf edge, and a lower reservoir-level consisting of up to 70 m thick, amalgamated sheet-like massive turbidite sandstones, deposited along the slope – basin floor transition. The two levels are connected by stringers of gully-filling turbidite sandstone, which may serve as migration conduits for hydrocarbons.