Role of Mass-Transport Deposit (MTD) Related Topography on Turbidite Deposition and Reservoir Architecture: A Comparative Study of the Tres Pasos Formation (Cretaceous), Southern Chile and Temburong Formation (Miocene), NW Borneo

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Submarine-slope topography has a fundamental control on turbidity current routing and the subsequent distribution and geometry of associated deposits. Although typically controlled by tectonics, an increasing number of field and subsurface-based studies have demonstrated that topography developed at the top of mass-transport deposits (MTDs) also influences turbidite depositional patterns. This has clear implications for the distribution and architecture of turbidite-sandstone reservoirs, although there is a paucity of outcrop analogues with which to understand these relationships in the subsurface. This study focuses on the slope to base-of-slope Tres Pasos Fm (TPF), Southern Chile and Temburong Fm (TF), NW Borneo; in these locations the effect of MTD-related topography on turbidite depositional patterns is highlighted.

The upper surfaces of the mud-rich MTDs are highly irregular at both field locations, commonly due to large intrabasinal clasts. Three hierarchical levels ('Tiers') of topographic relief are identified, which have a varying impact on the geometry of overlying turbidites; (i) Tier 1 - metre-scale topography caused by the cohesive nature of mud-rich MTDs; controls individual bed-scale onlap and pinchout within overlying turbidites; (ii) Tier 2 - metre to decametre-scale topography related to either rafted clasts or possibly imbricate-thrust faulting within the debrites; controls onlap, pinchout patterns, and internal architectural styles within bed packages; and (iii) Tier 3 - topographic relief of up to several hundred metres related to either cohesion-related topography or large, out-sized clasts; controls the pinchout of entire turbidite packages (i.e., 'fans').

MTDs, depending on their composition and thickness, may cause stratigraphic compartmentalisation of turbidite reservoirs, resulting in the multiple fluid contacts and highly-variable pressure regimes. It is important, therefore, to understand the scale and potential impact of MTD-related topography on turbidite reservoirs through incorporation of outcrop data and, for example, forward-seismic models. Synthetic profiles of exposures in the TPF illustrate the uncertainties associated with identifying subtle stratigraphic relationships on standard industry seismic-reflection datasets and further emphasize the need to constrain reservoir models with detailed outcrop studies.