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Poorly Confined Submarine Channels: Distribution, Evolution and Architecture

There is a tendency to classify deep-water architectural elements and depositional systems as either channel-form (erosionally confined with lenticular bed geometries) or lobate systems (unconfined, or confined at a basin-wide scale, with sheet-like bed geometries). This bipolar approach can lead to inaccurate and misleading geologic models. A less commonly described architectural element, between these two end members, has been referred to either as coalesced sheets or poorly confined channels. The Permian deep-water system in the Tanqua Karoo Basin, South Africa, contains several well-exposed examples of poorly confined channel systems and allows detailed analysis of this architectural element. Two 4-km2 study areas have been digitally surveyed and logged at a high resolution, which has increased understanding of the distribution, evolution and architecture of poorly confined channels. They are preferentially distributed in axial parts of submarine fan complexes and are represented by 10-20m thick loci of high amalgamation (axial) adjacent to zones of lower amalgamation (marginal). Zones of amalgamation are spatially associated with 2-0.3m deep erosional surfaces, where the deepest and/or steepest areas of erosion are typically mantled with mudstone rip-up clasts, interpreted as lag deposits indicating periods of bypass. Basal erosion surfaces decrease in amplitude distally. The channels in map view form ellipsoids and are interpreted as in-filled scour surfaces. Poorly confined channels have also been identified in core and wireline logs from boreholes drilled within the study area. Poorly-confined channel systems have also been identified in the Laingsburg Karoo Basin, the Brushy Canyon Formation, Texas, and the Hondarribia Formation, Northern Spain.