Deep-Water Channel Development in Proximity to the Channel-Lobe Transition: An Outcrop Example

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Deep-water channel-to-lobe transition zones represent the evolution of sediment-laden gravity flows from generally confined and erosional to unconfined and depositional processes. However, these transitional zones commonly are studied only on the present seafloor and with local, relatively shallow-penetrating piston cores, which provide a limited perspective of stratigraphic architectural variability and evolution. High-resolution mapping of outcropping base-of-slope, or toeset, deposits from an ancient basin margin, Magallanes Basin, Chile, reveal extensive sandstone that correlates updip to siltstone-dominated slope deposits with local evidence for sediment bypass and sandstone accumulation. Sandstone bodies of the toeset transition from channelized to tabular basinward and, hence, the outcrop offers a unique opportunity for detailed sedimentological characterization of channel-lobe transition strata.

The outcropping deposits of the Magallanes Basin provide evidence that erosion was critical in establishing deep-water channels in the channel-lobe transition. Creation of individual channel complexes initiated with incision of a master conduit (up to 20 m deep) and sediment bypass. Subsequent flows, which were underfit with respect to the master conduit, are interpreted to have included: (1) depositional flows that created confining thin-bedded overbank deposits within the master conduit (inner levees) and thick-bedded, amalgamated axial sandstone units; and (2) periodic higher energy bypassing flows, which are recorded by erosive surfaces and turbidity current tail deposits interbedded with inner levee units. Once filled with at least 6-15 m of amalgamated sandstone in the channel axis, a new conduit was typically incised and the channel evolution cycle repeated. The composite stratigraphic package of stacked channel deposits preserved in the outcrop belt is approximately 300 m thick. Successive channels are typically vertically stacked, slightly offset from one another.