DOWN-DIP TERMINATION OF SANDY FAN SYSTEMS - NEW INSIGHT FROM THE PENNSYLVANIAN ROSS SANDSTONE FORMATION, WESTERN IRELAND

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Sandy deep-sea fan systems can terminate distally by downlap, onlap or ponding; the distinction is important in terms of predicting distal fan fringe reservoir potential and character. The Pennsylvanian Ross Sandstone Fm. in western Ireland forms part of a thick (>2200m) progradational and shallowing-upward basin-fill succession. It crops out in sea cliffs around the outer Shannon Estuary (Loop Head peninsula) where a combination of behind-outcrop drilling and biostratigraphy have established a 490m-thick stack of at least nine sandy deep-water fan systems separated by variably-expressed condensed sections. Palaeoflow measurements indicate a north-easterly dispersal and it is likely the system was weakly confined laterally within a pre-existing trough (reflecting earlier Mississippian-age crustal extension). But how did these fan systems feather out distally? New and legacy borehole constraints and outcrop work on the eastward extension of the Ross help constrain the down-dip character at different levels in the fan stack.

A key outcome of the Loop Head coring has been the recognition that the advance of the sandy Ross system was preceded by a distinctive precursor cycle involving first many stacked thin mudflows, followed by isolated outsized and unusually coarse-grained hybrid event beds. The former dominate the upper part of the Clare Shale Fm. and extend through the first cycle of Ross deposition. They are interpreted as a muddy fringe deposited by the clay-damped wakes to flows that left most of their sand up-dip, implying a strongly feathered sand limit, controlled by flow dynamics at this level. This style of deposit is restricted to the outer Shannon area and similar deposits are not present further to the east. The overlying stack of fan systems are dominantly fine-grained sand and biostratigraphy confirms that they must shale out down-dip within 50km. The Ross-equivalent successions in east Clare and Kerry are thinner (40-150m thick) and mostly in barren or goniatitic mudstones. These are directly overlain by mass-transport complexes and subordinate sandstones attributed to the overlying Gull Island slope and base-of-slope system. Much of the Ross sand was probably trapped in a more rapidly subsiding westerly depocentre, with the distal fan fringe pinned by a slowly back-rotating axial counter slope that forced flows to decelerate, preventing them from escaping further to the east, but never with sufficient gradient to induce flow ponding.