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 terminate distally by downlap, onlap or ponding; the distinction is important to predict 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 490 m-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 of the fan stack.

Coring of the basal Ross in the west (Loop Head, Ballybunion) show that the advance of the system was preceded by a distinctive precursor cycle involving first many stacked thin (cm/dcm thick) mudflows, followed by isolated outsized and unusually coarse-grained hybrid event beds. The former 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. These deposits are restricted to the outer Shannon area and none are present further to the east. The overlying fan systems are dominantly fine-grained sand and biostratigraphy confirms they shale out down-dip within 50 km. The Ross-equivalent successions in east Clare and Kerry are thinner (40-150 m thick) and mostly in an alternation of barren and goniatitic mudstones. These are directly overlain by mass-transport complexes and subordinate sandstones attributed to the overlying Gull Island slope system. Much of the Ross sand was thus trapped in a more rapidly subsiding westerly depocentre. The distal fan fringe was 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.