Evidence of Wave-Dominated Deltaic Deposition in the Strongly Storm-Dominated, Lower Cretaceous Glauconite Formation, Strachen and Ferrier Area, Alberta, Canada.

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ABSTRACT

Distinguishing strandplain shoreface from wave-dominated deltaic deposits is problematic where facies are strongly overprinted by storm events. The storm-dominated Glauconite Formation in the Strachen and Ferrier field areas of Alberta, exhibit subtle indications of accumulation in wave-dominated deltas. Such sedimentologic indications of deltaic accumulation include soft-sediment deformation, syneresis cracks in mud drapes, apparently structureless beds, and possible delta-front turbidites.

The principal discernable differences between delta and strandplain deposits occur in facies attributable to prodelta and distal delta front environments and the corresponding offshore and lower shoreface, respectively. In the offshore, hummocky cross-stratified (HCS) sandsones encased in sandy mudstones contain diverse and abundant distal and archetypal expressions of the Cruziana ichnofacies. HCS-bearing heterolithic intervals from the prodelta of wave-dominated deltas yield a diverse, though “stressed” Cruziana ichnofacies. Prodeltaic deposits contain sharp-based tempestites that may display burrowed tops or may be mantled by post-storm mudstone drapes. Although such prodeltaic intervals show comparable ichnological suites to those of the offshore, reduced bioturbation intensities, paucity of vertical suspension-feeding structures, and size reduction of ichnogenera are common, reflecting higher physico-chemical stresses.

Strong storm overprinting of the distal delta front and the analogous lower shoreface leads to broadly similar facies, consisting of stacked, erosionally-amalgamated tempestites. Depending upon the proximity of riverine input and the degree of delta asymmetry, the fair-weather deposits of the distal delta front may contain structureless sandstones interbedded with synsedimentary-deformed sandstones, sporadically capped with black, organic-rich, apparently massive shales. The ichnological suites of the distal delta front show low numbers of deposit-feeding and grazing structures, with very rare suspension-feeding structures. This paucity of suspension-feeding structures is probably due to elevated water turbidity. Despite the predominance of sandy substrates, such distal delta front successions yield a low diversity, proximal expression of the Cruziana ichnofacies. This contrasts with lower shoreface deposits, which typically possess abundant deposit-feeding and suspension-feeding structures, defining the mixed Skolithos-Cruziana or archetypal Skolithos ichnofacies.

In both settings, strong storm influence results in the seaward extension of sand-prone deposition from fairweather wave base to the much deeper storm-weather wave base. This obscures details of the offshore/lower shoreface and analogous proximal prodelta/distal delta front contacts, and results in anomalously overthickened intervals.