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ANALYSIS OF A STORM-FLOOD-DOMINATED DELTA SUCCESSION FROM THE CRETACEOUS OF PATAGONIA (AUSTRAL-MAGALLANES BASIN)

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Storm-flood-dominated deltas are shaped by the interaction of river floods and storm waves, where continental and open marine processes act simultaneously during storms. Their stratigraphic record remains poorly constrained, especially regarding facies variability and ichnological features. To address this, we conducted a high-resolution sedimentological and ichnological analysis of a 75-m-thick sedimentary succession of the Piedra Clavada/Kachaike Formation (Cretaceous, Austral-Magallanes Basin), to: (i) decipher the variability of depositional processes linked to storm-flood events, and (ii) assess the physicochemical conditions influencing trace-making communities.

Facies associations (FAs) analysis reveals multiple deltaic-coastal elements, including complex prodelta fines, storm-flood frontal splays and channels, mouth bars, and storm-wave sandstone bodies. FAs record the interaction of hyperpycnal flows, hypopycnal plumes, wave-enhanced muddy gravity flows, and both fair-weather and storm wave processes, at both bed and bedset scales. These suggest deposition during storm-flood events alternating with inter-event (i.e., fair-weather) periods, mostly in prodelta to delta-front settings under storm-flood dominance. Vertical stacking evaluation and bounding-surface analysis allowed the recognition of 3 hierarchical levels of high-resolution genetic units: (i) two parasequences separated by a transgressive surface, the lower further subdivided into (ii) bedsets bounded by flooding surfaces; and (iii) sub-bedsets bounded by minor flooding surfaces. This stratigraphic framework reveals the autogenic and allogenic controls on storm-flood delta stratigraphy and provides insights into delta-lobe evolution under event-dominated conditions. Storm-flood dynamics additionally generate complex physicochemical conditions reflected in the ichnological signatures of the deposits. The overall reduction in bioturbation intensities (BI 0–5, typically 0–1), with extended intervals lacking bioturbation suggest that elevated sedimentation rates represented a primary stress for tracemakers, with limited colonization windows. The low ichnodiversity of these deposits, in addition with the presence of syneresis cracks suggest short-lived periods of reduced salinity. The dominance of structures positively correlated to mobile and sessile deposit-feeding strategies in detriment of suspension-feeding structures, which are markedly absent, indicate elevated water turbidity. Abundant phytodetrital pulses might also favor reduced bottom-water oxygenation resulting in unburrowed beds or suites dominated by *Chondrites* and *Trichichnus*. Rapid mud deposition via gravitational collapse of buoyant plumes or tractive remobilization likely produced fluid-mud substrates (soupground), which are mostly devoid of bioturbation or show only scattered sediment-swimming structures (navichnia) or deformed traces.