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Facies Characteristics, Time and Space Distribution of Channelised Sand-bodies within the Pliocene Nile Cone Succession (WDDM Concession, Nile Delta Offshore, Egypt)

Facies characteristics, time and space distribution of Pliocene channelised sand bodies of the Nile Delta offshore, are ultimately related to processes originated in the delta front region. Pliocene sedimentation in the Western Platform area occurred on a shallow, low-gradient ramp. Rhytmic alternation of sand-rich and mudstone units reflects the interplay between climatically-controlled, fluvio-deltaic processes, and sea-bottom topography changes induced by tectonic deformation. Mudstones with interbedded thin sheet sandstones represent the 'background' sedimentation; they derive from hypopycnal or low-density hyperpycnal flows, and are related to phases of normal fluvial activity. Channelised sandstone bodies developed since the late Early Pliocene, following a tectonic event that caused the progradation of Nile deltaic wedges and moved the delta front to the Rosetta Fault Zone. High tectonic instability of this area, together with climatic/eustatic factors, periodically triggered large-volume, highly erosive flows that formed channelized sand belts in outer shelf to slope regions. Deposition was promoted by sudden deceleration due to shelf gradient changes and/or sea-bottom irregularities. A three-step evolutionary model, implying a gradual flow volume decrease through the time, may account for facies associations and stacking patterns of individual sandstone bodies. In the initial stage, catastrophic flows generated by the collapse of the delta front, led to the incision of straight channels and deposition of coarser-grained deposits in small terminal lobes. Subsequent stages are characterized by backfilling of previous erosional features and the development of a complex network of small, sinuous channels related to hyperpycnal flows generated by fluvial floods of decreasing volume and duration.