Tectonic and Eustatic Controls on the Stratal Architecture of a Giant Gilbert-Delta, Corinth Rift, Greece

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The Kerinitis delta is a footwall derived, coarse grained, Gilbert-type fan delta deposited in the hangingwall of a linked normal fault system. It has a radius of 3.8 km, a thickness > 600 m, was supplied by an antecedent river and built in a brackish to marine basin. Although as yet poorly dated, correlation with neighbouring deltas suggests that the Kerinitis delta was deposited during a period of 500-800 kyrs in the Early to early Middle Pleistocene. A detail field study, of stratal geometries and facies stacking patterns was used to understand tectonic and eustatic control on stratal architecture.

Facies characterizing a range of depositional processes are assigned to four facies associations (topset, foreset, bottomset and prodelta). The dominantly fluvial topset facies association contains locally developed shallow marine (limestone) and fluvial-shoreface sub-associations, representing remnants of transgressive facies. This delta represents a subsidence-dominated system in which high fault displacement overwhelmed base level falls (creation of accommodation (A) predominantly ≥0). Eleven key stratal surfaces (KSS) separating eleven stratal units (SU) have been identified. Each KSS records a landward shift in the topset breakpoint path, indicating a rapid increase in A/S (S is sediment supply). Each SU records a gradual increase then decrease in A/S during deposition. The cyclic SU and KSS are interpreted as recording eustatic falls and rises respectively. A 30 m thick package of foresets below the main delta records the nucleation of a small Proto-delta probably on an early relay ramp. Based on changes in stratal unit geometries, the main delta is divided into three packages, recording the initiation, growth and death of the controlling fault system. The Lower delta comprises stacked, relatively thin, progradational SUs recording low displacement on the young fault system (relay ramp). The Middle delta comprises vertically stacked SUs, each recording initial aggradation-progradation followed by progradation. Their aggradational component increases up through the Middle delta, which records increasing rate of fault displacement. The Upper delta records pure progradation, recording the abrupt cessation of movement on the fault. A major erosion surface within the Lower delta incises basinward 120 m through the Lower and Middle delta and records an exceptional submarine erosion process (canyon or delta collapse).