Rivers and Rifting: Interaction of Normal Faulting, Erosion and Sediment Dispersal in the Corinth Rift

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Rivers are key agents of mass flux in rift basins. The evolution of these rivers, and thus the distribution of their deposits, is strongly influenced by the development of normal fault systems. Rivers and their deposits can be used to understand the behaviour and growth of fault systems while, conversely, the growth of normal fault systems influences the spatial distribution of river sediments. The Corinth rift in Greece provides a unique opportunity to study both the interaction of present day rivers with an rapidly opening rift and to trace the behaviour and influence of the same drainage system back through a rifting history of around 4 million years. Three stages are recognised in this rift's development.

(a) Early rift : the influence of inherited landscape and an antecedent drainage system on early rift structure and sediment dispersal (Pliocene -Early Pleistocene). The standard evolutionary model for normal fault systems and related rift stratigraphy, assumes that, in the initial pre-rift state, a homogenous crust has a flat upper surface and that the landscape and drainage system derives uniquely from the tectonic and climatic activity during rifting. But if, as occurs in the Corinth rift, rifting is superimposed on a complex pre-existing landscape with a well established drainage network, how will the early fault network evolve and how will sediments be distributed in early depocentres?

(b) Mid rift : Interaction of major normal faults with a well established antecedent drainage system during accelerated extension. At around 2-1.8 Ma the dynamics of rifting changed and the drainage system became subordinate to faulting. In the west, fault activity migrated northward and concentrated upon a single major fault (Ford et al. 2007) while in the east northward migration of fault activity was more progressive (Rohais et al. 2007). Giant Gilbert deltas were deposited in the main depocentres and track the life and death of controlling faults.

(c) Recent Rift: Erosion power of antecedent rivers during accelerated uplift - At around 0.7 Ma fault activity migrated north again and became focused on major coastal faults that control the current Gulf. The northern Peloponnesos began to uplift at a rate between 1 and 1.5 mm/a. In the west, rivers continued to flow northward, eroding into their own conglomeratic L-M Pleistocene deltas to redeposit them in the Gulf. Further east, many north flowing rivers were forced to flow south into endorheic basins.