Controls on Drainage and Facies Distributions in Continental Rift Basins

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Studies of modern and ancient continental rift systems are used to develop and refine models of drainage development and facies distributions, and to provide a more robust predictive model for the stratigraphic architecture of continental rift basins. Although facies models for rift basins are well established and have been widely tested, they are largely applicable to individual sub-basins within a rift province and rarely take into account the interaction between adjacent sub-basins. All these models assume that the rift province subsides at relatively constant rates and that sediment is preserved equally across all the sub-basins within the province. In reality this is rarely the case, with the majority of sub-basins in a rift province being developed at different elevations. The implications of this are that only a relatively small area of the rift province (10-20%) is actually accumulating sediment at any one time. Studies of modern rift provinces such as the Basin and Range and East African Rift indicate that net aggradation and therefore likely preservation in the rock record occurs in two types of basin, here termed: terminal and isolated.

Terminal basins occur at the lowest point(s) within a rift province and represent the terminus of the principal fluvial system(s) fed by an integrated drainage network developed across different half-grabens. Axial fluvial systems form erosional tributary drainage networks that link sub-basins and are therefore unlikely to be preserved. Isolated basins display endorheic drainage and are not integrated into the regional drainage network. Both basin types are dominated by transverse and/or longitudinal distributive fluvial systems and playa/lake deposits. The implications for the rock record are: 1) the detailed stratigraphic architecture of sub-basins in the same rift province will be significantly different, 2) correlation between adjacent rift sub-basins will be inherently difficult as it is unlikely that they will have been connected, 3) axial fluvial systems have little or no preservation potential, 4) the alluvial part of rift basin fill will be dominated by distributive fluvial systems.