The structural evolution of the central basin of the Malawi (Nyasa) Rift, Africa: methodologies, tectonic insights, and stratigraphic implications

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Early-stage continental breakup is best studied in young, active rifts where syn-rift sediments and structures have not yet been removed or overprinted. These studies provide valuable analogues for understanding the continental rift sections preserved on passive margins such as the Atlantic Margin of Canada.

Syndepositional fault analysis using 2D reflection seismic data is used to constrain the structural evolution of the central basin in the Malawi (Nyasa) Rift at the south end of the East African Rift System's Western Branch. The structural methods used in this study can be applied to 2D reflection seismic data in regions where 3D reflection seismic data are not available.

The central basin of Lake Malawi is a single-half graben rift segment with considerable deformation in the hanging wall of the border fault on the western margin of the basin. Analysis shows that intrabasin faults have been continuously active, with no significant lateral tip propagation, for ~8.5 Ma, coincident with border fault activity. The synchronous fault activity created a small (~500 km^2) structurally confined sub-basin that is the ultimate sink for sediments from two major watersheds which have a combined total area of nearly 27 000 km^2. Continental rift lakes are not an environment where mud diapirs are typically expected, however the overpressure conditions required for mud diapirism developed in Lake Malawi in the last 1.3 million years as a result of the high sedimentation rates of fine-grained sediments and the sediment loading associated with coarse-grained sediment deposition in the confined basin.

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