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Effects of the tectonics of the East African Rift System on the evolution of the Tanzania margin offshore Zanzibar and Pemba Islands.

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The East African Rift Systems (EARS) is a modern example of a divergent plate boundary at early stages of development. In Tanzania, the rift has evolved in two branches since the Early Miocene. In addition, recent studies have proposed the existence of a marine branch of the rift in the western Indian Ocean, corresponding to the Kerimbas Graben – Davie Ridge (DR) system offshore northern Mozambique and southern Tanzania. North of this region, putative passive margin structures are present: the islands of Zanzibar and Pemba, and the troughs that separate them from the mainland. Although different theories for their formation have been proposed, a clear understanding of how the islands relate to the regional tectonic regime and the effect on the deep-water sediment routing system is lacking.

In this study, we use 2D seismic reflection profiles and exploration wells to investigate the Oligocene to recent stratigraphy offshore northern Tanzania to examine the following two questions: When did the Pemba and Zanzibar islands form? And how does the evolution of deep-water depositional systems record rift tectonics? Regional correlation of dated seismic horizons, integrated with 3D reconstruction of canyons/channels network through time, allow understanding of the main depositional events and their timing. A net decrease in the number of slope channels is visible offshore Pemba during the middle-late Miocene, which we interpreted to mark the onset of the uplift of the island. At the same time, deep-water channels were still aggrading offshore Zanzibar, indicating that the uplift of this island occurred later, likely during the late Miocene to early Pliocene. The uplift of the islands promoted the formation of a newly discovered giant canyon, characterized by a modern width of > 30 km and depth of > 485 m at > 2,200 m water depth.

The timing of the islands' uplift indicates a potential relation with the EARS tectonics. While the structures which form the anticlines of Pemba and Zanzibar Islands may be related to Tertiary

(EARS) inversion of Mesozoic-aged rift faults, numerous high-angle normal faults, both antithetic and synthetic, dissect the post-Oligocene stratigraphy. These create horsts and grabens on a variety of scales, some of which (e.g. Kerimbas Graben and Zanzibar/Pemba trough) show comparative shape and size respect to onshore rift basins. The stratigraphic evolution of deep-water channel systems provides a tape-recorder with which to determine the modification of EARS' tectonics on sedimentation of the older Tanzania margin.

Supported by these new results, we propose a new alternative conceptual model for the evolution of the central East African margin during the Neogene and Quaternary, highlighting the main tectonic structures and their timing of formation.