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Somali Basin's Crustal Structure and Post-Rift Deformation: A Recorder of Madagascar and India Drifts

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Summary

The opening of the West Somali Basin between Madagascar and east Africa in Late Jurassic-Aptian is recorded in the oceanic domain by NE-SW to E-W trending magnetic anomalies M25 to M10 (Coffin & Rabinowitz, 1987). To the East and NE, it is separated from the Mascarene Basin and the North Somali Basin by transforms. Thanks to petroleum exploration, its western continental margin is now imaged by deep seismic: i.e. the Davie Transform Zone (DTZ), the Kenya-Tanzania oblique segments to the South and the Kenya-Somalia divergent segment to the North. The whole margin has experienced various post-rift tectonic reactivations that can now be well illustrated.

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The Somali rifted margin (Stanca *et al.*, 2016) has formed at the expense of the thick cratonic Karoo Basin. It is a typical magma-poor margin much alike the well-known type described by Manaschal's group (e.g. Mohn *et al.*, 2015) from Iberia to the Alps. The proximal normal faults as well as the northern corner of the basin adjacent to the Dhow-VLCC-ARS fracture zone have suffered significant inversion during the Neogene.

The crustal structure of the Kenya-Tanzania margin is more difficult to decipher due to poorer seismic quality in the continental domain. However the proximal oceanic basin, is well-imaged by ION lines: it is shown to be made of both volcanic and mantle rocks, derived from the early rifting and from the formation and evolution of the DTZ (Sauter *et al.*, 2016 and submitted). The Cretaceous-Recent record is fair and allows describing several phases of reactivation. During the opening of the Somali Basin, from Late Jurassic to Aptian, the DTZ accommodated the southward drift of Madagascar. While spreading was active, both extension and compression were recorded in the oceanic domain and along the margin following the trend of the DTZ. To the North, a splay of the DTZ connects to the boundaries of the East African Anza Graben, a Valanginian-Barremian NNW-SSE half-graben that extends eastward into the Kenyan Margin and Africa. Along the splay faults, and more generally in the wide sheared corridor of the DTZ, N-S to NW-SE thrust affected the oceanic crust during the Hauterivian-Barremian while spreading was active in the basin. The Davie trend is again reactivated in the Late Cretaceous-Paleogene with the large inversion of the Anza Graben to the North. The Kerimba Trough in Tanzania is a Miocene sinistral pull-apart reactivation along the DFZ coeval with the onset of the Comoros volcanism. Sinistral movements still occur along the DTZ as well as normal faulting between Zanzibar and Pemba Island and the coast. This activity features the incipient Rovuma plate (Stamps *et al.*, 2014).

A structural map, some cross-sections and a tectonic calendar are proposed to illustrate the different crustal domains and the history of a margin which never really became passive. The post-rift events are tentatively correlated with the evolution of the Somali and younger basins that could have formed as a consequence of the Indian break-up and drift and possibly other remote kinematic events.