Geophysical Research Abstracts
Vol. 19, EGU2017-13760, 2017
EGU General Assembly 2017

The Rovuma Transform Margin: the enigmatic continent-ocean boundary of East Africa

Jordan Phethean (1), Lara Kalnins (2), Jeroen van Hunen (1), Ken McCaffrey (1), and Richard Davies (3)

(1) Geosciences, University of Durham, Durham, United Kingdom, (2) School of GeoSciences, University of Edinburgh, Edinburgh, UK, (3) School of Civil Engineering and Geosciences, Newcastle University, Newcastle upon Tyne, UK

The N-S trending Davie Fracture Zone (DFZ) is often assumed to form the continent-ocean transform margin (COTM) of the Western Somali Basin. However, multiple plate tectonic reconstructions favour a pre-breakup location for Madagascar that crosses the DFZ, incompatible with its interpretation as the COTM (e.g., Lottes & Rowley, 1990; Reeves, 2014; Phethean et al., 2016). For the first time, we have identified classic COTM features in seismic reflection data from the Southern Rovuma Basin, to the west and inboard of the DFZ. These suggest a NNW trend to the margin, consistent with the tectonic reconstructions. 2D gravity models, with the seabed and top basement constrained by seismic data, are used to investigate the Moho structure across the Rovuma margin and are best fit using steep 'transform style' geometries, confirming the nature of the margin. We thus model generic COTM geometries elsewhere along the East African and Madagascan transform margins to locate best-fitting positions for these conjugate COTMs. This analysis confirms that the COTMs follow a NNW trend along the Rovuma Basin and Southern Madagascar, respectively, and allows a restoration of the conjugate COTMs. This restoration is used alongside geological maps and satellite imagery from Madagascar and East Africa to refine early plate motions and further constrain the precise origin of Madagascar within Gondwana. Our refined plate tectonic model independently predicts major observations made from seismic reflection and gravity data across the basin, including: regions of major transpression/transtension along the DFZ, merging of fracture zones to form the DFZ, oceanic crust on either side of the DFZ and within the Tanzania coastal basin, and the location of an abandoned MOR within the Tanzania coastal basin. We believe that this study finally provides conclusive evidence that Madagascar originated from within the Tanzania Coastal Basin, inboard of the DFZ, after some 30 years of debate regarding this matter.

Lottes, A.L., Rowley, D.B., 1990. Reconstruction of the Laurasian and Gondwanan segments of Permian Pangea. Geol. Soc. London Mem., 12, 383-395.

Reeves, C., 2014. The position of Madagascar within Gondwana and its movements during Gondwana dispersal. J. Afr. Earth Sci., 94, 45–57.

Phethean, J.J.J., Kalnins, L.M., van Hunen, J.,Biffi, P.G., Davies, R.J., McCaffrey, K.J.W., 2016. Madagascar's escape from Africa: A high-resolution plate reconstruction for the Western Somali Basin and implications for supercontinent dispersal. Geochem. Geophys. Geosyst., 17, doi:10.1002/2016GC006624.