



Polyphase Rifting and Breakup of the Central Mozambique Margin

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The breakup of the Gondwana supercontinent resulted in the formation of the Central Mozambique passive margin as Africa and Antarctica were separated during the mid-Jurassic period. The identification of magnetic anomalies in the Mozambique Basin and Riiser Larsen Sea means that post-oceanisation plate kinematics are well-constrained. Unresolved questions remain, however, regarding the initial fit, continental breakup process, and the first relative movements of Africa and Antarctica. This study uses high quality multi-channel seismic reflection profiles in an effort to identify the major crustal domains in the Angoche and Beira regions of the Central Mozambique margin. This work is part of the integrated pluri-disciplinary PAMELA project*. Our results show that the Central Mozambique passive margin is characterised by intense but localised magmatic activity, evidenced by the existence of seaward dipping reflectors (SDR) in the Angoche region, as well as magmatic sills and volcanoclastic material which mark the Beira High. The Angoche region is defined by a faulted upper-continental crust, with the possible exhumation of lower crustal material forming an extended ocean-continent transition (OCT). The profiles studied across the Beira high reveal an offshore continental fragment, which is overlain by a pre-rift sedimentary unit likely to belong to the Karoo Group. Faulting of the crust and overlying sedimentary unit reveals that the Beira High has recorded several phases of deformation. The combination of our seismic interpretation with existing geophysical and geological results have allowed us to propose a breakup model which supports the idea that the Central Mozambique margin was affected by polyphase rifting. The analysis of both along-dip and along-strike profiles shows that the Beira High initially experienced extension in a direction approximately parallel to the Mozambique coastline onshore of the Beira High. Our results suggest that the Beira High results from strike-slip deformation localised along a proposed crustal weakness, represented by the Lurio-Pebane shear zone. A more north-south oriented extension is recorded by the continental breakup and oceanisation. A failed rift is initially formed between the Beira High and the African continent followed by the successful rifting of its southern margin. This study proposes a segmentation of the Central Mozambique margin, with oceanisation first occurring in the Angoche segment. The formation of the first oceanic crust in the Beira segment followed, likely delayed by the formation and failure of the northern Beira High rift.

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