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Deep-structure of the East-Limpopo margin, Mozambique (the PAMELA project)

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The break-up of the Gondwana supercontinent resulted in the formation of the Mozambique passive margin, as Africa and Antarctica were separated during the mid-Jurassic period. Although plate kinematics during the oceanisation phase are relatively well constrained, the initial fit of Africa and Antarctica, their earliest relative movements and margin architectures remain sparsely and/or fully unknown.

Two seismic refraction velocity models, together with the coincident seismic reflection and potential field data, allow (1) to delineate the major crustal domains in the Limpopo region of the Mozambique margin, (2) to constrain velocities and major interfaces down to the Moho discontinuity and (3) to observe the along-strike variations of the deep structures as well as the amounts of magmatism.

Our results show that the Limpopo Mozambique passive margin is characterised by (1) deep sedimentary basins (up to 12 km), which are controlled by crustal-scale normal faults; and by (2) magmatic sills and volcanoclastic material. The necking of the continental crust is narrow and is probably characterised by the presence of magmatic underplating at the base of the crust (upper mantle velocities of 7.3-7.6 km/s and complex wide-angle Moho reflectivity). We observe some extensional structures in the continental domain along both lines (deep landward dipping sedimentary basin, graben/half graben structures). We identify a transitional domain along both lines. However, we believe that this domain is probably oceanic. Oceanic crust is identified along both lines with typical oceanic layering; only, this crust is thicker than normal (8-9 km in the north and 10-13 km in the south), which means a more intense magmatism in the oceanic domain along the southern profile than the northern one. This study will be completed by a comparison of the structures observed along these two seismic sections with other known structures from other transform margins.

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