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Shear zone reactivation during South Atlantic rifting in NW Namibia

E. Salomon (1), D. Koehn (2), C.W. Passchier (1), P.C. Hackspacher (3), and U.A. Glasmacher (4)

(1) Institute of Geosciences, University of Mainz, 55128 Mainz, Germany (salomon@uni-mainz.de), (2) School of Geographical and Earth Sciences, University of Glasgow, G12 8QQ, United Kingdom, (3) Instituto de Geociencias e Ciencias Exatas, UNESP, Rio Claro-SP, 13506-900, Brasil, (4) Institute of Earth Sciences, University of Heidelberg, 69120 Heidelberg, Germany

The Kaoko Belt of northwestern Namibia is a transpressive Neoproterozoic-Cambrian mobile belt formed during the assembly of Gondwana. Left-lateral motion was accommodated along two major shear zones – the Three Palms and the Purros shear zone. Especially the latter one is a prominent structure as it extends from the Angolan border ∼450 km south where it enters the Atlantic Ocean. Parts of the Purros shear zone are covered by the Lower Cretaceous flood basalts (∼133 Ma) of the Etendeka Plateau in the south and of the Khumib block in the north-central part.

Previous onshore structural research in this area was concentrating mainly on the tectonic evolution during the build-up of Gondwana while the evolution during the break-up was largely neglected. Few reports of a rift-related reactivation of the shear zone exist (e.g. Marsh et al., 2001, Stanistreet and Charlesworth, 2001), but no detailed work was done.

Here, we present the first results of an ongoing study about the structural evolution of the onshore passive margin of northwestern Namibia during the Atlantic rifting. Our field investigations combined with the analysis of satellite imagery reveals indeed a reactivation of the Purros and the Three Palms shear zone. Normal offsets of up to 100 m west down are identified along the Purros shear zone and up to 500 m along the Three Palms shear zone. Offsets are accumulated mainly in half-grabens, but also in more complex environments as seen in the Khumib block. Here, an offset of ∼40 m directly at the Purros shear zone is recognized, yet another ∼200 m of vertical displacement is indicated towards the south-center of this block ∼9 km west of the Purros fault.

Fault-slip data collected in the field do not indicate a uniform stress field. While in the southern region (Huab basin) a WSW-ENE extension, i.e. perpendicular to the continental margin, is observed in upper Triassic sandstone and lower Cretaceous basalt dykes, a SSW-NNE extension is noticed in the central part of the Purros shear zone. Strike-slip movement dominates around the Khumib block.

References

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