Geophysical Research Abstracts
Vol. 15, EGU2013-10894, 2013
EGU General Assembly 2013

Major paleostress field differences on complementary margins of the South Atlantic

Eric Salomon (1), Daniel Koehn (2), Cees W. Passchier (1), Peter C. Hackspacher (3), and Ulrich A. Glasmacher (4)

(1) Institute of Geosciences, University of Mainz, Becherweg 25, Mainz, 55128, Germany (salomon@uni-mainz.de), (2) School of Geographical and Earth Sciences, University of Glasgow, 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, Im Neuenheimer Feld 234, 69120 Heidelberg

A detailed study of paleostress fields of the Namibian and Brazilian passive continental margins of the South Atlantic addresses a general debate on whether or not these complementary margins experienced similar tectonic histories. On the one hand, these margins may have been affected by different processes, such as the Andean orogeny for the Brazilian margin (e.g. Cobbold et al., 2001) versus convective mantle upwelling for southern Africa (e.g. Al-Hajri, 2009). On the other hand, the high topography along both margins is regarded as the consequence of similar tectonic processes resulting from far-field compressional stresses (Japsen et al., 2012).

In our paleostress study presented here, we chose to compare the NW of Namibia and the SE of Brazil with each other. These areas are largely covered by the flood basalts of the Paraná-Etendeka-Large Igneous Province. With an age of $\sim$133 Ma the basalts are slightly older than the Altantic rifting, as sea-floor spreading started at this latitude around 115 Ma. Thus, the flood basalts serve as a good time marker for rift- and post-rift-related tectonics. We studied mainly fault planes and associated striations within the flood basalts and compared the resulting stress patterns of both margins.

Results reveal remarkable differences in the stress patterns for SE Brazil and NW Namibia. In NW Namibia, a WSW-ENE directed extensional stress field dominates and fits well with extension of the original continental rift and the passive margin. A second extensional stress field (σ_3 SSW oriented) as well as a strike-slip system (σ_1 NW oriented) and a compressional stress field (σ_1 NNW oriented) appear only subdued.

In contrast, the SE of Brazil is mainly characterized by two strike-slip systems (σ1 oriented SW and E, respectively) whereas an extensional stress field is almost non-existent. As normal faulting is seen offshore SE Brazil (e.g. Blaich et al, 2011), an extensional stress field should have existed in Brazil. Either the offshore stress field is mainly decoupled from the continental stress field or our fault slip data indicates massive overprinting in Brazil, while in Namibia the extensional setting is preserved. Both major strike slip systems in Brazil fit well with the proposed far-field effect of the Andean mountains on the passive continental margin of Brazil (Cobbold et al., 2001).

Our results indicate that different mechanisms may have produced the present-day high topography on both sides of the Southern Atlantic, the Brazilian margin being under compression in a strike-slip regime whereas the Namibian margin mainly under margin perpendicular extension.

References:

Al-Hajri, Y. et al. (2009): Scales of transient convective support beneath Africa: Geology, 37, 883-886.

Blaich, O. A. et al. (2011): Crustal breakup and continent-ocean transition at South Atlantic conjugate margins: Journal of Geophysical Research, 116, B01402.

Cobbold, P. R. et al. (2001): Reactivation of an obliquely rifted margin, Campos and Santos basins, southeastern Brazil: AAPG Bulletin, 85, 1925-1944.

Japsen, P. et al. (2012): Episodic burial and exhumation in NE Brazil after opening of the South Atlantic: Geological Society of America Bulletin, 124, 800-816.