Geophysical Research Abstracts
Vol. 14, EGU2012-6810, 2012
EGU General Assembly 2012

A deep mantle origin for the asymmetry of the South Atlantic margins

N. Flament (1), M. Gurnis (2), S. Williams (1), M. Seton (1), R. D. Müller (1), and J. Skogseid (3)

(1) Earthbyte Group, School of Geosciences, The University of Sydney, Australia (nicolas.flament@sydney.edu.au), (2) Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, United States of America, (3) Statoil, Vækerø, Oslo, Norway

Amongst the salient features of the margins of the South Atlantic are the deep Argentine Basin and the Elevated Passive Continental Margins of Northeast Brazil and Southern Africa. The origin and the age of this asymmetry of the margins of the South Atlantic are subject to debate. For instance, the amount of Cenozoic uplift in Southern Africa varies depending which observations are emphasized, the Argentine basin has been attributed either to shallow asthenospheric flow or to dynamic topography, and the Brazilian Highlands have been attributed either to continental-scale far-field stresses associated with Andean convergence or to the interaction of a plume tail with thick cratonic lithosphere.

In order to better understand the origin and age of the asymmetry of the margins of the South Atlantic, we developed a workflow to investigate the effect of mantle dynamics on deforming continents. This workflow consists in a) global plate reconstructions, generated using the *GPlates* software, that account for continental deformation deduced from published geological and geophysical data and plate reconstructions; b) imposing the kinematics of such reconstructions in forward global mantle flow models, computed using the 3D-spherical finite-element code *CitcomS*, in which compositionally distinct crust and continental lithosphere are embedded within the thermal lithosphere. Our plate reconstruction for the South Atlantic, based on that of *Torsvik et al.* (2009), accounts for intraplate deformation in both Africa and South America, lithospheric stretching at passive margins, and mountain building along the convergent margin of South America. We have investigated the interaction between mantle flow and lithospheric stretching and their contributions to surface topography in passive margins systems. In particular, the contributions to topography of lithospheric stretching, thermal cooling and deep mantle flow (dynamic topography) are simultaneously quantified in the case of pure shear of the lithosphere. Our model reproduces the first-order asymmetry of the South Atlantic margins. We attribute the large subsidence of the Argentinian margin to the dynamic topography induced by ongoing subduction along the narrow southern portion of South America. In addition, we suggest that part of the uplift of Southern Africa can be attributed to its motion away from this dynamic topography low.

Reference

Torsvik, T. H., Rousse, S., Labails, C., and Smethurst, M. A., 2009, A new scheme for the opening of the South Atlantic Ocean and the dissection of an Aptian salt basin, *Geophys. J. Int.* **177**, 1315–1333.