Solid Earth Discuss., 6, C837–C840, 2014
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Interactive comment on "Asymmetry of high-velocity lower crust on the South Atlantic rifted margins and implications for the interplay of magmatism and tectonics in continental break-up" *by* K. Becker et al.

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Received and published: 28 August 2014

Reviewer 2:

The authors should describe in more detail how the crustal structures used in gravity modelling (Figs. 5 and 6) have been obtained. Note that the seismic data presented in Figs. 2 and 3 are far to reproduce the fine structure of the upper-middle crust depicted in gravity modelling.

The upper crustal structures were obtained from reflection seismic data. This includes

the subdivision of the postrift sediments, the basement the SDRs as well as the synrift graben. The referee is absolutely right in stating that there is no basis for a subdivision of the gravity model into an upper and a lower crustal unit. We could have modeled the crust with an average density or guess the approximate position of the boundary between upper and lower crust. Both approaches have their limitations. Most important in our view is the fact that either approach has no effect on the results and conclusions obtained.

The northern part of the study region is clearly affected by the Tristan plume (Parana-Etendeka margins), which is responsible for anomalously high potential mantle temperature and magma generation (flood basalts and anomalously thick oceanic crust). The effects of Tristan plume superpose to those related to passive extension and rifting.

This is a non-trivial problem because it is very likely that both processes took place together, at least in the northern segments and it is difficult to separate their effects. While geologic and geochemical-petrologic studies of the magmatic record on both margins may indicate the presence of a hot-spot, the 4-fold difference in HVLC volumes across the margins is at least of similar magnitude as the along-margin variations, and this cannot be explained by variable proximity to the hot-spot. In addition this is in sharp contrast to the Paraná flood basalts which are in fact more voluminous than their counterparts in the Etendeka province on the African side. This east-west contrast in HVLC is almost certainly related to the rifting process, and we have proposed a simple-shear scenario of rifting to explain it. If we accept that the northward increasing volumes of HVLC are related to the hot-spot, then the lateral position of the HVLC indicates that the influence of the latter became distinct only after rifting and breakup.

One of the main conclusions raised is that the South Atlantic margins obey to a simple shear mode of deformation. Perhaps the authors can add some discussion about. Definitely, a scheme or cartoon showing a lithospheric cross-section with the polarity of the simple-shear mechanism would help very much in understanding the proposed model.

Thank you for this suggestion. We added a cartoon (Figure 10) showing the supposed westward-dipping major detachment fault and the mechanism that may explain the major asymmetry in the HVLC across the margins.

All minor comments have been addressed and corrected in the main text.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/6/C837/2014/sed-6-C837-2014-supplement.pdf

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Interactive comment on Solid Earth Discuss., 6, 1335, 2014.

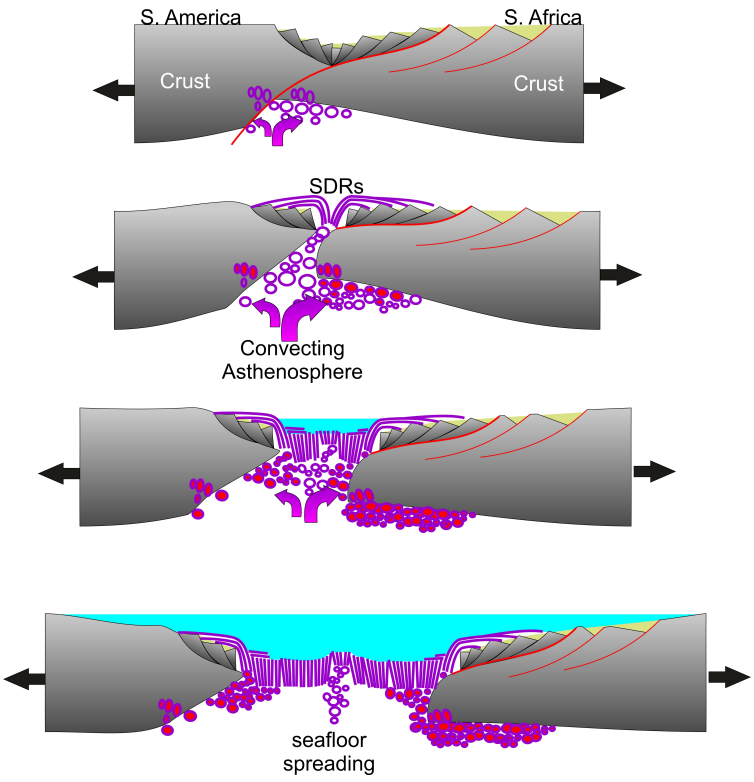

Fig. 1.