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# Asymmetric continental deformation along the South Atlantic and its influence on Paraná-Etendeka Large Igneous Province emplacement

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Kinematic plate reconstruction models demonstrate that South America and Africa do not fit perfectly when restoring the continents to their pre-breakup position, a misfit that is commonly solved by considering intra-plate deformation within South America. Indeed, such deformation is well documented in Patagonia, where the Salado, Colorado and San Jorge basins formed shortly before or during the South Atlantic rifting at a perpendicular angle to this rift.

Many kinematic models implement a further zone of deformation at the latitude of southern Brazil, despite the circumstance that geological indications for such a distinct zone in this region are poor. This region was subject to the emplacement of the voluminous Paraná-Etendeka Large Igneous Province (LIP), which derived from the Tristan da Cunha hot spot and whose preserved remains cover 917,000 sq km in South America, and 78,000 sq km in Namibia. The relation of these lavas to the South Atlantic rift is debated, i.e. whether they extruded shortly before, during, or shortly after the onset of rifting, as well as the location of the Tristan da Cunha hotspot during their emplacement.

Here, we present a synthesis of data published throughout the last two to three decades on various geological aspects of Namibia and southern Brazil, which pictures an asymmetric tectonic evolution of these regions. This includes aspects of basement reactivation during rifting, fault patterns, and dyke emplacement. Analyses of magmatic flow directions in dykes, as well as stratigraphic and geophysical studies indicate a hot spot location in or near the rift center. Based on this data, we present a breakup model (Salomon et al., 2017), in which we argue for significant rift-parallel extension on the South American side that is not confined to a distinct deformation zone in southern Brazil, but distributed across ∼1000 km along the margin. This extension is inferred to result from a clockwise rotation away from stable Africa and stable northern South America, in a similar fashion as it has been proposed for Patagonia (e.g. Koopmann et al., 2013). Subsequently, widespread pathways were created for dyke intrusions in Brazil, Paraguay, and Uruguay causing the massive outpour of lavas on the South American side, while the center of the hot spot was located in or near the rift. In consequence, the data and our model further emphasize a syn-rift relation of the lava emplacement, with their distribution guided by large-scale tectonic plate movements.

References

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