Geophysical Research Abstracts
Vol. 14, EGU2012-11400, 2012
EGU General Assembly 2012

Rifting by continental rotation, mantle flow and hotspot volcanism in the salt-depositing South Atlantic

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Rabinowitz & LaBrecque (1979) proposed that Africa and South America separated between 130 Ma and 107 Ma by 11.1º rigid plate rotation about an Euler pole in NE Brazil. According to those authors, the two continents remained contiguous in the north as the wedge-shaped South Atlantic opened up between them and deposited salt mostly over oceanic crust. Subsequent seismic profiling and drilling showed that salt, restricted to north of the volcanic proto-Walvis Ridge, deposited over rift sediments and stretched-thinned continental crust. Increasingly accurate restorations by Nürnberg & Müller (1991), Aslanian et al. (2009), Torsvik et al. (2009), and Moulin et al. (2010) differentiated in both continents several rigid plates separated by active deformation zones. Still, tectonic analysis of the rifted margins indicates that the main Early Cretaceous event was the clockwise rotation of South America about an Euler pole in its northeast. Both rifting and volcanism, including the Paraná-Etendeka large igneous province, where most flood basalts erupted at 134.6 $\pm$ 0.6 Ma (Thiede & Vasconcelos, 2010), were controlled by distance and orientation of rift segments relative to that pole in NE Brazil. Rifting was active from latest Jurassic to early Albian time (Magnavita et al., 2011) over inherited late Proterozoic fold-thrust belts. By Aptian time a long, dry wedge-shaped basin formed north of the volcanic barrier of the proto-Walvis Ridge, widening southward to 700 km and subsiding deep below sea level in the Santos Basin. The basin was filled with oil-rich lacustrine limestone and marine salt, each more than 2 km thick, deposited in often desiccating shallow water over the partially hyperextended continental crust of the São Paulo Plateau (Zalán et al., 2010; Magnavita et al., 2011; Szatmari, 2011). Further south marine sediments deposited over oceanic crust. Surface subsidence of the long, deep sediment-starved rift wedge was shaped, prior to the deposition of the lacustrine limestones and marine evaporites, by South America's continental rotation and by hotspot activity; asthenosphere inflow was limited by the bordering two old continents.