Geophysical Research Abstracts
Vol. 13, EGU2011-3546, 2011
EGU General Assembly 2011

Rift-to-drift transition at the South African volcanic margin and comparison with conjugated structures off Argentina

Bernd Schreckenberger, Dieter Franke, Hannes Koopmann, Michael Schnabel, and Kai Berglar
Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Germany (b.schreckenberger@bgr.de)

The Atlantic part of the passive continental margin of southernmost Africa was investigated during a marine geophysical cruise with refraction and reflection seismic as well as potential field data acquisition. Here, the data are being used to study the nature of the transition between continental and oceanic crust in view of marine magnetic anomaly lineations and their potential to determine age constraints for the breakup process. Furthermore, equivalent data from the conjugated South American margin off Argentina are used to test the symmetry of South Atlantic margin structures. The data cover typical volcanic passive margin segments with distinct occurrences of seaward-dipping reflector sequences (SDRS) that are inferred to represent subaerial basaltic volcanics emplaced directly before the onset of seafloor-spreading.

One of the main observations is a slightly asymmetric angular interaction of late volcanic breakup structures (SDRS) and early seafloor spreading lineations. The data indicate a local propagation of the early spreading center to the North approximately at the time of magnetic Chron M9n (133 Ma). Identifications of earlier anomalies in the older literature seem to incorporate anomalies caused by SDRS and do not represent oceanic crust. The SDRS are closely related to strong magnetic anomalies that occur along large segments of the passive margins. The southernmost part of the South African margin does neither show distinct magnetic anomalies nor SDRS. Insofar, the South Atlantic margins seem to be symmetric as the observation of a transition from a volcanic to a non-volcanic margin could already be made off Argentina. Also some internal structures like a subdivision of the SDRS by distinct high reflectivity horizons at conjugated transects can be considered as symmetrical features. The shape and the amplitude of magnetic anomalies over of SDRS, on the other hand, turn out to be different between both sides of the Atlantic with amplitudes on the African margin being generally stronger than those off Argentina. Notably, a wider (up to 200 km) anomaly off South Africa seems to indicate that a larger area was covered by breakup related subaerial volcanics than off Argentina.

We also investigated the rift basins that formed along the Argentine shelf during a Late Triassic to Early Cretaceous breakup phase. These narrow basins are located between the shallow shelf and the huge wedges of SDRS. We identified numerous half-graben structures that are mainly less than 1 s (TWT; $\sim$1.5 km) deep. Listric basin-bounding faults dip landward and seaward. By correlating the major faults across the lines we observe a distinct change in the trend of the individual rift basins at about 44°S, i.e. at the transition from the sheared to the volcanic rifted margin. South of 44°S the faults trend NNW, while farther north the main trend is NNE, parallel to the slope. The NNW trend might be explained either as being related to an earlier extensional phase affecting the area, or by dip-slip movements along the NW-trending shear zone.