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The crustal structure of Beira High, Central Mozambique

C.O. Müller*[1], D. Franke[2], I. Heyde[2], B. Schreckenberger[2], W. Jokat[1]
[1]Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Geophysics, Bremerhaven, Deutschland, [2]Federal Institute for Geosciences and Natural Resources (BGR), Hannover, Deutschland

Abstract
Up to Jurassic times the Antarctic and African continents were part of the supercontinent Gondwana. Since some 185 Ma the rifting in our research area caused the dispersal of Gondwana and Eastern Africa. The timing and geometry of the break-up as well as the amount of volcanism connected to the Jurassic rifting are still controversial. In the southern part of the Mozambique channel a prominent basement high, the Beira High, forms a specific crustal anomaly along the margin. It is still controversial if this high is a continental fragment or was formed during a period of enhanced magmatism.

Therefore a deep seismic profile was acquired from the deep Mozambique Channel, across the Beira High and terminating on the shelf. The main objectives are to provide constraints on the crustal composition and origin of the Beira High as well as the amount of volcanism and the continent-ocean transition below the Zambezi Delta. To obtain a P-wave velocity model of this area the data was forward modeled by means of 2D-Raytracing. Furthermore, potential field data acquired in parallel to the seismic data were used to calculate a 2D gravity model.

Preliminary results indicate a 20-24 km thick crust for the Beira High. In good agreement to the adjacent oceanic crust in the Mozambique Channel the upper crust has velocities between 5.5-5.9 km/s. The middle crust is characterized by velocities between 6.2-6.7 km/s and the lower crust higher than 6.7 km/s and a density of 3.0 g/cm3. However, the velocities for lower crust are only constrained by Moho reflections, since no diving waves are observed for this layer. In the area of the Zambezi Delta Depression the top of the acoustic basement is at 11.5 km depth and the crust thickness thins to 7 km. The basement here is overlain by a 2 km thick layer of 4.9-5.1 km/s, which we interpret as pre-rift sediments (Karoo-Belo-Group, including Lava Flows). Furthermore, evidence for the presence of a high velocity body (HVB) at below the western part of Beira High with a velocity of 7.2-7.4 km/s and 3 km thickness is found.

Below the shelf our results indicate evidences for an increased volcanism during the initial break-up. The location of the continent-ocean boundary as well as the geometry of the break-up depend strongly on the tectonic classification of Beira High. Future work will provide further constraints by amplitude modelling, a 3D gravity model of Beira High and by means of interpretation of the magnetic anomalies.

Autoren

Erstautor	C.O. Müller
Präsentiert von:	C. Müller
Eingereicht von:	C.O. Müller