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Deep crustal structure of the Walvis Ridge at the junction with the Namibian coast

Tanja Fromm (1), Wilfried Jokat (1), Jan H. Behrmann (2), Trond Ryberg (3), and Michael Weber (3)

(1) Alfred-Wegener-Institute, Bremerhaven, Germany, (2) Geomar, Kiel, Germany, (3) German Research Centre for Geoscience (GFZ), Potsdam, Germany

The Walvis Ridge perpendicular to the African coast offshore Namibia is believed to be caused by a long-lived hotspot, which started to erupt with the opening of the South Atlantic in mid Cretaceous. The ridge in combination with the large igneous provinces (Etendeka and Parana) in South America and Namibia is today considered to be a classical model for hotspot driven continental break-up.
To unravel details on how the crust and mantle were modified by such a major thermal event, a large-scale geophysical on- and offshore experiment was conducted in 2011.

We present p-wave velocity models of two active seismic profiles along and across Walvis Ridge.
The profile along the ridge continues onshore, has a total length of ∼730 km and consists of 28 ocean bottom stations, 50 land stations and 8 dynamite shots.
This section reveals a complex structure with multiple buried seamounts, strong lateral velocity gradients and indication of a high velocity body at the crust-mantle boundary beneath the shelf area. Lower crustal velocities range from 6.5 km/s in the west to 7.0 km/s in the east while the crustal thickness is approximately 28 km at the coast thinning westwards.

The second profile perpendicular to the ridge is located about 140 km west of the first profile, has a length of ∼480 km and consists of 27 ocean bottom stations.
The crustal thickness is well constrained by multiple Moho reflections showing a thickness of 20km under the crest of the ridge and gradually thinning to 8km towards north and south. A seamount marks the northern termination of the ridge leading to an abrupt thickening of the crust to 14km before reaching the Angola Basin.
While crustal velocities of 5.5 km/s and 6.5 km/s in the upper and lower crust are similar to the first profile, lower crustal velocities north of the crest are approximately 6% higher.