Magnetotelluric image of conductivity distribution at the passive continental margin in the Kaoko Belt in Northern Namibia and the Walvis Ridge

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Understanding of processes related to the deformation and evolution of the South Atlantic margins and factors controlling the continental rifting and breakup of Gondwana 200 my ago are few objectives of the interdisciplinary SAMPLE project (South Atlantic Margin Processes and Links with onshore Evolution).

In frame of this project we conducted an on- offshore magnetotelluric (MT) survey in the Kaoko Belt in Northern Namibia and the Walvis Ridge to image the subsurface electrical conductivity structure of the Southern African passive continental margin. With a conductivity model we aim to study the magmatic and tectonic activity in this area since the early Cretaceous and the influence of pre-existing neoproterozoic structures on the placement of magma and subsequent continental breakup.

The experiment consists of 167 onshore sites in a ~140 km wide and ~260 km long EW trending corridor from the Atlantic Ocean onto the Congo Craton across the major tectono-stratigraphic units of the Kaoko Belt. It was extended offshore by measurements along two transects parallel and perpendicular to the Walvis Ridge.

The MT data are generally of a high quality but, but indicate significant three-dimensional structures in the crust and upper mantle, particularly in the vicinity of the prominent Neoproterozoic shear zones and faults of the Western Kaoko Zone (Purros Mylonite Zone, Three Palm Mylonite Zone). Thus, we apply a two-part inversion strategy: In areas and frequency ranges where the 3D effects are not dominant, we apply 2D inversion of data sub-sets in order to identify the prominent conductivity features and assess their resolution and robustness; however, the entire data set can only be explained by 3D inversion.

The 2D models of the crust beneath the profile from the Walvis Ridge onto the Congo Craton reveal a spatial correlation of resistive zones with the Archean Craton and the Northern Platform. Zones of high electrical conductivity seem to correlate with surface expressions of prominent faults of the Kaoko Belt.

These 2D results are complemented by an image derived from a 3D inversion.

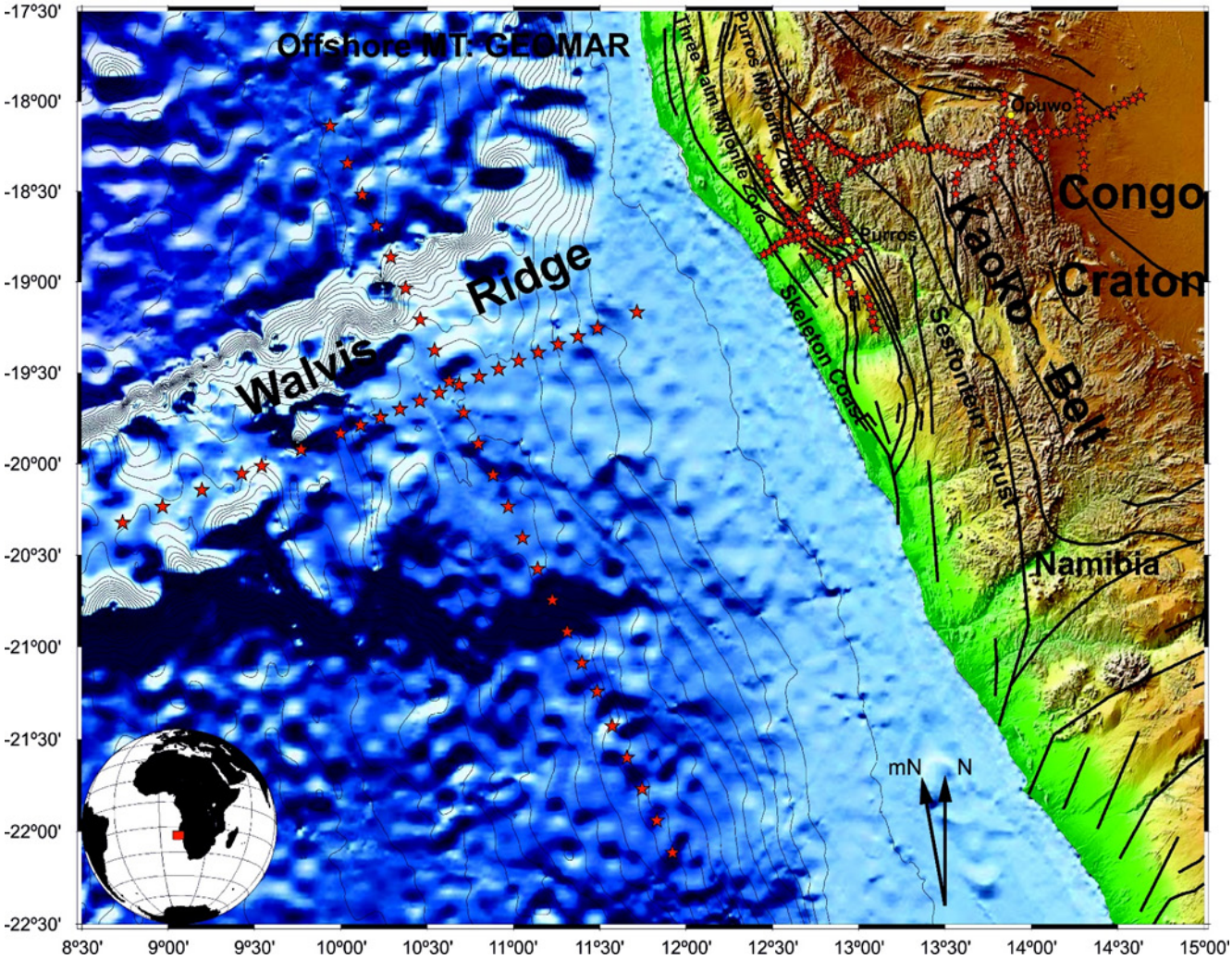

Figure 1: Fig. 1 Topography map of the study area in northern Namibia with tectonic units and fault traces (black lines, modified after de Wit et al. (2008)). Asterisks indicate on- and offshore MT sites stations; mN is magnetic north with a declination of 10.5° W from geographic N.