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Evolution of the SW African passive continental margin during the post-rift phase

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The tectonic evolution of the SW African margin and the breakup of the South Atlantic Ocean are still under debate. Furthermore, there are economic interests in terms of hydrocarbon resources. In particular, the understanding of the subsidence history at the SW African passive continental margin can help to investigate the evolution of this margin. For this reason, we aim to reconstruct paleotopographies for three time steps during the post-rift phase (112 Ma to present day). These three time steps are: Cretaceous-Tertiary boundary (67 Ma), Cenomanian-Turonian boundary (93 Ma) and start post-rift (112 Ma).
We use a recent regional scale 3D structural model (Maystrenko et al., 2013) as base for our subsidence analysis. This model includes the upper mantle, the crystalline crust, four sedimentary units as well as the water column. The sedimentary units comprise sediments of the (1) Cenozoic, (2) base Turonian-base Cenozoic, (3) base Aptian-base Turonian and (4) pre-Aptian sediments. Therefore, our subsidence reconstruction has the particular advantage that we include as much present day information as possible.
In order to reconstruct paleotopographies we calculate the subsidence components separately. On the one hand we determine the thermal subsidence due to cooling of the lithosphere. On the other hand, the load induced subsidence exerted by the preserved sedimentary cover is calculated by applying a backstripping method which considers local isostatic rebound and decompaction.
Both the amount of thermal subsidence and the amount of load induced subsidence are then subtracted from the total subsidence which is nowadays observed. Subtracting these individual subsidence components leads to the paleotopographies.
The paleotopographies provide information about the long-term behavior of the margin area since the beginning of the post-rift phase. Moreover, the paleotopographies provide the opportunity to estimate vertical movements which have occurred during the post-rift phase across the entire margin area and which can be compared to recent findings on e.g. vertical movements from onshore SW Africa or to results from subsidence analysis in local sub-basins. We find indications for two phases of uplift with a minimum estimate of the vertical movements in a range of a few hundred meters each.

Maystrenko, Y. P., Scheck-Wenderoth, M., Hartwig, A., Anka, Z., Watts, A. B., Hirsch, K. K. Fishwick, S. (2013): Structural features of the Southwest African continental margin according to results of lithosphere-scale 3D gravity and thermal modelling. Tectonophysics 604, 104-121.