Geophysical Research Abstracts
Vol. 15, EGU2013-11457, 2013
EGU General Assembly 2013

From topography to topography: Surface elevation, Moho geometry and African lithosphere dynamics

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Up to date the lithospheric structure is unknown for the biggest part of the African continent. Many attempts have been done to link thermal and/or compositional mantle anomalies below Africa to its anomalous regional long-wavelength topography. But only few studies, apart from seismic experiments, addressed the detailed structure of the lithosphere revealing Moho and LAB geometry. Here we want to give a comprehensive insight into the actual knowledge of crustal thickness in Africa presenting a detailed compilation of seismic Moho data from active and passive seismic experiments from the late 1970s till now. Additionally, further constraints on crustal and lithospheric thickness coming from the global model CRUST2.0 and regional tomography models are available as well from gathered regional geophysical observables as elevation, gravity, geoid and surface heat flow. Despite all scientific efforts vast areas of the continent, especially in the central part, still lack reliable data on Moho depth. Models, providing data for these areas purely base on global or regional tomography, interpolation or even on transposition only and unfortunately miss a proper relation between elevation, mean crustal density and crustal thickness. Herein lies our motivation to present a preliminary study of the crustal and lithospheric thickness in Africa using elevation, geoid data and thermal analysis. Assuming local isostasy and a four-layered model composed of crust and lithospheric mantle plus sea water and asthenosphere we present a first approach of the Moho and LAB geometry for the African continent. Before further regional observables related with the lithospheric structure such as gravity and heat flow are introduced, this approach helps to better relate surface topography with the topography of the Moho and the LAB and stands as a basic first-order study to also investigate density distribution in the lithosphere.