



Geoid, elevation and crustal thickness: Investigating the lithospheric structure of Africa

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The African continent shows striking topographic features and has recently been target of numerous geophysical and seismic studies to determine its crustal structure, locally and regionally. Observation of surface tectonics coupled with knowledge of variations in crustal thickness provide a top to bottom frame to investigate sub-crustal processes, which affect the uppermost lithosphere and control today's African topography. As the significance of previous models of crustal thickness in Africa is debatable and favors premature conclusions here our motivation is to address the detailed structure of the African lithosphere revealing Moho and LAB geometry using 1D modeling of elevation, geoid and thermal data including the thermotectonic age of the crust as well as age and thickness of sediments to better account for lateral variations in crustal density. The four-layered model is composed of crust and lithospheric mantle plus sea water and asthenosphere, assuming Airy isostasy and is benchmarked against a detailed compilation of seismic Moho data from active and passive seismic experiments across the continent and its margins. Relating better surface topography with the depth of the Moho and the LAB contributes to improve knowledge on the lithospheric structure in Africa that mainly comes from global models, such as CRUST1.0, regional tomography models and gravity modeling, which unfortunately miss a proper relation between elevation, mean crustal density and crustal thickness. Our approach therefore is seen to support the discussion around the strongly debated processes responsible for the anomalous high elevation especially in the south eastern part of Africa and the observed undulations in Moho depth from about 20 km below the extended regions of the East African Rift System to 50 kilometers underneath the thickest Proterozoic belts. By linking differences in age, density and thermal state of the lithosphere with topography and geoid we want to provide new information especially for the data remote areas in Northern and Central Africa.