Geophysical Research Abstracts
Vol. 20, EGU2018-3423, 2018
EGU General Assembly 2018

The lithospheric structure of the Saharan Metacraton from 3D integrated geophysical-petrological modelling

Mohamed Sobh (1), Jörg Ebbing (1), Hans-Jürgen Götze (1), and Mohamed G. Abdelsalam (2)

(1) Department of Geoscience, Christian-Albrechts-University Kiel, Germany, (2) Boone Pickens School of Geology, Oklahoma State University, Stillwater, USA

We model variations in the crustal and lithospheric thickness and composition beneath the Saharan Metacraton using three-dimensional (3D) modelling. The former Archean-Paleoproterozoic craton, is assumed to have been remobilized (metacratonized) during the Neoproterozoic due to partial loss of its sub-continental lithospheric mantle (SCLM) during collisions along its margin. The partial loss of the SCLM might have allowed for the preservation of cratonic remnants within the metacraton. Nowadays, the cratonic remnants are overlain by Paleozoic-Mesozoic sedimentary basins and surrounded by topographic swells with Cenozoic volcanism (e.g. the Hoggar Swell, Tibisti Massif, and Darfur Dome).

Geophysical-petrological modelling which combines multiple geophysical observations (topography, surface heat flow, gravity gradients, and seismic tomography), petrological findings, and geological information show that the cratonic remnants are underlain by a relatively thick lithosphere (up to ∼200 km beneath Al-Kufra) compared to the surrounding Saharan Metacraton. We also found that the SCLM of the cratonic remnants to be relatively colder, denser and have faster S-wave velocity compared with the surrounding Saharan Metacraton.

We suggest that the presence of relatively thinner lithosphere beneath the Saharan Metacraton was caused by superposition of Precambrian events (e.g. partial SCLM delamination during the Neoproterozoic) and Phanerozoic events (Mesozoic-Cenozoic rifting and Cenozoic mantle plume).