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Thermal Imaging of the Lithosphere beneath Arabian Shield and Implications for "Harrats" Volcanic Field

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Widespread Cenozoic volcanisms in the Arabian shield including "Harrats" have been referring to lithospheric thinning and/or mantle plume activity as a result of Red Sea rift-related extension.

A fundamental key in understanding the deriving mechanism of these volcanic activities and its relationship to 2007-2009 seismic swarms required a reliable model of the present-day lithospheric thermo-chemical structure.

In this work, we modeled crustal and lithospheric thickness variation as well as the variations in thermal, composition, seismic velocity, and density of the lithosphere beneath the Arabian shield within a thermodynamically self-consistent framework.

The resulting thermal and density structures show large variations, revealing strong asymmetry between the Arabian shield and Arabian platform within the Arabian Plate.

We model negative density anomalies associated with the hot mantle beneath Harrats, which coincides with the modelled lithosphere thinned (~ 65 km) as a result of the second stage of lithospheric thinning following the initial Red Sea extension.