

Modern Approaches in Solid Earth Sciences

Ashoka G. Dessai

# The Lithosphere Beneath the Indian Shield

A Geodynamic Perspective

 Springer

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# Integration of Insights

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## Abstract

The polygenic suite of on- and off-craton mantle xenoliths from the ensemble of cratons reveals the admixed and/or interstratified nature of the depleted and fertile mantle beneath the Indian shield. Most cratons are reactivated and exhibit decoupling of the crust and mantle post-Proterozoic. The SCLM beneath exhibits accretion and reworking to varying degrees. The cratons to the south of the CITZ are older and have a more evolved crustal structure than the ones to the north. The Conrad is less prominent beneath the Bundelkhand Craton, and the lower crust has a larger component of magmatic cumulates.

A melt-depleted mantle keel, ~125–145 km thick, capped by Archaean crust distinguished the WDC until the Proterozoic. The post-Proterozoic thermotectonic episodes brought about decoupling of the crust and mantle transforming the bulk of the cratonic lithosphere. By the end of the Palaeocene, the WDC was characterised by a thermal high, an attenuated continental lithosphere (60–80 km), and a thin crust (<10–~21 km) adjacent to the then intra-cratonic Arabian Sea, resulting in the decratonisation of the WDC.

The EDC has a thinner crust (34–40 km) with a strongly depleted, relatively thick (175–190 km), partly reworked, Archaean keel consisting of sub-calcic harzburgites and eclogites. The SCLM shows compositional modification due to metasomatic re-fertilisation both laterally and in depth, and a distinct density contrast from west to east.

The Bastar Craton has the thickest crust (50–60 km) with the lithosphere thickness not more than 150 km. The SCLM is cool, highly depleted, coexists with young, fertile mantle and shows more than two episodes of lithosphere–asthenosphere interaction. The mantle beneath the SGT terrain (av. crustal thickness 40 km) is the least depleted of that beneath all the cratons. In the Aravalli and Singhbhum cratons, the Moho depths are variable from 37 to 48 km, the latter has a thin refractory SCLM. The lithosphere beneath both, the western and eastern margins of the shield, has a thin, transitional crust and variable depths of fertile, juvenile mantle that accreted coincident with the ridge jump in the Arabian Sea/Indian Ocean.