



The Puzzling Earth

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Planet Earth is unique in terms of its dynamic nature driven by the movement of lithospheric plates through what Earth Scientists term as plate tectonics which is the fundamental driver for continent building, life evolution and extinction, natural hazards, as well all the evolution of natural resources and environment. The history of our planet over its 4.6 billion years since birth is mostly shrouded in mystery except for our direct knowledge on ongoing processes from which we attempt to build the jigsaw puzzles of the past. In this special issue of the IISc Journal, we assemble five contributions that address some of the key evidence gathered from the Indian subcontinent and the adjacent Sri Lankan region that provide insights in various Earth processes in relation to the geological evolution through various tectonic processes.

The opening paper by Bose and Dasgupta¹ focuses on the Eastern Ghats Belt and its implications on the Proterozoic evolution of the Greater Indian landmass. They correlate tectonic cycles involving cratonic blocks of India and East Antarctica in the broad framework of the assembly of the supercontinent Rodinia. They conclude that the Eastern Ghats Belt of India played a pivotal role in the continental amalgamation process and it evolved in tandem with the Central Indian Tectonic Zone and the Aravalli Delhi Mobile Belt.

In the next paper, Silpa and Satish-Kumar⁶ investigate the mafic dyke swarms in the Dharwar Craton to gain insights on the Archean-to-early Paleoproterozoic evolution. They present petrological and geochemical data on dyke rocks from the Western and Eastern Dharwar Cratonic blocks and bring out their distinctions. The authors conclude that the dykes were emplaced prior to the amalgamation of the Western and Eastern Dharwar blocks. They compare their results in a global perspective to understand the global-scale magmatic activity and inter-craton correlations.

Hari et al.² investigate the granitoids from the Phenai Mata Igneous complex in the Deccan Large Igneous Province of central India. They

identify contrasting magmatic conditions in the generation of anorogenic (A-type) felsic rocks based on a detailed analysis of the geochemical features of these rocks, the authors fractional crystallization from a basaltic magma, for one suite and crustal reworking or assimilation of crustal components for the second suite. The magmas underwent different degrees of crustal contamination during their ascent and were emplaced at shallow crustal levels.

In the next contribution, Pandey et al.⁵ present results from petrographic and mineral chemical studies on xenoliths in a lamprophyre from the Deccan Province. They correlate the recurrent lamprophyre emplacement in this region to the polychronous nature of Late Cretaceous alkaline magmatism in NW India associated with extensional events linked with the reactivation of the Narmada rift zone.

In the next contribution, Malaviarachchi⁴ provides an overview on the age of magmatism and crustal evolution in Sri Lanka based on U-Pb and Lu-Hf isotopes. They identify distinct crustal provinces. The Lu-Hf systematics from the Highland Complex record some of the oldest models age of ~3.5 Ga suggesting contribution from older subducted sediments and/or crustal components. The Sri Lankan terrains were juxtaposed at an active continental margin setting associated with two stages of subduction during the amalgamation of the Gondwana supercontinent.

In the final contribution, Lodhi et al.³ evaluates the current trends in hyperspectral imaging from different platforms and instruments for various applications. These include mobile platforms, space-borne, airborne, ground-based sensing, unmanned aerial system, and underwater vehicle-based, in relation to Earth Observation.

We hope that the articles assembled in this special issue will provide a glimpse on the various geological and tectonic processes that contributed to the building of the continental and cratonic blocks in the Indian Peninsula and adjacent

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regions in the context of understanding the puzzling Earth processes over millions of years.

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