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Editorial

Geophysical signatures of Precambrian shields and suture zones: Preface for thematic section

The Precambrian shields and associated suture zones of the globe preserve important records of continental growth and destruction, the formation and closure of ocean basins, and the early evolution of the Earth in terms of tectonics, resources, and environment. They also offer critical clues on the nature and style of plate tectonics, mantle dynamics and crust-mantle interaction. In this thematic section of *Geoscience Frontiers*, a set of four contributions are assembled that provide a window to the mechanisms and processes in Precambrian shields and associated suture zones from a geological and geophysical perspective.

The southern Indian crustal fragment occupied a central position within the late-Neoproterozoic-Cambrian Gondwana supercontinent assembly (Santosh et al., 2009). The crustal architecture and tectonic history of the region is relatively well studied by gravity, seismics and magnetotellurics. These studies identified the Palghat Cauvery Suture Zone to be the trace of a major ocean closure, with the subduction–collision–accretion tectonics along this zone related to the final amalgamation of the Gondwana supercontinent (Naganjaneyulu and Santosh, 2010, for a review). In the opening contribution to this thematic section, Rajaram and Anand (2014) present aeromagnetic data from this region covering the Southern Granulite Terrain and the Dharwar Craton. The magnetic highs associated with Palghat Cauvery Suture Zone are interpreted as the extruded high pressure-ultra high temperature metamorphic belt formed as a result of subduction process. The observed East-West highs within the Madurai Block to the south are correlated to the metamorphosed clastic sediments, BIF and mafic/ultramafic bodies resulting from the process of accretion. The Dharwar Craton in the north which has figured prominently in the reconstructions of the earliest supercontinent “Ur” (Rogers, 1996; Rogers and Santosh, 2004) is divided into the western and eastern domains. A key problem here is whether the Chitradurga boundary shear or the Closepet granite is the boundary between the western and eastern Dharwar cratons (Ramakrishnan and Vaidyanadhan, 2008). Differential reduction to pole map in the Dharwar Craton region suggests that NE-SW trends in the western part of Dharwar change completely to NW-SE in the eastern part. Based on the distribution of magnetic sources and their structure, Rajaram and Anand (2014) suggest that Chitradurga boundary shear is the divide between WDC and EDC.

Towards east of the Bastar Craton lies the Singhbhum Craton. The Talchir Basin is bounded by the Bastar Craton, Singhbhum Craton and Eastern Ghat Mobile Belt. Small to moderate seismicity is reported from this province due to reactivation of faults located towards northern part of the basin. Detailed gravity studies were carried out in this region (Gupta et al., 2014). The gravity anomalies are predominantly negative towards north indicating cratonic domains (Singhbhum Craton) and towards south (Eastern Ghat Mobile Belt) they are characterized by positive Bouguer gravity anomalies. Paired gravity anomalies are considered as an indication of suture zones. This study suggests that present-day seismicity in the Indian shield is driven by far-field stresses related to the northward movement of the Indian plate towards Eurasia.

Mishra and Ravi Kumar (2014) address the scenario towards west of the Eastern Ghat Mobile Belt. Gravity model of a profile from Satpura Mobile Belt into the Deccan Volcanic province inferred the remnant of the subducting slab characterized by high conductive and low density slab in lithospheric mantle up to a depth of about 120 km. Further west, the gravity highs associated with the Satpura Mobile Belt and Aravalli Delhi Mobile Belt join to form a curvilinear mobile belt. The North-South convergence of Bundelkhand Craton across the Satpura Mobile Belt and its East-West convergence across the Aravalli Delhi Mobile Belt suggest primary stress direction as NE-SW with East-West and North-South components.

In the last paper in this thematic section, Chernicoff et al. (2014) present geological, geochronological and geophysical (aeromagnetic) information from southwestern Rio de la Plata Craton which reveal that the amalgamation of the craton involved coeval Rhyacian sutures (associated with the Transamazonian orogeny). A reinterpretation of the pre-Neoproterozoic evolution of the southwestern portion of the Rio de la Plata craton is also presented. According to the authors, the pre-Neoproterozoic evolution of the Tandilia belt was initiated by the extension of Neoarchean crust, the development of narrow oceans, sedimentation over transitional continental to oceanic, crust, and arc magmatism.

I would like to express my sincere thanks to Prof. M. Santosh, Co Editor-in-Chief of Geoscience Frontiers for his support in making this thematic section a reality. I am also grateful to Ms. Lily Wang, Editorial Assistant of Geoscience Frontiers for the assistance during the review and processing of manuscripts to this issue. We thank all the authors, including those whose articles did not reach the final stage of acceptance, for providing interesting articles covering aspects of

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the shield and suture zones. We would also like to express our warmest appreciation to all the reviewers in providing fast and constructive reviews, many of whom carried out multiple reviews, for the submitted papers. This work contributes to Council of Scientific and Industrial Research - National Geophysical Research Institute (CSIR-NGRI)'s India Deep Earth Exploration Program (INDEX).

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