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Research paper

A review of the ~1600 Ma sedimentation, volcanism, and tectono-thermal events in the Singhbhum craton, Eastern India

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ABSTRACT

The Palaeoproterozoic–Mesoproterozoic transition (~1600 Ma) is a significant event in the Earth history as a global thermal perturbation affected the pre-1600 Ma landmasses. Like other cratonic blocks of the world, lithospheric thinning, sedimentation, magmatism, metamorphism and crustal melting/anatexis are associated with this significant geological event in the Singhbhum cratonic province of India. This paper is a review of sedimentological, magmatic and tectono-thermal events in the Singhbhum craton at ~1600 Ma. The Palaeo-Mesoproterozoic sedimentation and volcanism in the Singhbhum craton took place in a terrestrial intracontinental rift setting. The available geochronological data are indicative of late Palaeoproterozoic to Neoproterozoic tectono-thermal events in the Chhotanagpur Granite Gneissic Complex (CGGC), an east–west trending arcuate belt of granite gneisses, migmatites and metasedimentary rocks. A detailed multidisciplinary geo-scientific investigation of the Dalma volcanic belt and the area to its north (Chandil Formation) and further north in CGGC will enable us to constrain the extant surface processes and crust-mantle interactions, the collision events between the North and South Indian cratonic blocks, and the position of India in the Columbia supercontinent.

1. Introduction

Our perception regarding Precambrian surface processes and crustal evolution is changing rapidly with increasing accumulation of observational data from different cratons the world over (Eriksson, 1995; Reddy and Evans, 2009; Eriksson et al., 2012). The Precambrian volcano-sedimentary succession of the Singhbhum craton (Fig. 1A) is one of the few in the world that records sedimentation, volcanism and tectono-thermal events from Mesoarchaean to Neoproterozoic (Mazumder, 2005; Mazumder et al., 2012a,b and references therein; Table 1). Mukhopadhyay (2001) has presented a detailed account of the growth and the temporal evolution of the Archaean nucleus of Singhbhum (encompassing various granitoids and the Meso- to Neoarchaean Iron Ore Group supracrustals). Mazumder (2005) and Mazumder et al. (2012a,b) have presented an updated synthesis of the Mesoarchaean to Palaeoproterozoic sedimentation, volcanism in the Singhbhum craton and have highlighted the regional stratigraphic issues that deserve closer scrutiny.

The Palaeoproterozoic–Mesoproterozoic transition (~1600 Ma) is a significant event in Earth history as a global thermal perturbation affecting the pre-1600 Ma landmasses was associated with it (Condie, 1997; Zhao et al., 2002; Rogers and Santosh, 2002, 2009). Lithospheric thinning, sedimentation, and crustal melting/anatexis took place in most major cratonic provinces including Singhbhum during this transition (Roy et al., 2002a; Mazumder, 2003, 2005; Zhao et al., 2002 and references therein). Although efforts have been made by earlier researchers to understand various geological aspects of the late Palaeoproterozoic to Mesoproterozoic supracrustals of the Singhbhum (Yellur, 1977; Bhattacharya and Dasgupta,

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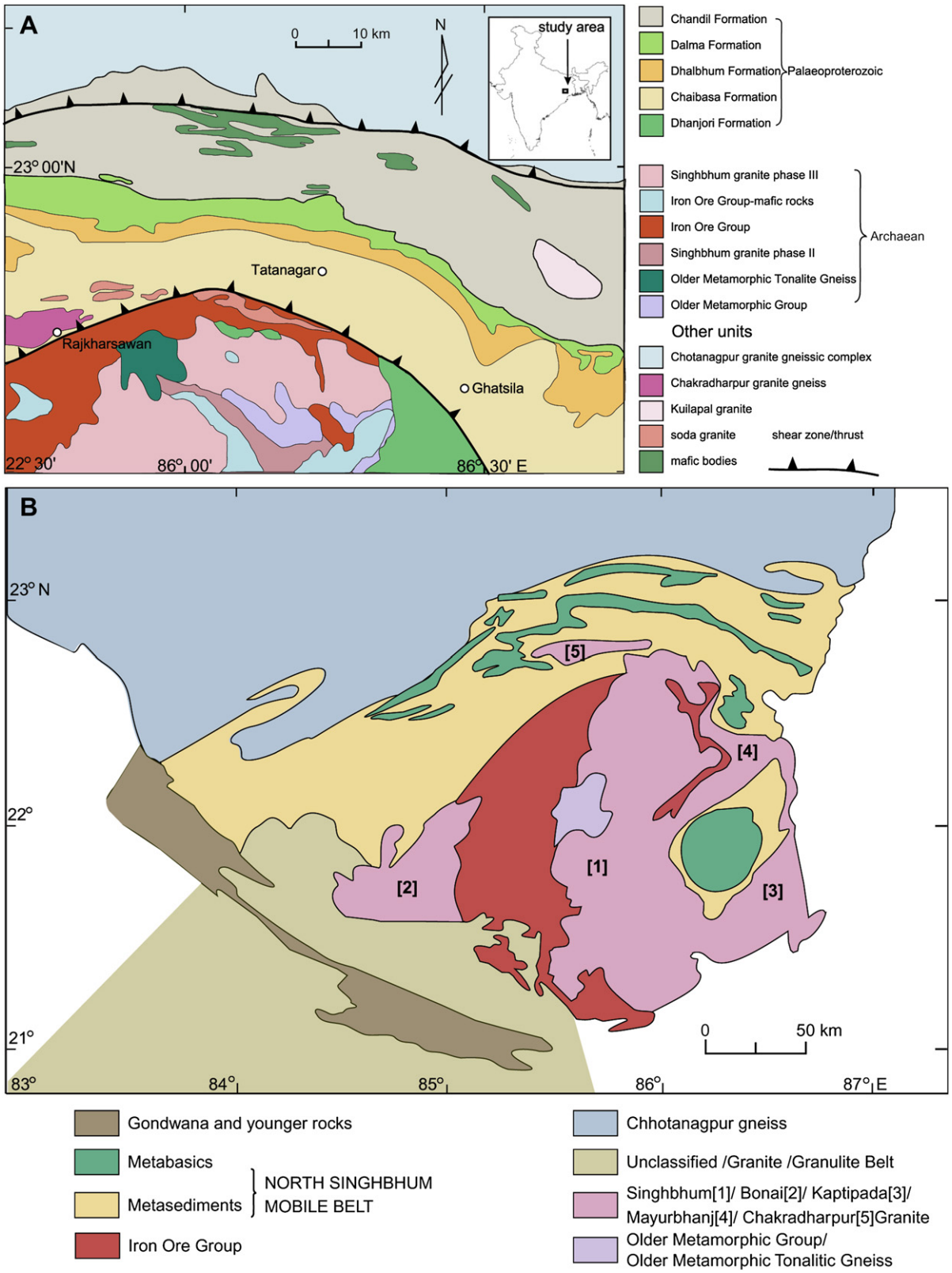

Figure 1. (A) Geological map showing disposition of Archaean and Proterozoic units of the Singhbhum crustal Province (after Saha, 1994; Sengupta et al., 2000; Mazumder et al., 2012b). The arcuate shear zone occurring to the north of the Singhbhum granite and the IOG rocks is known as the Singhbhum Shear Zone (SSZ). (B) Simplified geological map (modified after Mukhopadhyay, 2001) showing the disposition of the Older Metamorphic Group (OMG), the Older Metamorphic Tonalite Gneiss (OMTG), the Archaean granitoids and the Iron Ore Group (IOG). Note that the IOG occurs to the east, west and south of the Archaean Singhbhum granitoid (after Mazumder et al., 2012b).