SUPPLEMENTARY MATERIAL

Meso–Proterozoic tectonic evolution of Chhotanagpur Gneissic Complex (CGC): Existence of an either way subduction within Central Indian Tectonic Zone (CITZ)

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The present study involves tectonic evolution of western side of Chhotanagpur Gneissic Complex (CGC), eastern part of Central Indian Tectonic Zone (CITZ) wherein a metasedimentary-metavolcanics and younger granite gneiss-granitoids had suffered at least five episodes of deformation. According to this study, first (D_1), third (D_3) and fourth (D_4) episodes of deformation in CGC are related to thrust movement manifested by shear zones. Among these, presently established D_3 and D_4 episodes correspond to 1.62-1.42 Ga and 1.04-0.94 Ga respectively mark the Columbia and Rodinia amalgamation. These thrust zones are highlighted by juxtaposition of granulite rocks with low to medium-grade metamorphic rocks accompanied by shear zones. In the northern part of CITZ, Makrohar granulites (MG) are juxtaposed with amphibolite facies metavolcanics of CGC along newly established northerly dipping Balangi-Sanawal thrust zone (splay of Son-Narmada South Shear Zone-SNSSZ) and a syn-tectonic porphyroclastic augen syenogranite has been emplaced. In the central part of CITZ, along northerly dipping Gavilgarh-Tan shear zone (GTSZ) CGC rocks got juxtaposed with Ramakona-Katangi granulites (RKG) at ~1.04-0.94 Ga. In the southern part of CITZ, the Balaghat-Bhandara granulites (BBG) and Chhatuabhavna granulites (CBG) occur juxtaposed with greenschist-amphibolite facies CGC rocks alongwith emplacement of syn-tectonic porphyroclastic augen syenogranite against southerly dipping Central Indian Shear (CIS) zone at ~1.62-1.42 Ga (Chattopadhyay et al., 2017; 2020; Roy and Prasad, 2003). All the earlier aforesaid studies opined the age of MG belt – CGC thrusting along SNSSZ at >1.8 Ga and postulated subduction of then South Indian Block (SIB) below North Indian Block (NIB) at about >1.8 Ga along SNSSZ followed by subduction of NIB below SIB along CIS at ~1.62-1.42 Ga again followed by subduction of SIB below NIB along GTSZ at ~1.04-0.94 Ga. However, this study reveals that the northernmost thrusting of MG belt enderbite above CGC truncates the low-plunging F_2 folds of CGC amphibolite and in proximal zones of all these shear zones syn-tectonic porphyroclastic augen syenogranite got emplaced through numerous narrow channels. These narrow emplacement of sheared augen syenogranite and associated amphibolite exhibit Class-2 Similar/Shear folds with vertical geometry with no folding internal layers/form surfaces and that is why the Balangi-Sanawal thrusting event has been correlated with regional D_3 episode of CGC i.e. at ~1.62-1.42 Ga. Though the present areal distance between Balangi-Sanawal thrust and CIS is about ~170 km along N-S direction, both the thrusting events can be correlated with D_3 episode as both of those are associated with emplacement of aforesaid sheared augen syenogranite. The GTSZ, a representative of D_4

episode of CGC, on the other hand has developed through a 'Ramp and Flat' geometry with imprints of brittle-ductile shearing in the study area. Due to this ~170 km apart northerly and southerly subduction of then Central Indian block, now preserved as CGC, during D_3 event at ~1.62-1.42 Ga and thrusting of deep-crustal granulites through hanging wall block, existence of a Meso-Proterozoic either way coupled subduction is postulated such as analogue of Ngalau plate subduction below Andaman and Sundaland continental plates in north and south respectively (Plunder et al., 2020).

References:

Chattopadhyay, A., Chatterjee, A., Das, K. and Sarkar, A., 2017: Neoproterozoic transpression and granite magmatism in the Gavilgarh-Tan Shear Zone, central India: Tectonic significance of U-Pb zircon and U-Th-total Pb monazite ages. Journal of Asian Earth Sciences, 147(1): 485-501.

Chattopadhyay, A., Bhowmik, S. K. and Roy, A., 2020: Tectonothermal evolution of the Central Indian Tectonic Zone and its implications for Proterozoic supercontinent assembly: the current status. Episodes, doi:https://doi.org/10.18814/epiiugs/2020/020008.

Plunder, A., Bandyopadhyay, D., Ganerød, M., Advokaat, E. L., Ghosh, B., Bandopadhyay, P. and van Hinsbergen, D. J. J., 2020: History of subduction polarity reversal during arc-continent collision: Constraints from the Andaman ophiolite and its metamorphic sole. Tectonics, 39(6), e2019TC005762. https://doi.org/10.1029/2019tc005762.

Roy, A. and Prasad, M. H., 2003: Tectonothermal Events in Central Indian Tectonic Zone (CITZ) and Its Implications in Rodinian Crustal Assembly. Journal of Asian Earth Sciences, 22 (2), 115-129. doi:10.1016/S1367-9120(02)00180-3.

Supporting figures:

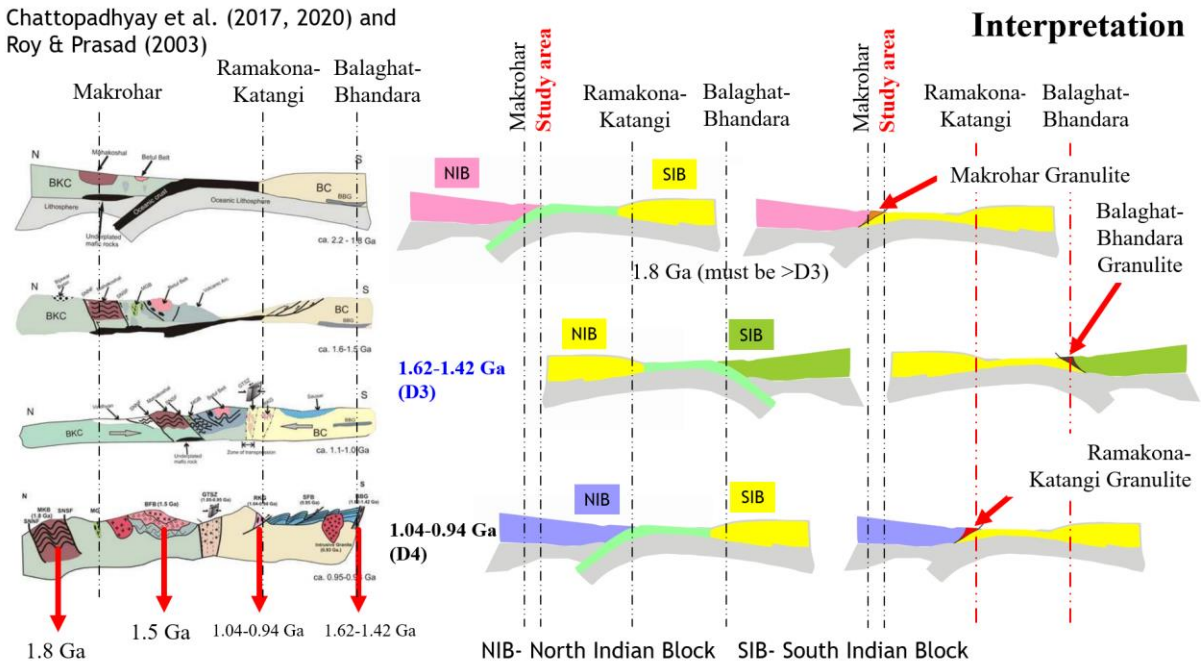

Fig. 1: Correlation of NIB-SIB movement as per earlier postulations.

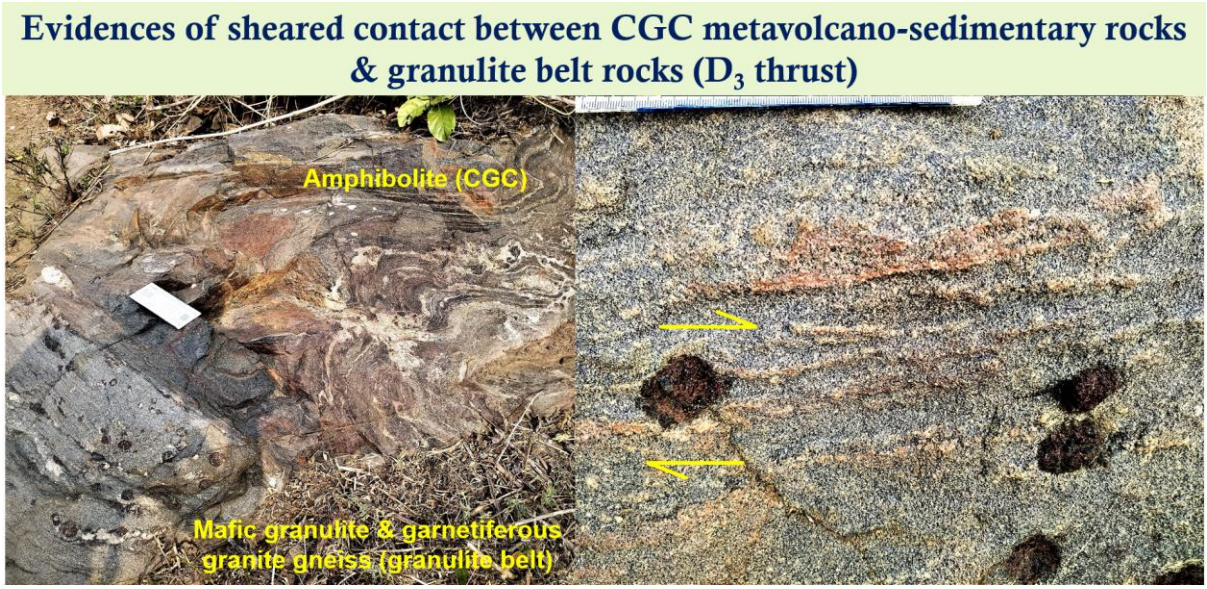

Fig. 2: Thrusting of Makrohar granulites with folded (low-plunging, upright F_2) CGC amphibolite and sigmoid shaped garnets within Balani-Sanawal thrust zone.

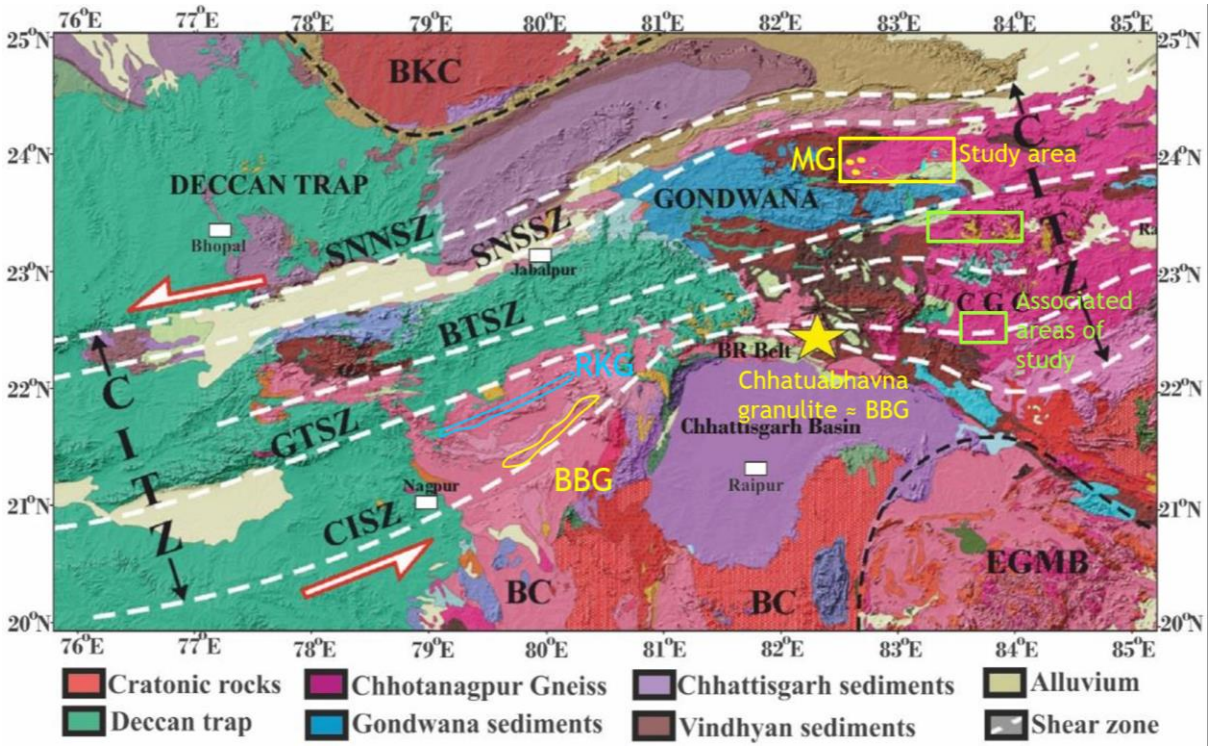

Fig. 3: Lithological map of parts of CGC and CITZ along with studied areas and major granulite belts in CITZ.

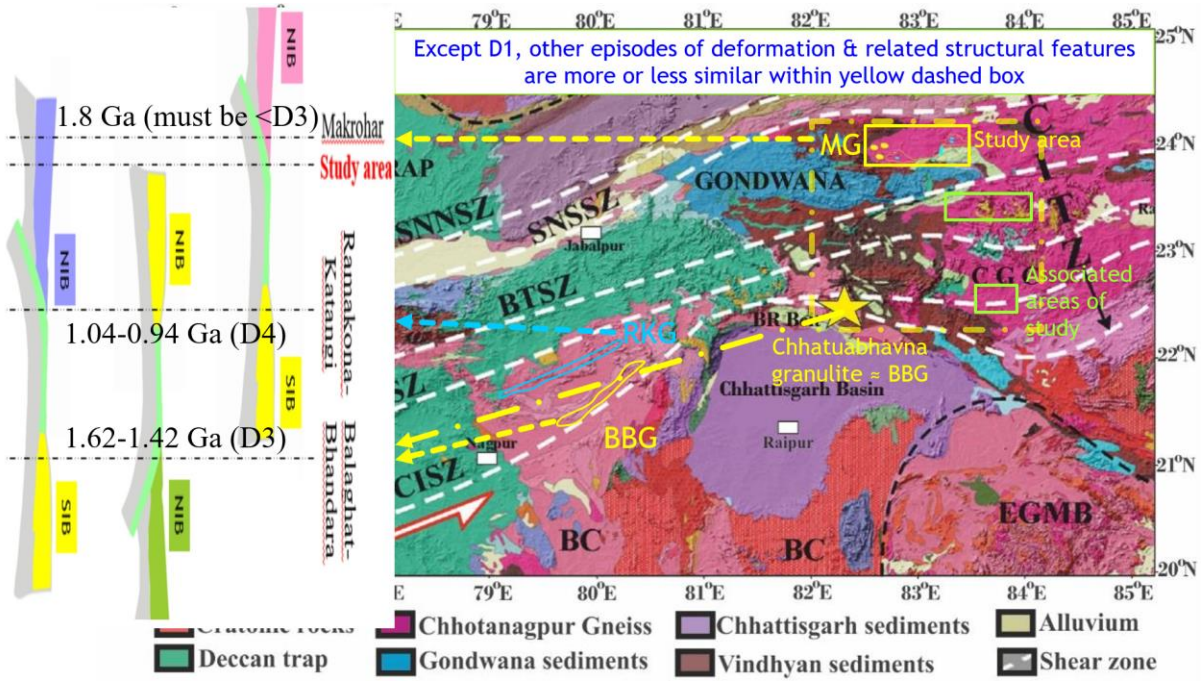

Fig. 4: Schematic representation of temporal relationship of collisional events with spatial distribution of different thrust systems in CITZ.

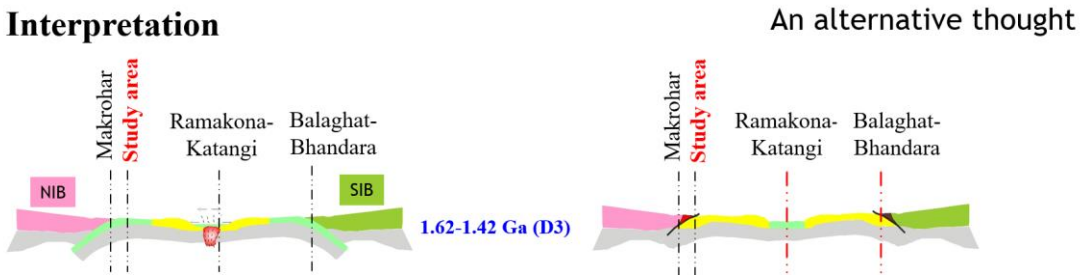

Fig. 5: An alternative postulation based on the evidences of present study.