TECTONICS OF THE PRECAMBRIAN ROCKS OF THE CHOTTANAGPUR GNEISS COMPLEX (EASTERN INDIA) AND IMPLICATIONS FOR GLOBAL CORRELATIONS

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ABSTRACT

In physiographic reconstructions of the Columbia and the Rodinia Supercontinents, the position of India is ambiguous. The lack in comprehensive understanding of the tectonic evolution of the Proterozoic mobile belts in India impedes precise correlation across dispersed crustal fragments. This study focuses on the tectonic evolution of the Chottanagpur Gneiss Complex (CGC) at the eastern end of the Greater Indian Proterozoic Fold Belt deemed to be the zone of accretion between the North India (NIB) and the South India (SIB) blocks.

Detailed structural mapping in selected areas, kinematic vorticity analyses and electron back-scatter diffraction studies, Th-U-Pb chemical dating of monazite and SIMS U-Pb zircon dating, major and trace element whole-rock geochemistry, and metamorphic P-T estimations were used four deformation events (D1-D4) in the CGC. The ~1.6 Ga granulite facies D1 deformation identified from isoclinally-folded metatexite layers in the granulite facies basement gneisses is preserved in the intrafolial domains of the penetrative steeply-dipping N-striking D2 deformation (1.45–1.4 Ga). The timing of the D2 deformation is constrained by within-plate emplacement of Mid-Mesoproterozoic within-plate peraluminous A-type granites chemically identical to the North American ~1.4 Ga granitoids. The Grenvillian-age accretion of the CGC with the Archean Singhbhum Craton in South and the Paleoproterozoic Gaya-Mahakoshal Belt in North closely followed the emplacement of voluminous Grenvillian-age granitoids. The accretion was accommodated by basement involved thin-skin type translation of supracrustal rocks (D3) and nucleation of steeply-dipping orogen-parallel basement-piercing left-lateral transpressional D4 shear zones with sub-horizontal/gently-plunging stretching lineations. The

pure shear dominated shallowly-dipping D3 foliations are extensional fabrics forming a regional scale low-angle detachment fault, along which the CGC basement rocks were exhumed, aided by oblique extrusion along the D4 shear zones. Variations in convergence direction caused some of the shear zones to curve and possess steeply-plunging stretching lineations.

The tectonic evolution of the CGC since the Mid-Mesoproterozoic indicates that the CGC behaved as a distinct ‘micro-continent’ involved in the breakup of the Columbia Supercontinent that induced widespread A-type magmatism, and was subsequently integrated within India due to NIB-SIB accretion contemporaneous with the Rodinia assembly.

Key words: *Chottanagpur Gneiss Complex (India), accretion dynamics, transpressional shear zones, flat-lying foliation, Mid-Proterozoic A-type granites, Columbia Supercontinent breakup, Rodinia assembly*