Precambrian Research 298 (2017) 56–78

Contents lists available at ScienceDirect

Precambrian Research

journal homepage: www.elsevier.com/locate/precamres

Late Paleoproterozoic clockwise *P–T* history in the Mahakoshal Belt, Central Indian Tectonic Zone: Implications for Columbia supercontinent assembly

Tanzil Deshmukh [a], N. Prabhakar [a,*], A. Bhattacharya [b], K. Madhavan [a]

[a] Department of Earth Sciences, Indian Institute of Technology Bombay, Powai, Mumbai 400076, India
[b] Department of Geology and Geophysics, Indian Institute of Technology, Kharagpur 721302, India

ARTICLE INFO

Article history:
Received 3 November 2016
Revised 18 April 2017
Accepted 21 May 2017

Keywords:
Mahakoshal belt
Central Indian Tectonic Zone
Phengite–mica–andalusite schists
Clockwise *P–T* path
Near-isothermal decompression

ABSTRACT

The Paleo/Neoproterozoic Central Indian Tectonic Zone (CITZ) suggested being continuous with the Capricorn Orogen of Western Australia (COWA) and the Trans North China Orogen (TNCO) is the zone of accretion between the North India and the South India Archean Blocks. This study aims to establish the tectonothermal history of the Mahakoshal Belt (MB) in the CITZ and to review its relevance to the suggested correlation of CITZ with COWA and TNCO. In this study, we focus on the metamorphic *P–T–t* history of phengite–quartz–andalusite–margarite–muscovite–chlorite–biotite schists/phyllites and rare andalusite–corundum–quartz veins in the schists/phyllites. S_1 inclusion trails of phengite + biotite + quartz ± muscovite ± chlorite assemblages in syn/post-S_2 andalusite porphyroblasts were stabilized at ~8 kbar, 520 °C. Near-isothermal decompression led to andalusite–muscovite stabilization at the expense of phengite-bearing assemblage at <4 kbar. Continued isothermal decompression (2–3 kbar) led to fluid-aided post-S_3 replacement of andalusite porphyroblasts by margarite–muscovite–chlorite pseudomorphs, and andalusite–corundum in the veins were replaced by muscovite–diaspore ± chlorite assemblages. U–Th–Pb (total) age determinations suggest that the clockwise *P–T* path in the MB schists/phyllites occurred at 1.7–1.8 Ga, which overlaps with the 1.7–1.8 Ga granitoids in the supracrustal belt. This Paleoproterozoic subduction-metamorphism and granitoid emplacement synchronous with exhumation in the MB combined with existing information suggest that the CITZ comprised disparately-evolved crustal domains that accreted over a protracted time between Late Paleoproterozoic and Early Neoproterozoic. The tectonothermal events in the CITZ partly overlap with those in the COWA and TNCO with major omissions, and therefore, these global correlations should await further petrological and robust age determinations in the CITZ.

1. Introduction

Accretion zones comprise crustal domains with distinctive pressure *(P)* – temperature *(T)* – time *(t)* – deformation *(d)* histories (e.g. Groppo et al., 2009; Kohn, 2014; Manzotti et al., 2015). The disparately evolved crustal units may accrete simultaneously as in paired metamorphic belts (Miyashiro, 1961; England and Thompson, 1984; Maruyama, 1997), or the interleaved allochthonous domains may accrete sequentially over protracted geological time (Reymer and Schubert, 1984; Eisele and Isachsen, 2001; Wandres and Bradshaw, 2005; Zhou et al., 2006; Zeh et al., 2009; Burton-Johnson and Riley, 2015). A comprehensive understanding of the dynamics of accretion in a polychronous orogen depends on critical assessment of the *P–T–t–d* paths recorded by the accreted units.

The E–W trending Central Indian Tectonic Zone (CITZ) extends across peninsular India and is bounded by the Son-Narmada North Fault (SNNF) to the north and the Central Indian Shear Zone (CISZ) to the south (Radhakrishna and Ramakrishnan, 1988; Radhakrishna, 1989; Acharyya and Roy, 2000; Ramakrishnan and Vaidyanadhan, 2010). The CITZ is deemed to be the continental-scale suture along which the North India Block (comprising the Archean Bundelkhand Craton), and the South India Block (comprising the Archean nuclei of the Singhbhum, Bastar and Dharwar Cratons) accreted (Fig. 1a). The CITZ is a collage of (a) greenschist/amphibolite facies metavolcanic and metasedimentary supracrustal belts, e.g. Mahakoshal, Betul and Sausar supracrustal belts, and (b) granulite facies para/ortho-gneisses of

* Corresponding author.
E-mail address: prabhakarnaraga@gmail.com (N. Prabhakar).

http://dx.doi.org/10.1016/j.precamres.2017.05.020
0301-9268/

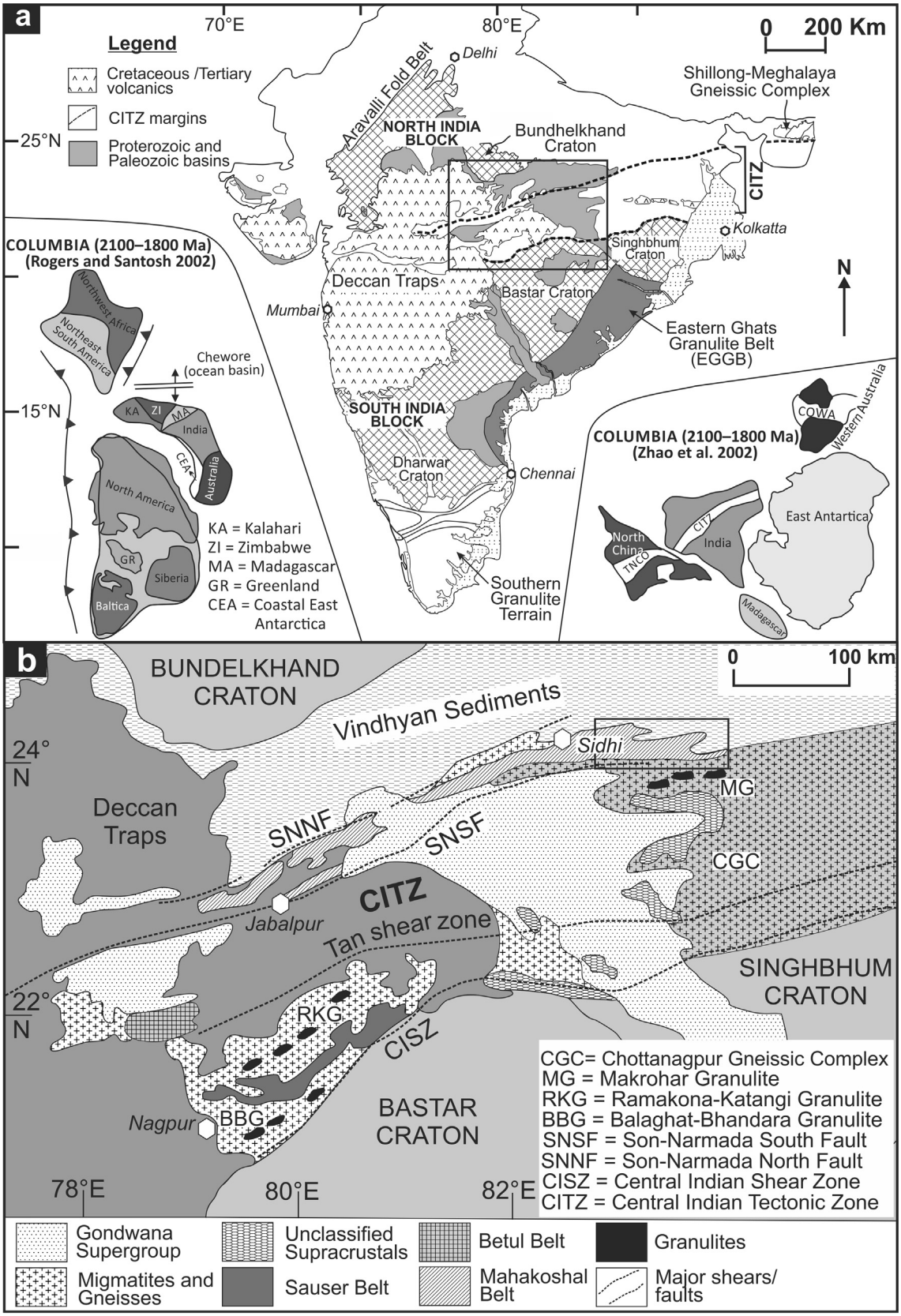

Fig. 1. (a) Tectonic map showing major Archean Cratons and Proterozoic mobile belts in the Indian subcontinent (modified after Ramakrishnan and Vaidyanadhan, 2010). The Central Indian Tectonic Zone (CITZ; dashed lines) demarcates the accretion zone between the South India Block and the North India Block. Inset images in the lower left and right corners indicate the reconstruction of Columbia Supercontinent by Rogers and Santosh (2002) and the part of Columbia assembly by Zhao et al. (2002) respectively. (b) Geological map (box in Fig. 1a) illustrating the spatial distribution of low-grade supracrustal belts (e.g. Mahakoshal, Betul and Sausar Belts) and granulite belts (e.g. Makrohar, Ramakona–Katangi and Balaghat–Bhandara Belts) within the CITZ and its environs (modified after Roy et al., 2002). Box in (b) shows the area examined (Fig. 2) in this study.