Timing and dynamics of the juxtaposition of the Eastern Ghats Mobile Belt against the Bhandara Craton, India: A structural and zircon U-Pb SHRIMP study of the fold-thrust belt and associated nepheline syenite plutons

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[1] Sensitive High Resolution Ion MicroProbe (SHRIMP) U-Pb dating of zircon from basement granite gneisses and nepheline syenites of the Sinapalli Nappe, occurring along the northwestern margin of the Eastern Ghats Mobile Belt, indicate high grade regional metamorphism and associated folding accompanying juxtaposition of the nappe with the Bhandara Craton, to have taken place between 617 ± 85 Ma (lower intercept age of a reworked basement unit) and 517 Ma (age of the youngest syenite). This shows, for the first time, that the final juxtaposition of the northwestern parts of the Eastern Ghats Mobile Belt against the Bhandara Craton came about in the late Neoproterozoic and not, as previously thought, during the Mesoproterozoic. The northwestern part of the Eastern Ghats Mobile Belt comprises a fold- thrust belt consisting of a stack of northwesterly verging nappes that have been thrust over the Bhandara Craton. The Sinapalli Nappe is the lowermost nappe and rests over a tectonic contact on the Archean granites and gneisses of the craton. The basal décollement is exposed as a two-km-wide ductile-brittle thrust, hosting nepheline syenite plutons that show fabrics consistent with a synkinematic emplacement during thrusting. The Sinapalli Nappe is comprised of a sequence of alternating mafic granulites and quartzofeldspathic gneisses with slivers of basement granites, which are folded in three phases of folding (F_1, F_2 and F_3) and were subjected to granulite facies metamorphism during F_1 folding. Thrusting is synkinematic to F_2 folding and is responsible for the juxtaposition of the northwestern part of the Eastern Ghats Terrane over the Bhandara Craton during the assembly of parts of eastern Gondwana. **Citation:** Biswal, T. K., B. De Waele, and H. Ahuja (2007), Timing and dynamics of the juxtaposition of the Eastern Ghats Mobile Belt against the Bhandara Craton, India: A structural and zircon U-Pb SHRIMP study of the fold-thrust belt and associated nepheline syenite plutons, *Tectonics*, *26*, TC4006, doi:10.1029/2006TC002005.

1. Introduction

[2] It has long been thought that India and Antarctica were juxtaposed during the Mesoproterozoic, possibly forming part of the Rodinia Supercontinent (~1.0 Ga, Figure 1a) [*Du Toit*, 1937; *Grew and Manton*, 1986; *Powell et al.*, 1988; *Yoshida et al.*, 1996]. This assumption has been based on a geometric fit of the continental margin and Indian Ocean sea floor magnetic anomalies. Occurrence of similar Ultra High Temperature (UHT) granulite sapphirine-spinel-assemblages, a similar anticlockwise P-T path with isobaric cooling, and isotopic data indicating a matching Meso-Neoproterozoic tectonothermal history between the Eastern Ghats Mobile Belt (EGMB) and Rayner-Napier Complex corroborate to this assumption. However, with advancements in geochronological methods, these previous correlations, especially the exact fits between the various blocks, have been the focus of considerable debate. While *Chetty* [1995] inferred that the Rayner-Napier boundary joins up with the Nagavalli-Vamshadhara Shear Zone, *Yoshida* [1995] and *Dasgupta and Sengupta* [2003] proposed that the above boundary meets the Godavari rift. *Biswal et al.* [2002] and *Biswal and Sinha* [2003] interpreted that the Rayner-Napier boundary joins up with Terrane margin of the EGMB. Further, *Rickers et al.* [2001] suggested that the Archean Napier Complex is an exotic terrane to both Antarctica and the EGMB or Indian margin. However, in all these studies it has been assumed that the EGMB was an integral part of India since the Mesoproterozoic. In the present paper we contribute new data suggesting that at least part of the EGMB was only emplaced in the late Neoproterozoic-Cambrian during the amalgamation of Gondwana. We present new zircon U-Pb SHRIMP data on basement granite gneisses and nepheline syenites from the northwestern margin of the EGMB, which contradict previous ages on the plutons [*Aftalion et al.*, 2000; *Upadhyay et al.*, 2006a] as well as existing models of the tectonic

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