

Geology, geochemistry and geochronology of the Archaean Peninsular Gneiss around Gorur, Hassan District, Karnataka, India

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Abstract. The Peninsular Gneiss around Gorur in the Dharwar craton, reported to be one of the oldest gneisses, shows nearly E–W striking gneissosity parallel to the axial planes of a set of isoclinal folds (DhF₁). These have been over printed by near-coaxial open folding (DhF_{1a}) and non-coaxial upright folding on almost N–S trend (DhF₂). This structural sequence is remarkably similar to that in the Holenarasipur schist belt bordering the gneisses as well as in the surpracrustal enclaves within the gneisses, suggesting that the Peninsular Gneiss has evolved by migmatization synkinematically with DhF₁ deformation.

The Gorur gneisses are high silica, low alumina trondhjemites enriched in REE (up to 100 times chondrite), with less fractionated REE patterns ($Ce_N/Yb_N < 7$) and consistently negative Eu anomalies ($Eu/Eu^* = 0.5$ to 0.7).

A whole rock Rb–Sr isochron of eight trondhjemitic gneisses sampled from two adjacent quarries yields an age of 3204 ± 30 Ma with Sr_i of 0.7011 ± 6 (2σ). These are marginally different from the results of Beckinsale and coworkers (3315 ± 54 Ma, $Sr_i = 0.7006 \pm 3$) based on a much wider sampling. Our results indicate that the precursors of Gorur gneisses had a short crustal residence history of less than a 100 Ma.

Keywords. Archaean; trondhjemites; geochemistry; Rb–Sr geochronology; Peninsular gneiss; syntectonic emplacement; evolution of continental crust.

1. Introduction

Archaean gneiss complexes which host the greenstone belts are polycyclic in origin. Relicts of gneisses generated during early cycles rarely retain their identity because of superposed deformation, metamorphism and anatexis leading to migmatization which obliterates the memory of early events. The Peninsular Gneiss complex of southern India is one such polymigmatite-gneiss complex which has a long history of evolution from ~ 3300 to 2500 Ma ago (Beckinsale *et al* 1980; Taylor *et al* 1988). Three groups of Rb–Sr ages have been measured in the Peninsular Gneiss — 3300 ± 100 Ma, 3000 ± 100 Ma and 2500 ± 100 Ma (Pichamuthu and Srinivasan 1984). Relicts of 3300 Ma and older gneisses are rare in the Peninsular Gneiss terrane. They were first recognized in the gneisses exposed between Hassan and Gorur in the western part of Karnataka from a five-point whole-rock Rb–Sr isochron age of 3358 ± 66 Ma (Beckinsale *et al* 1980). Further dating of these gneisses based on a 34-point Rb–Sr whole-rock isochron and a 11-point whole-rock Pb–Pb isochron reconfirmed the earlier result at 3315 ± 54 Ma ($Sr_i = 0.7006 \pm 3$) and 3305 ± 13 Ma ($\mu_1 = 8.0$), respectively (Beckinsale *et al* 1982). Ancient gneisses of comparable age have subsequently been found in the Anmod Ghat region of Goa (Dhoundiyal *et al* 1987).