Evolution of the high grade terrain of southern India and Sri Lanka

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High-grade terrains consisting essentially of upper amphibiolite to granulite facies rocks represent either deeper levels of cratons or linear mobile belts. Examples of high-grade cratons are the North Atlantic craton and the cratonal margins of mobile belts such as the southern and northern marginal zones of the Limpopo belt. Following this framework of Precambrian shields, the high-grade terrain of southern India has been traditionally divided into the Eastern Ghat Belt and the Southern Granulite Terrain, the latter being regarded as the structural continuation of the former. Drury *et al.* (1984) made the first radical departure from this view by dividing the Precambrian shield of southern India into northern and southern blocks separated by the Palghat-Cauvery shear system. Extending this division further, Ramakrishnan (1988, 1990 a,b) described the high-grade terrain of the northern block as the deeper part of Dharwar craton and the southern block as the Pandiyan mobile belt. The Pandiyan mobile belt is not the structural continuity of the Eastern Ghat belt because of the differences in lithologic polarity, structural grain, metamorphic facies series, age and absence of manganese horizons in the former.

The Pandiyan mobile belt is divided into the Northern Marginal Zone (NMZ), the Central Zone (CZ) and the Southern Khondalite Zone (KZ) by analogy with the division of the Limpopo belt (Watkeys 1983). NMZ represents the northern block sandwiched between the Moyar-Bhavani and Palghat-Cauvery shear zones, along which the cratonic N-S trendlines abruptly swerve into the dextral E-W trending shear system. NMZ is conspicuous for the charnockite massifs like Vellore, Shevaroy and Nilgiri, which show lithological, structural and metamorphic continuity from the greenstone terrain in the north; it, therefore, represents the deeper levels of the Dharwar craton. NMZ is separated from the CZ by the Moyar-Bhavani-Attur shear zone.

CZ is characterised by swirling structural patterns similar to the Central Zone of the Limpopo belt. It is essentially a gneissic terrain with supracrustal enclaves of an orthoquartzite-carbonate-pelite suite. There are no mafic-ultramafic lavas; and iron formations, which are conspicuous in the Sargur and Dharwar greenstone belts to the north, are absent. Prominent dyke swarms of the Dharwar craton are also absent in the CZ. The CZ is separated from the SKZ by the Achankovil shear zone.

SKZ consists essentially of a khondalite-leptynite suite with subordinate charnockite. The western portions of this zone are locally called the Kerala Khondalite Belt. It is possible that there was another greenstone-granite terrain bounding the Pandiyan mobile belt to the south, but the break-up of Gondwanaland has wiped out clues to its existence. Just as the Limpopo belt is further sub-divided into seven tectono-stratigraphic domains (Watkeys 1983) following the terrain concept of plate tectonics, the southern granulite terrain is also sub-divided into several blocks (Gopalakrishnan *et al.* 1990).

The evolution of such a complex terrain could be deciphered only if the configurations of cratons and mobile belts are reconstructed from the pre-drift position of continents in Gondwanaland. One hypothetical configuration suggested here is that the Dharwar craton is bounded to the east by the Eastern Ghats - Sri Lanka Highlands mobile belt, to the south by the Pandiyan-Rayner complex mobile belt and to the west by the Mozambique-Malagasy mobile belt. These probably form an intersecting pattern of mobile belts as in the African shield. In such a model, the Achankovil shear zone may correspond to the Ronatsaro lineament of Malagasy and the Palghat-Cauvery shear zone to the Rayner-Napier complex boundary in Antarctica. The South-western Group of Sri Lanka may, therefore, coincide with the Southern Khondalite Zone of Pandyian Mobile belt in southern India.

A popular model linking greenstone belts with the southern granulite terrain is the northward collision of the south Archaean block with the Dharwar craton along the Palghat-Cauvery suture zone, similar to the Himalayan collision (Drury *et al.* 1984; Newton in press). A better alternative would be the collision directed from N to NE and E towards the Dharwar craton. This would account for the south-verging folds in the Bababudan and Shimoga belts, and the N-S arcuate trends of greenstone belts as well as the Closepet granite, produced by E-W compression coupled with N-S transcurrent motion (Chadwick *et al.* 1989). The E-W compression in the craton is a recurrent phenomenon from Archaean (Sargur and Dharwar, 3.0 to 2.5 Ga) to Proterozoic (Eastern Ghats, 1.0 Ga). The Pandiyan mobile belt of probable Pan-African age (500-700 Ma) may signify N-S compression as evidenced by WNW-ESE trends and the swerving of N-S shear zones from the craton into the Palghat-Cauvery shear system. The charnockites of southern India, Eastern Ghats and the Karimnagar-Bhopalatnam tract around the Godavari graben may have been exhumed during the later Proterozoic orogenies.

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