



## **Paleomagnetism and U-Pb geochronology of dykes from eastern Dharwar craton, India: giant radiating dyke swarms and the position of India in Paleoproterozoic time**

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The structural grain of granite-greenstone terrains of the Archean Dharwar craton of Peninsula India runs generally N-S with a curvature, convex to the east. A prominent dyke set is orthogonal to the Archean structural grain and therefore shows a radiating pattern that diverges from a focal region somewhere to the west<sup>1</sup>. This orthogonality is often a feature of the earliest Proterozoic dyke swarms in any given craton, inviting speculation<sup>1</sup> that the swarm could be about 2.4 Ga in age based on an early Rb-Sr date<sup>2</sup>. The old age of the dykes is confirmed by a U-Pb baddeleyite age of  $2365 \pm 1.1$  Ma<sup>3</sup> from the same E-W trending dyke dated by<sup>2</sup> which gives a steep upward remanent magnetization **A**<sup>4</sup>. Previous paleomagnetic studies show that **A** is a characteristic component in these dykes. A new U-Pb baddeleyite age of  $2366.7 \pm 1.0$  Ma has been obtained from a WNW trending dyke about 50 km SE of Mysore, which also yields **A**. **A** also occurs in a dyke about 250 km to the north where overall dyke trends are WSW and is suspected in a dyke near Hospet, another 100 km farther north, where regional dyke trends are more SW. On paleomagnetic evidence the dykes have the same  $\sim 2.37$  Ga age and constitute a radiating swarm, with a fan angle of about 40°, that covers an area of at least  $10^5$  km<sup>2</sup>. The dykes, where intruded into granulites, are fresh and show clouded feldspar. To the north, where host rocks are in greenschist-amphibolite facies, the dykes have clear feldspar but are more hydrously altered. The variation in clouding intensity in the Indian dykes shows that the Dharwar craton has

been tilted northwards, a conclusion in harmony with previous studies on the Archean host rocks <sup>5</sup>. Paleomagnetic results for **A** use a site acceptance criteria of Number of samples  $\geq 4$  and  $\forall_{95} \# 15^\circ$ , and combine two data sets: 13 sites from this work and 18 sites from previous publications. Both data sets show an odd bimodal grouping of site VGPs, a result of contamination by a more recent remagnetization. Removal of suspect sites from both data sets produces the following best combined estimate for the **A** pole position: Plat =  $24.2^\circ$  N, Plon =  $57.4^\circ$  E,  $A_{95} = 5.4^\circ$ , Number of dykes = 16. The dyke swarm has no known age correlatives in other cratons; the closest is the Widgiemooltha swarm in Australia with an older U-Pb age of  $2410 \pm 2$  Ma<sup>6</sup>. Both continents at the times of dyke intrusion were at high southern latitudes and may only have been about 2000 km apart if the Archean structural grain was originally of a similar trend in both continents. References: 1: Halls, 1982, *Geoscience Canada* 9: 145; 2- Ikramuddin & Stueber, 1976, *Lithos* 9: 235; 3 - French et al., 2004, *GSA Abstracts* 36; 4 - Dawson & Hargraves, 1995, *Precambrian Res.* 69:157; 5 - Raase et al. 1986, *J. Geol.* 94:261; 6 - Doehler & Heaman, 1998. *GSA Abstracts* 30.