Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9861

Is the N-S metamorphic gradient in the Western Dharwar Craton superficial and the effect of multiple metamorphic overprints?

DEWASHISH UPADHYAY AND SAMEER RANJAN

Indian Institute of Technology Kharagpur

Presenting Author: dewashish@gg.iitkgp.ac.in

The Western Dharwar Craton (WDC) hosts a typical Archean association of grey gneisses, potassic granites, and greenstone belts. A number of studies [1] have argued for N-S metamorphic gradient across the craton with the metamorphic grade increasing from greenschist facies conditions (4–5 kbar and 400–500°C) in the north, through amphibolite facies condition (5–8 kbar, 600–640°C) in the central part (Holenarsipur), to granulite facies conditions (8–10 kbar, 700–750°C) near the southern margin (Sargur belt). This led to suggestions that the craton exposes a tilted crustal section with lower crustal levels exposed towards the south. However, the major structural fabric of the craton including the orientation of the greenstone belts and major shear zones is broadly N-S [2, 3].

Uranium-Pb ages from detrital zircon in quartzite/metapelite from the Sargur belt furnish ages between 3.64 Ga and 2.69 Ga [4], while in-situ formed metamorphic zones cluster at c. 2.57 Ga and 2.48 Ga, which suggests that the southern part of the craton underwent high-grade metamorphism in the late Neoarchen and early Paleoproterozoic. In contrast, the regional high-grade tectonothermal overprint in the central part of the craton has been dated at 3.14–3.11 Ga [5], with little evidence for the 2.57–2.48 Ga overprints in the zircon age record [4]. Given the temporal differences in the timing of major high-grade metamorphism in the northern and southern parts of the craton, the idea that the N-S zonal metamorphic field gradient may be the result of one major metamorphic episode needs to be relooked. The variation of the metamorphic conditions likely reflects the polychronous nature of the metamorphic history involving Mesoarchean (3.14–3.11 Ga) cratonization that may have produced the N-S structural fabric of the craton, followed by late Neoarchean/early Paleoproterozoic metamorphism along the southern and eastern margins.

[1] Raase et al. (1986) J. Geol. **94**, 261–282; [2] Drury and Holt (1980) Tectonophysics **65**, T1–T15; [3] Janardhan et al. (1979) J. Geol. Soc. India **20**, 61–72; [4] Ranjan et al. (2022) Precam. Res. **371**, 106559; [5] Dasgupta et al. (2019) Lithos **342–343**, 370–390.