Combined geochemical, zircon U-Pb and Lu-Hf isotopic constraints on Archaean crustal evolution of the Banded Gneissic Complex, NW India

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The Archaean rocks of the Banded Gnessic Complex (BGC), occurring around Udaipur in NW India, were dated more than two decades ago using whole-rock Rb-Sr and Sm-Nd isochron methods, and single zircon evaporation or zircon ion microprobe techniques. In this study, the rocks of the BGC were subjected to combined *in situ* U-Pb zircon dating, Lu-Hf isotope compositions and whole-rock geochemistry.

The data reveal a discrete episode of Palaeoarchaean TTG magmatism at ca. 3.3 Ga, followed by a younger phase of Neoarchaean TTG magmatism at 2.56-2.55, and nearly coeval intrusion of granitoids at 2.55-2.49 Ga. The 3.3 Ga TTG is characterised by highly fractionated REE pattern [$(La/Yb)_N$ = 64.4] with low HREE contents and positive Eu anomaly (Eu/Eu* = 1.09); the pattern is similar to the medium-HREE TTG group [1]. It shows near chondritic εHf_t (-0.4 ± 1.2) and much older Hf model age (ca.3.80 Ga), indicating that it has formed by reworking of Eoarchaean mafic crust. The Neoarchaean TTGs show realtively less fractionated REE patterns [$(La/Yb)_N$ = 17.3-20.9], low HREE contents but similar positive Eu anomalies (Eu/Eu* = 1.05-1.18); however, the patterns are comparable to the high-HREE TTG group. The subchondritic εHf_t (-2.7 to -7.1), Hf model ages of 3.78-3.44 Ga and inherited zircons of 3.10-2.64 Ga suggest substantial reworking of older crust during the Neoarchaean. The Neoarchaean granitoids show much less fractionated REE patterns [$(La/Yb)_N$ = 2.2-5.4] and negative Eu anomalies (Eu/Eu* = 0.40-0.93). Their subchondritic εHf_t (-3.4 to -11.7), older Hf model ages (3.64-3.18 Ga) and zircon xenocrysts (3.10-2.66 Ga) further lend support to dominance of crustal reworking during Neoarchaen. Nevertheless, a few inherited ca. 2.66 Ga zircons show superchondritic εHf_t, suggesting some juvenile mantle input also at this time. These results are integrated with recently published data from adjoining Bundelkhand Craton [2] to havea holistic picture of Archaean crustal evolution of northern India.

[1] Moyan & Martin (2012) *Lithos* 148, 312-336. [2] Kaur *et al*. (2016) *Precambrian Res.* 281, 384-413.