

Metamorphic evolution of Baijnath Klippe, Kumaun Lesser Himalaya North West India

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Tectonically transported Palaeoproterozoic crystalline thrust sheet over the Lesser Himalayan Neoproterozoic-Eocene age meta-sedimentary zone in the Kumaun-Garhwal region (Uttarakhand), India is represented by the Almora, Baijnath, Askot and Chiplakot klippen. The largest among these, the Almora klippe, consists of ca. 1850 Ma mylonitized granite gneiss at the base overlain by a quartzite-schist sequence having ca. 850 to 580 Ma maximum depositional age. Our study from the Baijnath Klippe, suggests that the granitoids having crystallization age of ca. 1870-1850 Ma, is thrust over the 1815 Ma (U-Pb detrital zircon; maximum depositional age) metamorphosed supracrustal sequence. Outside the klippe, the Nanghat-Berinag Formation yields the maximum depositional age of ca. 1010 Ma (U-Pb detrital zircon). Based on these results, we infer that the Baijnath Klippe belongs to the Inner Lesser Himalayan Sequence. Being a structurally complex domain depicting multiple thrusting, the supracrustal sequence of this klippe shows progressive metamorphism which is characterized by field, petrographic and phase equilibria modelling data. The mineral assemblage in the metabasic schists is marked by chlorite + Ca-plagioclase + actinolite + quartz + biotite + muscovite + epidote + tschermakite + titanite with zircon and apatite as accessory phases. The prograde evolution is reflected by the (i) coarsening of grain size, (ii) decrease of modal chlorite and muscovite with concomitant increase of modal biotite + sphene, epidote and amphibole, (iv) Ca-enrichment in plagioclase along a clockwise P-T path. Thermobarometric estimates (T ranging from ~550°C to ~650°C with pressure from ~6.51 to ~8 kbar) from the studied samples of the Baijnath Klippe suggest the metabasic schists underwent peak metamorphism at the epidote-amphibolite facies. This metamorphism could be related to burial and thrusting of the ca. 1870-1850 Ma granitoid over the ca. 1815 Ma supracrustal sequence during the Himalayan orogeny.