

A comparative study among the Lesser Himalayan Klippes, Kumaun Himalaya: A Tectonometamorphic perspective

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Tectonically transported Palaeoproterozoic crystalline thrust sheet over the Lesser Himalayan Neoproterozoic-Eocene meta-sedimentary zone in the Kumaun-Garhwal region of Uttarakhand is represented by different synformal klippen like *Almora*, *Baijnath*, *Askot* and *Chiplakot*. The *Almora klippe*, known as the largest of these belts, is comprised of ca. 1850 Ma mylonitic granite gneiss overlain by a quartzite-schist sequence having 850 to 580 Ma (MDA), and the whole sequence is intruded by ca. 550 Ma granitoids. This set up of the Almora klippe is bit different in view of metamorphism from the others Klippen although Valdiya (1980) suggested a genetic linkage among all the klippes of this region. It thus became crucial to investigate whether the *Askot*, *Chiplakot* and *Baijnath Klippe* (all situated above Tons thrust) bear any tectonometamorphic signatures that can be distinct from the Almora Klippe/nappe (situated below Tons Thrust).

The metamorphic evolution of these klippes is characterized using field data with petrography, geothermobarometry and phase equilibria modeling. Our study reveals following features:

Baijnath Klippe: The major mineral assemblages of schists marked by chlorite+Ca-plagioclase+actinolite+quartz+biotite+muscovite+epidote+tschermakite+titanite with zircon and apatite as accessory phases reflecting the grade of metamorphism that varies from green-schist facies to epidote-amphibolite facies.

The Askot Klippe: The presence of chlorite+biotite+cordierite+garnet+muscovite+plagioclase+hornblende in the schist suggests the occurrence of metamorphism grading from green-schist facies to upper-amphibolite facies.

The Chiplakot Klippe: The major assemblages are defined by biotite+garnet+muscovite+plagioclase+hornblende. The garnet bearing schists of *Chiplakot Klippe* suffered a peak metamorphic condition up to upper-amphibolite facies also.

Almora Klippe: A prograde metamorphic sequence beginning with the biotite zone to the K-feldspar-sillimanite zone has been delineated in its central parts and repetition of metamorphic isograds is also present.

Thus, the tectonometamorphic evolution implies that klippes above the Tons thrust can be grouped together which bears dissimilarities with the klippe present below the Tons thrust. So, the Tons thrust is the demarcating boundary along which the greater Himalayan sequence stacked over the Lesser Himalayan sequence during the Himalayan Orogeny.