Pre-Himalayan tectonometamorphic signatures from the Kumaun Himalaya

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It is necessary to resolve the relative contributions of the Himalayan and Pre-Himalayan tectonometamorphic signatures for refinement of the existing models for the evolution of the Himalaya. An attempt has been made for the Lesser Himalayan metamorphics exposed in the Kumaun Himalaya to identify the Pre-Himalayan deformations and metamorphisms. The isoclinal F1 folds and the tight to isoclinal F2 folds in the Lesser Himalayan metamorphics of the Kumaun Himalaya can be safely inferred to be distinctly Pre-Himalayan as the 560±20 Ma old Champawat Granitoides and its equivalent Almora Granite (Rb-Sr dating, Trivedi et al. 1984) intrude the F2 folds.

The metamorphics comprising the Almora Group of rocks have been subjected to green schist facies to upper amphibolite facies metamorphism (M1) reaching temperatures of ≥ 700°C and pressures of 7.4±0.5 kbar (Joshi and Tiwari 2004). Four metamorphic zones, viz. chlorite-biotite, garnet- biotite, kyanite – biotite and sillimanite K-feldspar zone have been identified in the Almora Group of rocks. These metamorphics can be demonstrated in the field to gradually increase in metamorphic grade from the chlorite zone of the green schist facies to the K-feldspar sillimanite zone of the upper amphibolite facies comprising gneisses through a migmatite zone in the Champawat, Almora, Dwarahat and Dudatoli regions. Thus, these sillimanite K-feldspar gneisses are evidently a product of the culmination of metamorphism and have been dated at 1860±50 Ma by Trivedi et al. (1984) by Rb-Sr dating. The metamorphic sequence both in the southern flank, viz. Champawat and Almora areas and in the northern flank, viz. south of Someshwar and Dwarahat areas have been affected by F1 and F2 folding which has led to a repetition of isograd surfaces across north – south transects.

This folded sequence in the southern flank of the Almora Nappe has been intruded by 560±20 Ma granitoids. This hot intrusion of granitoids has left a well preserved contact aureole in the Champawat area (Joshi et al. 1994) and the Almora area (Joshi and Tiwari 2007). The well preserved randomly oriented chloritoids and andalusites overprinting the regional schistosity (S2) clearly show that the regional metamorphism is older than the 560±20 Ma contact metamorphism (M2). This fact is further corroborated by the age of the gneisses around 1860 Ma, which have formed as an end product at the culmination of regional metamorphism. Thus it is highly likely that the age of the dominant regional metamorphism is also close to 1860 Ma.

The two stage garnet growth in these metamorphics is suggestive of a polymetamorphic history of the area and it is likely that the outer rim of the garnet formed during the Tertiary (Himalayan) metamorphism (M3). It can be safely inferred that the dominant regional metamorphism in the Almora Group of rocks is of Pre- Himalayan (Pre- Cambrian) age and the Himalayan metamorphic imprint in the Almora Nappe was of lower grade and in all likelihood did not exceed the garnet grade.

References

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