

Metamorphism and Melting within the Nanga Parbat Syntaxis (Pakistan)

TALK

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Metamorphism within the Indian Plate gneisses within the Nanga Parbat syntaxis reached kyanite-bearing granulite facies in which the assemblage quartz-plagioclase-orthoclase-garnet-biotite-kyanite (or sillimanite) -rutile was stable. Calculated peak metamorphic conditions were at about 10 kbar and 800°C achieved after a period of prograde metamorphism along a P-T path with positive slope. A leucogranite melt is intimately associated with the main fabric, within the plane of which is contained a south trending lineation. This melt is considered to be an *in situ* anatectic melt derived by vapour absent melting during the main phase of south verging thrusting. Melt reaction topologies imply that such melting should be decompressive in nature and this may imply that late stages of the peak metamorphism were consistent with some unroofing of the metamorphic pile. Similar trends of regional metamorphism during pressure increase with some decompression at the metamorphic peak have been documented elsewhere in the Pakistan Himalaya.

That all these fabrics are folded by the large scale folds that dominate the Nanga Parbat syntaxis, and which date from syntaxial growth, as well as being cut by large garnet-tourmaline bearing leucogranite sheets poses a problem. Do these anatectic melts date from a peak metamorphic phase that substantially predates syntaxial evolution or do they document early stages in that evolution? The lineation data within the layered anatectites is critical here, as it indicates that the fine scale anatectic layering dates from a different tectonic environment from that of the syntaxial growth, that of southward thrusting rather than east-west shortening. Thus we infer the presence of two melt phases within the syntaxis. The first, under granulite facies conditions, dates from the main phase Himalayan metamorphic-deformation event which, elsewhere in Pakistan, reached its peak during the Eocene although reasons of structural geometry indicate that this could have been somewhat delayed within the Nanga Parbat region. The second is Neogene in age and is related to decompressive vapour-absent melting during active uplift and unroofing of the syntaxis.

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