Structural and metamorphic equivalence across theLHS-HHCS contact, Sikkim Himalaya – indicator of post-deformation metamorphism or the wrong MCT?

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In the Sikkim Himalaya, the contact between the base of the Lingtse Gneiss (an augen gneiss body at the base of the Higher Himalayan Crystalline Sequence, HHCS) and the metapelitic schists of the Lesser Himalayan Sequence (LHS) has been considered to be the Main Central Thrust (MCT). The region is characterized by an inverted metamorphic sequence, with the index minerals chlorite to sillimanite appearing at progressively at higher structural levels across the sequence. The study has been conducted along the North-Sikkim Highway (NH -31A), and focuses along the contact zone between HHCS and LHS. Structural studies reveal that the contact zone is a ductile shear zone (the MCT zone) dominated by a single penetrative fabric (S2) trending NW-SE and dipping northeast. This corresponds to a second deformation event that affected lithounits on either side of the contact. Since the intersection lineation between the earlier fabric in both units (S1) and S2 is identical, it is inferred that the earlier fabrics in the HHCS and LHS had similar disposition prior to D2 deformation. A third deformation event (D3) is recorded in the mica schists of the LHS, but this is confined to lower structural levels. The late S3 foliation related to this event cuts across the earlier S1 and S2 fabrics in the LHS. Microstructural relationships between the mineral phases and deformation fabrics, and zoning characteristics of garnet indicate a progressive metamorphic history from the syn-D1 to post-D2 period. Peak metamorphic conditions in both the HHCS and the LHS were attained after D2 deformation, and there appears to be no significant difference in the estimated peak P-T (~ 7 Kb, 650°C) across the MCT zone. The pressures and temperatures have been estimated through both conventional thermobarometric techniques and THERMOCALC, and the interpretations cannot be attributed to flaws in the applied methodology, as suggested by some workers. Thus, the estimated conditions are considered to be realistic. The lack of any detectable difference in peak metamorphic conditions that followed D2 deformation in both units may indicate that the entire metamorphic development is independent of and unconnected to, movement along the MCT. Alternatively, it is possible that the observed shear zone does not correspond to the MCT at all, and that the MCT in this sector needs to be relocated. The latter possibility appears to be supported on structural grounds, since the structural orientation of pre-D2 fabrics in the HHCS and LHS are interpreted to be similar. A more comprehensive study is being undertaken across the sequence to confirm one or the other possibility.