

## Relationship between the Higher Himalayan Crystalline and Tethyan Sediments in the Kali Gandaki area, western Central Nepal: South Tibetan Detachment revisited

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During our recent fieldwork in Kali Gandaki valley in western-central Nepal, we observed a definite intrusive relationship between the augen gneiss of the Higher Himalayan Crystalline Sequence (HHCS, Formation III of Le Fort 1975) and the base of the Tethyan Sedimentary Sequence (TSS). Hagen (1968) also reported beautiful outcrops of the similar relationship from Namun range east of the Annapurna Range.

This means that the observed contact between the HHCS and TSS is the intrusive, exemplified by the intrusion of the augen gneiss unit between the remaining part of HHCS and the overlying TSS. Between the TSS and underlying HHCS, a north-dipping normal fault system has been reported from various parts of the Himalayan Orogen from Kashmir to Bhutan through Nepal; this fault system has been identified as the South Tibetan Detachment System (STDS) and been considered to form one of the major fault systems dividing principal geologic units in the Himalayan Orogen (e.g., Burchfiel and Royden 1985). In the Kali Gandaki area, the STDS was identified as the Annapurna Detachment by Brown and Nazarchuk (1993) and studied in detail by Godin (1999). Our small observation above conforms neither to these studies, nor even to other earlier studies, which mentioned a tectonic contact between the two (e.g., Bodenhausen and Egeler 1971, Garzanti and Frette 1991). We also observed that there is a good lithological similarity between the lower part of the TSS and the metasedimentary gneisses of the HHCS, the metasedimentary gneisses forming the lower part of the HHCS and being separated from the TSS by the intrusive augen gneiss body as mentioned above. Worth noting is that the metasedimentary gneisses are quite consistent throughout HHCS, their lithology changing gradually downwards from calcareous to psamopelitic, maintaining structural conformity throughout as pointed out in earlier studies (e.g., Gansser 1964, Stöcklin 1980). Many small reverse folds and related small structures with southerly vergence were observed, while normal sense faults and folds were rarely observed in the lower part of TSS.

Based on these lines of evidences, we suspect a continuous development of the Annapurna Detachment in the Kali Gandaki area. We also consider a possibility that the metasedimentary gneisses of the HHCS are actually the lower equivalent or a lower

formation of the TSS intervened by the intrusive body of the augen gneiss. This view is in conformity with the classical observation by Le Fort (1975), and is supported by recent geochronologic data suggesting that the age of the HHCS could be in the range of 800–480 Ma (e.g., DeCelles et al. 2000). Our observations also support in part a recent proposal by Gehrels et al. (2003) who proposed Cambro-Ordovician thrusting tectonics at the base of the TSS, and pointing out a possibility of repetition of the lower formations of the TSS into the underlying HHCS. If the above are to be admitted, we may have to consider the re-definition of the Tethyan Sedimentary Sequence so that it could include all metasediments of HHCS, with the stratigraphic and structural base lying just above the MCT. This consideration leads us to re-examine the role of the STDS in the Himalayan Orogen.

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