

Folding of Tethyan sedimentary succession before the Himalayan collision event: evidence from Annapurna region, Nepal

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The Tethyan zone of the Himalaya comprises a Cambrian to early Cretaceous sedimentary succession characterized by spectacular folded structures. A structural analyses in the Jomosom and Yak Kharka?Manang areas in Central Nepal were carried out to investigate the folds. The study areas are made up of the Permian Thini Chu Formation, the Triassic Tamba Kurkur Formation, Mukut Limestone, Tarap Shale, Quartzite Series and the Jurassic Jomsom Formation in an ascending order (Bordet et al., 1975; Fuchs et al., 1988; von Rad et al., 1994; Garzanti, 1999). The spatial distribution of these sequences plays a key role in analyzing folded and faulted structures. Especially, the P/T boundary is a distinct key to trace these deformed successions. In

addition, slaty cleavages associated with folded structures were also analyzed. The major folded structures are grouped into F1 and F2 types.

The F1-folds represent a recumbent folding phase and they penetrate the entire Tethyan Himalayan realm. In the F1-folds, a slaty cleavage (S1) is developed subparallel to their axial plane. In the study areas, a large F1-type syncline was formed with an almost horizontal axial plane. The younging direction in it indicates northerly vergence. The F2-folds are formed in a limited area, and well developed in the northeastern part of the Yak Kharka-Manang area. They are characterized by tight overturned folding. The axial plane of the F2-folds trends NW?SE and dips due north. An incipient slaty cleavage to crenulation cleavage (S2), which is subparallel to the axial plane, is associated with F2. Under the microscope, the S2 cleavage is observed to intersect the S1 cleavage. The younging direction of the F2-folds reveals southward vergence.

The southerly vergence of F2-folds fits well with the top-to-the-south movement direction characterizing the Himalayan tectonics. However, F1-folds have opposite (i.e., northerly) vergence. Hence it is suggested that the F1-folds were formed before the Himalayan upheaval.

Fig.1 shows structural development of the Himalayan collision zone. The Tethyan Himalayan succession was deposited in the southern margin of the Tethys Sea during the Cambrian to Upper Cretaceous time (Fig. 1a). Prior to the collision of Indian and Eurasian continents, the Tethyan Himalayan succession underwent F1-folding (Fig. 1b). Owing to the collision of two continents,

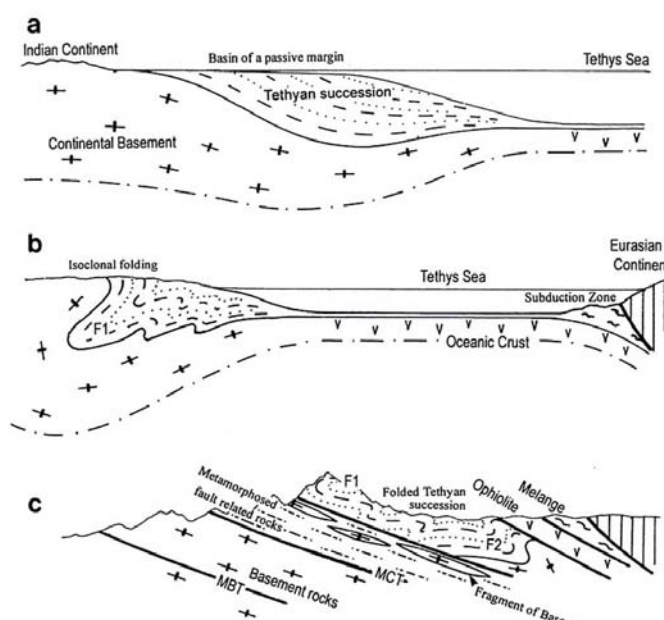


Fig. 1: The structural development of the Himalayan collision zone

the folded Tethyan succession was subsequently uplifted and formed the Himalayan Range. The F1-folds are facing north, whereas the F2 folds, which were formed during the collision event, are facing south (Fig. 1c).

Keywords: Himalaya, Tethyan succession, folding event, vergence, axial plane cleavage, Annapurna region