The Main Central thrust and the South Tibetan detachment in the Dadeldhura klippe (West Nepal): New insights for the evolution of the Himalayan metamorphic core.

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Mapping combined with structural analyses in the foreland edge of the metamorphic core of the Himalaya in SW Nepal highlight the existence of two north-dipping shear zones with opposite sense of shear. Here the metamorphic core is mainly affected by non-coaxial top-to-the-south sense of shear at temperatures between 450 ºC and 550 ºC that switch to a top-to-the-north sense of shear at the top of the metamorphic core. We regionally correlate this upper shear zone with the South Tibetan detachment system. $^{40}Ar/^{39}Ar$ dating, $^{40}K/^{40}Ar$ dating on white micas indicate that both shear zones operated between 23 Ma and 17 Ma. Restoration of the folded South Tibetan detachment in far western Nepal yields a minimum dip-slip distance of 190 km. This estimate is in agreement with estimates from other parts of the Himalayan orogen and with orogenic models in which the extrusion of the GHS caused the telescoping of folded isotherms [1] during channel flow. The decrease in peak metamorphic temperatures and older cooling ages (i.e. muscovite $^{40}Ar/^{39}Ar$ ages) preserved toward the tip of the Himalayan metamorphic core are likely linked to early cooling of the frontal part of the metamorphic core while rocks in the hinterland were still buried, hot and undergoing regional metamorphism. In west Nepal, the frontal part of the orogenic system is characterized by low metamorphic grade rocks displaying dominant brittle deformation in the form of thrust imbricates and duplex structures [2]. Farther north in the Karnali River, sillimanite- and kyanite-bearing migmatitic GHS gneisses record a metamorphic field pressure gradient ca. 67% steeper than that of an average lithostatic gradient, indicating ductile vertical thinning and horizontal stretching compatible with the channel flow model [3].

Our results support an orogenic model in which such contrasting deformation styles can be coeval and compatible should the horizontal stretching/vertical thinning of the hinterland be compensated by coeval horizontal shortening/vertical thickening in the foreland [4]. It is therefore crucial that models for the Himalayan orogen be based on geological field data covering the whole system from the Indus-Yarlung suture zone to the Main Frontal Thrust.

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