

A working hypothesis on the evolution of the eastern Himalayan Syntaxis (Namche Barwa)

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The Himalaya terminates at both ends in syntaxes (*Nanga Parbat* in the W, *Namche Barwa* in the E), distinctive features of collisional belts where orogenic structures seem strongly bent around a vertical axis. These syntaxes expose high- and low-pressure granulites in their cores, flanked by folded and sheared relics of the *Indus-Yarlung-Tsangpo Suture*. Both syntaxes are traversed by large rivers (*Indus* in the W and *Yarlung-Tsangpo* in the E) which cut into their cores to form a relief of more than 3000 m. The core of the *Namche Barwa Syntaxis* is a crustal scale, gently NNE-plunging antiform which began to grow and exhume approximately 4 Ma (*Booth et al. 2009; Burg et al. 2008; Zeitler et al. 2001; Ding et al. 2001*). The surface uplift rate is fast but not yet quantified. *Burg et al.* suggest an exhumation rate of 10 mm/yr at 4 to 3.5 Ma that decreased to 3-5 mm/yr from 2.2 Ma to the present.

A reassessment of available structural, petrological and geochronological data, together with our interpretation of a new geological map of the *Namche Barwa* area (*Quanru et al., 2006*) leads us to the following working hypothesis: (1) the HP granulite (peak at 16 Ma; Sm-Nd whole rock and garnet) in the *Namche Barwa* core is affected by and therefore predates parasitic folds related to the main antiform as well as anatexis related to the Pliocene-Pleistocene exhumation; (2) the *Namche Barwa* antiform is kinematically linked to a system of normal and strike-slip shear zones that exhumed anatectic rocks (3.9-2.8 Ma; U-Th-Pb xenotime and thorite) in the antiform's core. The strike-slip faults bounding the core seem to be steeped parts of the *Southern Tibetan Detachment* that truncate the HP granulite body in the hangingwall.

We interpret these features as evidence for two exhumation events with different rates: (a) an older and possibly faster event that exhumed the HP granulites (16 to 4 Ma?); (b) a second event ongoing since 3.9 Ma that exhumed the migmatitic core of the *Namche Barwa* antiform. If valid, this two-stage exhumation history calls for more complicated driving mechanisms than the climate/erosion-driven *Tectonic Aneurism* model of *Zeitler et al. (2001)* or than the *Kink-fold* model of *Burg et al. (1998)*.

References

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