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

P. Crupi[1], M.R. Handy[1], P. O'Brien[2], M. Konrad-Schmolke[2]

*1 –Freie Universität Berlin, Germay, 2 –Universität Potsdam, Germany*

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**

Booth, A.L., Chamberlain, P.C., Kidd, W.S.F., Zeitler, P.K. 2009: GSAB 121, 385-407

Burg, J.P., Nievergelt, P., Oberli, F., Seward, D., Davy, P., Maurin, J.C., Diao, Z., Meier, M. 1998: Journal of Asian Earth Sciences 16, 239-252

Ding, L., Zhong, D., Yin, A., Kapp, P., Harrison, T.M. 2001: EPSL 192, 423-438

Quanru, G., Guitang, P., Zheng, L., Chen, Z., Fisher, R.D., Sun, Z., Ou, C., Dong, H., Wang, X., Li S., Lou X., Fu H. 2006: Journal of Asian Earth Sciences 27, 265-285.

Zeitler, P.K., Meltzer, A.S., Koons, P.O., Craw, D., Hallet, B., Chamberlain, C.P., Kidd, W.S.F., Park, S.K., Seeber, L., Bishop, M., Schroder, J. 2001a: GSA Today 11/1, 4-8