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Late-Quaternary exhumation of Namche Barwa constrained using low-temperature multi-OSL-thermochronometry

Georgina King (1,2) and Frederic Herman (2)

(1) Institute of Geography, University of Cologne, Cologne (georgina.king@uni-koeln.de), (2) Institute of Earth Surface Dynamics, University of Lausanne, Switzerland

The influence of climate on tectonic processes remains a controversial concept. Exhumation rates of >5 mm/yr make Namche Barwa, Tibet, one of the most rapidly exhuming places on earth, and two main hypotheses have developed to explain the very high rates of exhumation there. The tectonic aneurysm model (Zeitler et al., 2001) proposes that crustal weakening coupled with extremely active surface processes causes a spatial stationarity of exhumation. Alternatively, a northward plunging antiform that is progressively migrating north-eastward (Seward and Burg, 2008) may explain the concentration of extremely low cooling ages and rapid exhumation that characterise the Namche Barwa massif. Here we use multi-OSL-thermochronometry of feldspar, which comprises a series of different systems with closure temperatures ranging from 30 to 70 C, to quantify spatial and temporal changes in exhumation rates. We have applied this new technique to a suite of samples from the Namche Barwa massif and inverting our data enables us to precisely resolve cooling histories over 0.1 Ma timescales. Our data indicate propagation of a knick-point along the Parlung river, which can be explained by progressive north-eastward migration of a northward plunging antiform. We suggest that river incision does not therefore feedback onto tectonics, as proposed by the aneurysm model.

Zeitler, P.K., Meltzer, A.S., Koons, P.O., et al., 2001. Erosion, Himalayan Geodynamics, and the Geomorphology of Metamorphism. GSA Today 11, 4-9

Seward, D., Burg, J-P., 2008. Growth of the Namche Barwa Syntaxis and associated evolution of the Tsangpo Gorge: Constraints from structural and thermochronological data. Tectonophysics 451, 282-289.