Geophysical Research Abstracts, Vol. 7, 08247, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08247

Mid-Miocene transition from extrusion tectonics to rotation and lower crustal flow along the Ailao Shan shear zone and Red River fault, Yunnan Province, China

L. Schoenbohm (1), B.C. Burchfiel (2) and Chen Liangzhong (3)

(1) University of Potsdam, Inst. for Geosciences, Postfach 601553, Potsdam, 14415, Germany, (2) Massachusetts Institute of Technology, Cambridge, MA, USA, (3) Yunnan Institute of Geological Sciences, Kunming, Yunnan, China

The Red River fault and the Ailao Shan shear zone extend from Tibet to the South China Sea and are important in accommodating the India-Eurasia collision. These structures have been viewed as major, intra-continental faults that penetrate the lithosphere, accommodating first southeastward extrusion of Indochina and later eastward extrusion of the South China block. However, alternate interpretations view these features as passive markers, deflected by rotation of an internally deforming region around the eastern Himalayan syntaxis. Further, recent studies suggest that the southeastern margin of the Tibetan plateau may have grown in Miocene and Pliocene time through flow of weak lower crust from beneath Tibet.

Insights into the nature of these faults and related surface uplift can be gained from an examination of Oligo-Miocene fluvial and alluvial conglomerates in the Red River valley, which record both the unroofing of the Ailao Shan shear zone and the more recent brittle deformation along the Red River fault. Results indicate that Oligo-Miocene left-lateral displacement on the shear zone is generally consistent with lateral crustal extrusion, though deformation is transpressive rather than transtensional, and extends into the adjacent crustal blocks. In late Miocene time, tectonic quiescence allowed the formation of a low-relief landscape. The region has experienced 1400-1500 m surface uplift since Pliocene time, which may be the result of lower crustal flow. Total right-lateral displacement on the Red River fault is ˜40 km, with 25 km occurring since river incision and surface uplift began in Pliocene time. Long term average slip-rate is

a minimum of ˜5 mm/yr on the Red River fault. Rotation of a crustal fragment around the eastern Himalayan syntaxis, bounded on the east by the Xianshuihe-Xiaojiang fault system, causes deflection of the Red River fault, accommodated by distributed shear along strike of the Xianshuihe-Xiaojiang fault system. The Red River fault has decreased in regional importance since the initiation of the Xianshuihe-Xiaojiang fault system during growth of the southeast plateau margin.

Thus we find that Oligocene and mid-Miocene deformation is consistent with the extrusion model, but since late Miocene time, deformation is dominated by lower crustal flow, surface uplift, rotation of upper crustal blocks around the Eastern Himalayan Syntaxis, and the possible development of a detachment zone in the mid to lower crust.