Crustal flow around the Eastern Himalayan Syntaxis in western Yunnan, China

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The mode of Cenozoic deformation along the eastern boundary of the northward moving Indian block is still controversial. Models considered are: (I) eastward flow of the lower crust accompanied by large-scale clockwise rotation and crustal thickening; (II) southward lateral extrusion of a single crustal block bounded by the right lateral Sagaing Fault in Myanmar and the left-lateral Ailao-Shan shear zone (ASSZ) in Yunnan; (III) southward lateral extrusion of at least two different crustal blocks between the right-lateral S(W)-striking Gaoligong Shan shear zone, the NW-trending Chong Shan shear zone (CSSZ), and the ASSZ.

We present a new model where the Gaoligong Shan and Chong Shan shear zones constitute a folded sub-horizontal detachment, separating the brittle upper crust from a metamorphic segment of the middle-lower crust, the Mogok belt. Kinematics of flow along the detachment was dominantly top-to-south. Folding of the detachment was coeval with and followed top-to-south flow. In the brittle crust, ~E-W shortening is expressed by a fold and thrust belt, and in the ductile crust by L>S tectonites. The deformation pattern is preliminary interpreted as reflecting gravitationally driven flow of upper crustal material from Tibet towards SE-Asia, reminiscent to what is observed by GPS geodesy today.

New Mogok-belt granitoid U−Pb zircon data span the Early to Late Cretaceous (peaks at ~125; 115; 90, and 65 Ma) and tie the Mogok belt to the Gangdese arc of the Lhasa block. New Tertiary magmatic and metamorphic U−Pb zircon ages yield 40−30 Ma, similar to magmatism observed across SE-Asia and alike to the monazite age of dikes that we interpret as pre-tectonic along CSSZ [1]. Published and new $^{40}Ar/^{39}Ar$ data show that rapid cooling started at 20-15 Ma [2, 3]. We explain these results as onset of the high-strain deformation along the shear zones. Fission-track and (U−Th)/He thermochronology indicates that its activity continued at least to 6−3 Ma.

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