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Title: EVOLUTION OF THE EASTERN HIMALAYAN SYNTAXIS AND ITS RELATION TO LOWER LITHOSPHERIC AND MANTLE DEFORMATION

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Abstract: Within syntaxes rotations around a vertical axis are often large and rapid and offer the potential in young and active syntaxial regions to examine the relations between crustal and deeper mantle processes. At the active Eastern Himalayan syntaxis plate reconstructions indicate that, at the latitude of the syntaxis, 3200 km of northward motion occurred after the India/Eurasia collision at ~50 Ma. Part of this motion was accommodated by shortening in the Himalaya, but most of it occurred within Eurasia during at least two major events: 1) During Eocene to Early Miocene convergence much of Indochina was extruded to the SE by 500 to 1000 km from north of the syntaxis. Crustal fragments rotated clockwise as much as 120° and were strongly internally

deformed. 2) Late Miocene to present convergence caused clockwise rotation of crustal fragments that were located north and partly west of earlier syntaxial structures. The younger system, like the older one, consists of crustal fragments bounded on the east by major left-lateral fault zones, and active rotation is well expressed by geological and GPS data.

Tomographic data indicate slow P-wave velocities in the Tibetan lithosphere and upper mantle near the eastern syntaxis. High P-wave velocities beneath the Himalaya and southern Tibet, which are restricted to depths less than ~200 km, suggest that the Indian lithosphere was subducted only a short distance north of the Himalayan front. Beneath Burma, fast P-wave velocities mark an east-dipping slab that extends northeast of the syntaxis. This is juxtaposed against and continues into/as a belt of high velocity mantle below the Sichuan basin and the Ordos plateau. This belt of high velocity material appears to separate slow mantle beneath central Tibet from a huge area of low P-wave velocities that trends NNE beneath eastern China. Above the latter, the crust is dominated by ~E-W extension from Cretaceous to the present, with a complex spatial and temporal development. Shear-wave splitting data show fast polarization directions that generally follow the clockwise rotation around the syntaxis, similar to upper crustal movement directions and the orientation of upper crustal structures. However, the fast polarization directions are E-W in southern Yunnan, where they are not parallel to surface geology or the GPS velocity field, and are interspersed with “rotational” directions in Sichuan, where they are also not aligned with surface features.

From the geological and geophysical data we interpret the regions around the syntaxis and farther east to be controlled by two different dynamic systems: 1) In the west the India-Eurasia collisional system and 2) In the east slab roll back within the Pacific/Indonesian subduction system. The boundary between the two regimes may be marked by the belt of high velocity mantle that appears to connect the slab beneath Burma with Sichuan basin mantle.