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TI: Topographic Expression of Crustal Velocity Curls: An Example from Eastern Himalaya to Burma

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AB: The three-dimensional velocity field in southeastern Tibet is notable for its expression in the local topographic field. To investigate the links between strain and topography we examine the topography of the eastern Himalayan Syntaxis centered on the Namche Barwa region, considering wavelengths down to 25km. We are testing a hypothesis linking kinematics to topography in which processes of both erosion and crustal failure exhibit similar localization behavior due to strain weakening, and consequently the topographic field contains information on both present and past strain fields. A corollary of this hypothesis is that evolution of the higher frequencies of topography can only be poorly represented without recognizing the strain-related anisotropies and heterogeneities introduced by the deformation regimes through which the orogen has passed. The eastern Himalayan Syntaxis provides an excellent testing ground because of steep spatial gradients in velocity, significant concentration of large stream power and, by inference, rapid fluvial erosion. Our preliminary GPS measurements and

numerical modeling results indicate a region where the horizontal rates of vorticity diverge from the rates of horizontal shear strain in a manner consistent with a velocity corner driven by basal coupling of the crust with a dominantly north-flowing mantle. This divergence of vorticity and shear strain rates is reflected in the small-circle arcs of the major river valleys and considerable topographic anisotropy in the greater syntaxis. In addition to the role of horizontal vorticity on topographic development in corner regions, vorticity in the vertical plane produces steep spatial gradients in uplift that contribute to the high relief and complex topography characteristic of syntaxial corners.
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