Links Between Lithospheric Structure and Topography, Southeastern Tibet

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Observations:
geology, structure
geomorphology
gps
seismology

Geodynamics of Indentor Corners – supported by the Continental Dynamics Program, NSF
Temporary seismic array - GPS sites

- Broadband Station
- Short Period Station
- GPS Site

[Map showing seismic array and GPS sites]
Shear-wave splitting results

Fast axis of polarization wraps around syntaxis
Measure of time-integrated strain in lithospheric mantle
Fabric seen below major shear zones and below crustal blocks
Transition to east-west orientation south of 26°

Sol et al, in review
Crustal fabric wraps around and defines syntaxis. Measure of time-integrated strain in the crust.
GPS Results

Velocity field wraps around syntaxis
- East component emerges at ~90-92°
- North component ~0 at 97°
- Turns west south of ~26°

Sol et al, 2006
Sol et al, in review (King, Liu, Koons)
Comparison of surface and mantle

Crustal strain derived from GPS consistent with shear-wave splitting

Sol et al, in review (Burgmann)
P-wave tomography at 100 km depth

High velocity lithosphere restricted to south of Indus-Tsangpo suture
Gradient in Topography

- Steep gradients at Himalayan front
- Steep gradients at eastern syntaxis
- Steep gradients at eastern margin
Southeastern Tibetan landscape

- Strong fluvial incision, steep slopes
- Transition at easternmost rift
Receiver function results

Substantial Moho topography
Substantial lateral variation

Base Map Color Coded to Transect

Zurek
Receiver function results

Substantial Moho topography
Crustal thickness decreases eastward, correlates with topography
Poisson’s Ratio low in Tibet: felsic crust, no pervasive melt
Poisson’s Ratio increases eastward
Receiver function results

- Change in Moho reflectivity from west to east
- Variation laterally in crustal reflectivity
- Offset in Moho across Jali fault

Zurek
Earthquake locations

Namche Barwa massif active
Eastern rift active
Majority of hypocenters above 20 km depth
Comparison of data sets

Spatial correlations in:
- Moho topography
- Cooling ages, exhumation
- Fluvial dissection, relief,
Southeastern Tibet
vertically coherent deformation
mechanical coupling between crust and mantle lithosphere
lateral variation in geodynamic boundary conditions and lithospheric properties