Tectonic geomorphology of Tibet and the Himalaya using high-resolution digital topography from interferometric analysis of Shuttle radar imagery §

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The interior of Tibet is characterized by smMlow slopes because the lack of long-wavelength relief and dry climate preclude fluvial and glacial dissection, and late Cenozoic tectonics have not deformed the surface. In contrast, the active tectonics and wetter climates of the northern and southern margins of Tibet, the Kunlun and the Himalaya, generate high relief and steep slopes. In the moderately dry Kunlun, alluvial deposits offset by displacement on the Altyn Tagh fault are mapped with a digital elevation model (DEM) and radar imagery. Geocoding the DEM and radar images allows comparison with digital geologic maps near Mt. Everest. Variations in hillslope angles appear to be controlled by the transition between glacial and fluvial erosion, by the strong gradient in precipitation across the high Himalaya, and by contrasts in credibility, especially in sedimentary rocks.

Interferometric analysis of synthetic aperture radar (IntSAR) is an efficient method of generating high-resolution DEM's, co-registered with rectified radar imagery. A suitable pair of images are combined to measure elevations with a horizontal grid spacing of 5-20 m and a vertical accuracy usually in the range of 1-10 m (relative). Absolute elevations here are not so accurate. The second flight of the Shuttle Imaging Radar-C. (SIR-C) instrument in October 1994 collected interferometric imagery. I have produced experimental IntSAR DEM's from portions of a pair of SIR-C datatakes that crosses the Tibetan plateau and the Himalaya, including Mt. Everest. While the IntSAR swath is narrow (~25 km wide), it provides an oblique topographic cross-section of the orogenic belt. Topographic gradients or slopes can be measured over distances of 100 m or less with the high resolution (10-20 m postings) of these IntSAR DEM's. The extreme relief of the Himalaya prevents complete topographic coverage, but elevations and slopes are determined for most of the terrain.

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