Interseismic deformation in south-central Tibet from InSAR and GPS data

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The degree to which deformation and seismicity are focused on major mapped structures remains a key unknown in seismic hazard assessment. In southern Tibet, north of the Himalayan frontal thrust, the high plateau is undergoing east-west extension. A series of north-south grabens characterize the topography. However, recent earthquakes have not all been associated with these grabens, and an open question is the degree to which extension is focused on the major grabens and the degree to which extension occurs in a more distributed fashion outside them. We combined 208 GPS observations of present-day crustal velocities with InSAR rate maps derived from 12 Envisat tracks to form continuous high-resolution velocity and strain fields for south-central Tibet. We found that southern Tibet is undergoing east-west extension at an average rate of 15 nanostrain/yr. This extension is not evenly distributed across the region. In central Tibet, we also found a low slip rate of less than 4 mm/yr on all conjugate strike-slip faults. Our results revealed a few zones with elevated strain rates away from the Himalaya, most notably a NNW-SSE-elongated zone that spans the entire study area at ~ 30-35°N. Our results support arguments that the most robust estimates of seismic hazard should supplement seismicity catalogues with the use of geodetic data and with the mapping of active fault structures.