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# Present-day deformation of the intra-Eurasian plate regions

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We build on the results of two recent, yet independent, studies. In the first (Warners-Ruckstuhl et al., 2013) the forces on, and stresses within the Eurasian plate were established. In the second (Tesauro et al., 2012) the distribution of mechanically strong and weak parts of the Eurasian plate was found. We predict lithospheric deformation of the Eurasian plate, mainly focused on the Tibetan Plateau and in a lesser scale, on the Zagros Mountains and Anatolia, and compare it with observations. This constitutes a test of both the force/stress results and of the strength results. Specific questions are to which extent stresses localize in specific regions and whether micro-plates as identified by geodesists arise naturally from the results.

Importantly, Warners-Ruckstuhl et al. (2013) found an ensemble of mechanically consistent force models based on plate interaction forces, lithospheric body forces and convective tractions. Each of these force sets is in mechanical equilibrium. A subset drives Eurasia in the observed direction of absolute motion and generates a stress field in a homogeneous elastic plate that fits observed horizontal stress directions to first order. Deformation models constitute a further test to discriminate between the remaining force sets.

Following Tesauro et al. (2012) we assume five different compositions for the upper and lower crust. We use their geotherms and crustal thickness maps to estimate vertical distributions of strength at any location within the Eurasian plate. From the power-law relationship between strength and viscosity, and based on the assumption that horizontal strain rates do not vary with depth, we estimate the vertically averaged viscosity of each element of the domain.

The combination of forces and averaged viscosities, and the inclusion of major active faults in our mechanical model allow us to predict deformation (velocities, strain rates and rotation rates). We compare our results with GPS velocities, InSAR, seismic, and paleomagnetic observations, which capture present-day and long-term deformation. We discuss various causes for differences.