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Slab deformation and seismicity

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The dynamics of plate tectonics depend on slab and asthenospheric viscosity, yet a range of macroscopic diagnostics such as plate kinematics and the geoid yield non-unique inferences. This motivates renewed efforts to evaluate the co-seismic, in-slab strain imaged by earthquake moment tensor solutions in the light of mantle flow models. We discuss results from global, high resolution mantle circulation modeling and reanalysis of the global Centroid Moment Tensor (gCMT) earthquake catalog. We show that first order patterns in slab seismicity can be explained by the stresses as predicted from our flow models. The style of deep slab deformation indicates a sensitivity to slab and lower mantle viscosity, and net rotations of the lithosphere with respect to the lower mantle. The non-double couple (CLVD) radiation pattern component of seismicity increases with depth, and such a behavior is predicted by the flow models, providing a first physical model of such CLVD systematics. The geodynamic modeling results can be interpreted as a simple reference model against which individual subduction zone patterns can be compared, expanding our set of constraints for understanding regional and global force transmission in upper mantle convection.