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Relating viscosities from post-seismic relaxation to a realistic viscosity structure for the lithosphere

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Models of geodetic observations of postseismic relaxation most often represent the lithosphere with only a few layers with constant viscosity. This is surprising, because rock mechanical experiments consistently demonstrate that we should expect a profound vertical gradient in lithospheric viscosities, due to the geothermal gradient in this thermal boundary layer. We isolate the effect of lower crustal flow, where the effect of viscosity gradients has the largest impact on surface deformation. We therefore explore postseismic deformation in models with realistic vertical viscosity gradients, and seek to illustrate the differences between these models and those with idealized uniform viscosity layers. By means of synthetic experiments with a semi-analytical viscoelastic relaxation model, we show how, for a given earthquake, the averaged viscosity value obtained for a thick viscoelastic layer is dependent on both the layout of the geodetic network and on the observation time window.