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CRUSTAL LATERAL HETEROGENEITIES AND POSTSEISMIC RELAXATION

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The study of postseismic deformation has been recently supported by large improvements in both numerical modelling and geodetic datasets. So far, models of postseismic relaxation capable to deal with simple geometries and linear rheologies have been able to provide good estimates of surface deformation in a number of cases. Nonetheless, the quality and quantity of recent geodetic datasets are reaching the point where more complex crustal features can be investigated.

By means of a 3D Finite Elements Method, we study the effect on postseismic deformation of lateral variations in crustal thickness and lower crustal viscosity. The aim of this study is to provide an analysis of how stress-flow at depth is affected by the presence of lateral heterogeneities, together with a quantitative estimate of resulting postseismic deformation signals at the Earth's surface. The first step is represented by the assessment of the impact of lateral heterogeneities for a model with linear rheology. We show how the surface deformation pattern is dramatically influenced by lateral variations in crustal thickness. The second step is the attempt to build a realistic model of crustal and lithospheric structure, where mechanical properties depend non-linearly on temperature, pressure and rock type. In a consistent approach and supported by surface heat-flux data, we let a heterogeneous lithosphere control the thermal profile: the resulting viscosity structure is obtained from laboratory derived flow-laws, once composition and state of stress are fixed.

The chosen region for this study is represented by the Central Apennines, where a moderate and shallow earthquake took place in 1997. Detailed information about

crustal structure is provided by recent deep seismic reflection studies, surface-wave tomography and depth distribution of the related aftershock sequence. We give a quantitative estimate of how a lateral heterogeneous crustal structure is affecting the time and scale of postseismic deformation and we provide some constaints on the level of heterogeneity that is observable for a moderate normal fault earthquake.