POSTSEISMIC TRANSIENCE & THE HETEROGE NEOUS RI IEOLOGY OF THE DEEP CRUST

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Observations of rapidly evolving postseismic deformation following major earthquakes arc now retrieved with great accuracy and spatial coverage. Theoretical interpretation of this data, however, continue to bc rather nonunique. One interpretation is that rapid deformations are caused by aseismic creep along the broken fault zone. An alternative interpretation is that deep and widespread flow of the lower crust and mantle is involved. The latter mechanisms arc important since they act to relieve regional crustal stress, En toto, a consideration of quartz flow laws, thermal profiles, exposures of mylonitic horizons in geological cross section and the polymineralogy of the lower crust lends support to the hypothesis of widespread creep. A realistic model of the 1992 Landers earthquake in the southwestern U.S. is presented which is constrained by both GPS and laser strainmeter observations. The key feature of such a model is its ability to explain the multiplicity of exponential decay constants that arc dictated by the data. For a heterogeneous viscoelastic model this multiplicity is due to the different flow laws that apply to spatially isolated pockets of "soft" material embedded within the crust and/or mantle. If the viscosity of isolated inclusions is approximately 3-4 $\times 10^{15}$ Pa s then the observed 4-34 day, and longer, exponential decay time constants may be retrieved. The low viscosity inclusions in this model may have a concentration at, or lower than, 5%, depending upon the degree of anisotropy allowed.