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# Investigation on afterslip and steady state and transient rheology based on postseismic deformation and geoid change caused by the Sumatra 2004 earthquake

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The commonly used rheological model for the Earth's mantle when considering geological time scales (mantle convection) is the viscoelastic Maxwell model, which assumes a steady state creep process. However, application of this model to phenomena on shorter time scales, such as postglacial rebound or postseismic relaxation, leads to difficulties in finding a consistent interpretation of obtained viscosities. Using standard Maxwell viscosity of 1e19 Pa·s to analyze postseismic near field GPS time series from the 2004 Sumatra-Andaman Earthquake requires large time dependent afterslip with a relaxation time of about one year. We show that using linear biviscous Burgers rheology for the asthenosphere, together with a refined coseismic slip model, we can drastically reduce the amount of apparent afterslip. Comparison of predicted geoid change to observations by the GRACE satellite mission shows that a univiscous Maxwell model with afterslip is not compatible with observations, since even large afterslip has a more localized effect than transient relaxation due to the main earthquake, which in turn is in agreement with observations. Thus, a combination of ground- and space based geodetic observations is very useful in differentiating between rheological models. An additional independent discrimination between afterslip and biviscous relaxation could be obtained by installing ocean bottom pressure gauges close to the trench [1].

**References**

[1] A. Hoechner, S. V. Sobolev, I. Einarsson, R. Wang (2011), Investigation on afterslip and steady state and transient rheology based on postseismic deformation and geoid change caused by the Sumatra 2004 earthquake, Geochemistry Geophysics Geosystems, doi:10.1029/2010GC003450.