

FE modelling of postglacial rebound and the microphysical approach

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When modelling postglacial rebound the value of the rheology-controlling parameter - either the viscosity η or the pre-exponential parameter of the power-law creep A - is sometimes assumed as known on the basis of rough estimates or is often treated as a free parameter to be determined by the inversion of adequate data sets. We here derive the value, as a function of depth, of the pre-exponential parameter of the nonlinear-creep component A of a mixed linear-nonlinear rheology (Gasperini et al., 2004) through the knowledge on the microphysics of crystal deformation. This is done by extrapolating to mantle conditions theoretically established, and when possible experimentally controlled, creep equations, for relevant mantle materials (Ranalli, 2001). The depth-profile of A thus derived is implemented in the finite-element simulation of postglacial rebound and its performance is tested on North American Relative Sea Level (RSL) sites and also compared to previous homogeneous-mantle models (Dal Forno et al., 2005).

References:

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