



The use of a mixed linear-nonlinear rheology in modelling mantle deformation induced by glacial forcing

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We compare RSL predictions for finite-element (FE) models with different rheologies for describing the mantle deformation related to glacial forcing. Several thousand tests are conducted on pure Newtonian and mixed linear-nonlinear behaviors subjected to different ice-sheets according to the glaciological models available in the literature. The fit of models to RSL data is routinely examined through statistical model-selection techniques for evaluating the significance of the improved performance of a model with a varying number of free parameters. We employ, in particular, the "Extra Sum of Squares" F-Test, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

Both 2D and 3D FE meshes with an axisymmetric distribution of the rheological properties are used. Glacial forcing is approximated on the FE model through different methods and assumptions. One of the most efficient appears to be an Adjusted Spherical Harmonics (ASH) expansion of the load.

The mixed rheology comes out from the overall testing to achieve a statistically-significant better fit to RSL data than the linear creep for a wide range of parameter values.