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The influence of lateral Earth structure on predictions of Fennoscandian glacial isostatic adjustment

P. Whitehouse (1), K. Latychev (2), G. Milne (1), J Mitrovica (2), J Tromp (3)

(1) Department of Earth Sciences, Durham University, UK, (2) Department of Physics, University of Toronto, Canada, (3) Seismological Laboratory, California Institute of Technology, USA

We investigate the effect of 3D Earth structure on the isostatic adjustment of the solid Earth in response to loading during the last glacial cycle. Previous studies reveal an east-west trending residual across Fennoscandia when present day uplift rates estimated from the BIFROST GPS network are subtracted from numerical predictions [*Milne et al., Science, 291, 2001*]. We postulate that this misfit may be accounted for by considering lateral variations in lithospheric thickness and mantle viscosity in the GIA models.

We use a 3D numerical finite element code to calculate rates of solid earth deformation throughout Fennoscandia and compare these to GPS and relative sea level data. A global ice model is used to constrain surface loading throughout the last glacial cycle, and the redistribution of water is treated in a self-consistent manner [*Mitrovica and Milne, Geophys. J. Int., 154, 2003*]. Within the loading model, the Fennoscandian ice sheet is tuned to fit relative sea level data and local geological observations [*Lambeck et al., Geophys. J. Int., 134, 1998*]. Lateral variations in lithospheric thickness are derived from estimates of elastic thickness determined using gravity and topography data [*Perez-Gussinye et al., J. Geophys. Res., 109, 2004*], and mantle viscosities are determined from the global seismic shear wave heterogeneity model S20RTS [*Ritsema et al., J. Geophys. Res., 109, 2004*].

Our results show that both lithospheric and sub-lithospheric variations in Earth structure have a significant effect upon predictions of solid earth deformation in Fennoscandia.