



## **Ongoing and future glacio-isostatic crustal adjustments around Vatnajökull ice cap, Iceland due to ice retreat: GPS measurements and Finite Element Modeling**

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Glacial rebound at the end of the Weichselian glaciation was completed in Iceland around 9000 years BP, but extensive ice volume retreat has occurred in Iceland in historical times. Since 1890 the Vatnajökull ice cap has lost over 400 km<sup>3</sup> of ice. Unloading of the crust due to ice melting induces glacio-isostatic deformation around the ice cap. Ongoing uplift around the edges of Vatnajökull has been measured mainly by continuous GPS and campaign GPS. GPS measurements around the south and east edges of Vatnajökull from 1996 to 2003 are consistent with vertical velocities between 23-16 mm/yr. We use this dataset to constrain the rheological structure beneath Iceland.

We have constructed an axisymmetric finite element model, using the ANSYS software, to study the dynamic response of the Earth to a number of ice retreat models. We test ice models with gradual load removal only at the edge of the ice cap starting in 1890, as well as models considering unloading in the central part of the ice cap. Models incorporating earlier ice cap growth were also tested. The model consists of an elastic plate overlying a Maxwell viscoelastic medium in an infinite half-space. The elastic plate corresponds to the uppermost crust that behaves in an elastic manner while the viscoelastic substrate corresponds to the lower crust and upper mantle. Preliminary results suggest a thickness of the elastic layer of about 10-20 km and a viscosity of about  $3 \times 10^{18}$  Pa s, while values lower than  $1 \times 10^{17}$  are unlikely. Extrapolation

lating current uplift rates would suggest at least 1.6-2.3 m of uplift at the ice cap edge in 2000-2100, but values may be higher due to expected increase in ice thinning due to global warming.