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Optimal locations of GPS measurements in Laurentide and Fennoscandia for constraining 3D GIA models

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Knowledge of the Glacial Isostatic Adjustment (GIA) process allows us to understand mantle rheology and dynamics, ice sheet thickness history and climate change. In order to further constrain GIA models and improve our current knowledge of GIA, more relative sea-level data and geodetic observations (e.g. GPS, gravity measurements, tide-gauges) are desirable. Of the geodetic observations, GPS and gravity data have been most indispensible. While excellent measurements of land uplift and horizontal motion in Fennoscandia are provided, the density of GPS stations in North America is sparse. Currently, there is a need in GPS data especially in northern Canada to resolve the issues related to the following parameters in GIA: ice thickness, lithospheric thickness, radial viscosity profile and lateral viscosity changes.

We determine the optimal location in North America and Fennoscandia for uplift rate or tangential velocity data that will be useful for addressing ice sheet thickness, lithospheric thickness, lateral viscosity variation and background viscosity profile in the lower mantle. An optimal location is defined by where sensitivity lies above the current accuracy of GPS measurements. Our results show that in North America more permanent GPS stations are needed in northern Canada especially in a region west of the Hudson Bay until the Rocky Mountains. In Fennoscandia, the GPS network is almost adequate, but it should be extended to the last known GIA-affected areas in the east and to the south.