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The contemporary strain rate field of Fennoscandia derived from BIFROST GPS

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We use up to 4800 days of BIFROST GPS in Fennoscandia and surroundings in order to derive strain rates on a scale from 50 to 2000 km. Our investigations aim at discriminating limitations of current models of Glacial Isostatic Adjustment (GIA). We ask the question, to what extent the residual deformation could be explained by more detailed models of the ice sheet history, by lateral heterogeneities in the lithosphere/upper mantle structure and rheology, and by other (non-GIA) processes, such as contemporary tectonics?

In our strain rate processing we apply two different methods: (i) minimise a strain energy function using polynomials as base functions; (ii) employ a least-square s collocation method. The strain rate calculation is considered as an efficient amplifier of regional features of the displacement field.

The BIFROST network consists of 84 continuous geodetic quality GNSS stations. Since 2002 100 stations have been added to the network, Real-Time Kinematic stations that in their majority have been placed on existing buildings rather than designated pillars. However, we find that a large number of them appear to deliver position estimates with sufficient precision to be used for network densification.

In the strain rate calculations, coherent patterns are detected that point out candidate areas for more detailed studies. On the large scale, however, the ambiguity between ice history patterns and heterogeneous lithosphere/mantle structure is more difficult to resolve. For that purpose we conceive an inversion technique employing consistent constraints on simultaneous observables (horizontal, vertical, and gravity rates. The kernel functions involved are derived from the visco-elastic GIA earth model.