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Geodetic Reference Frames in Presence of Crustal Deformations

M. Lidberg (1,2), M. Nordman (3), J. M. Johansson (1), G. A. Milne (4), H.-G. Scherneck(1), J. L. Davis (5)

(1) Chalmers University of Technology, Onsala Space Observatory, Sweden. (martin.lidberg@lm.se)

(2) Lantmäteriet (The National Land Survey), Sweden.

(3) Finnish Geodetic Institute, Finland

(4) Department of Earth Sciences, University of Durham, UK.

(5) Harvard-Smithsonian Center for Astrophysics

We present the latest 3D velocity field of the Fennoscandian Glacial Isostatic Adjustment (GIA) process from BIFROST. It is derived from more than 4800 days (13 years) of data at more than 80 permanent GPS sites. We use the GAMIT/GLOBK and the GIPSY/OASIS II software packages for GPS analysis and compare the results. The solution has an internal accuracy at the level of 0.2 mm/yr (1 sigma) for horizontal velocities at the best sites. We present our results both in the ITRF2000 and in the new ITRF2005 reference frames, and discuss the difference in vertical rates associated with the choice of reference frame. Our vertical velocities agree with results derived from classic geodetic methods (tide-gauge, repeated levelling, and repeated gravity observations) at the 0.5 mm/yr level (1 sigma). We also compare the observations to predictions derived from our latest GIA model tuned to fit the new data and get agreement on the sub-millimetre level.

In the presentation we will discuss the non-linear signals we have found in the vertical GPS time series, and show impact from some choice of modelling at the GPS analysis stage. We will also address the problem of stability of the geodetic reference frame.

This is crucial in a number of key applications, such as when comparing results from space geodetic methods and tide gauges to study sea level change.