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Geodetic horizontal velocity and strain rate fields around Lake Vänern (SW Sweden) derived from GPS measurements between 1997 and 2011

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In 1989, the Värmland GPS network consisting of 8 stations spaced an average of 60 km apart was setup to monitor the ongoing deformation in and around Lake Vänern due to tectonic and mainly Glacial Isostatic Adjustment (GIA) processes in Fennoscandia. This network covers an area of about 10000 km2, straddles the Protogine and the Mylonite zones and includes one of the most active seismic zones of Sweden. We use GAMIT-GLOBK software to process the past GPS data, collected in October 1997, the only campaign that was measured with choke ring antenna, and the new GPS measurements in October 2010 and 2011 to estimate station velocities. We also integrate our local network with the SWEPOS (Swedish Permanent GPS network) and IGS (International GNSS Service) stations to better constrain the velocity fields in ITRF2008 and Eurasia-fixed reference frames. Since the rates of horizontal movements are very slow (less than 1 mm/year), our measurements in longer time spans (at least in 13 years, between 1997 to 2010, 2011 and planned 2012) better resolve the tectonic signal from the noise. Preliminary results obtained from campaign-mode measurements in 1997, 2010 and 2011 agree well with those reported in the latest study by Lidberg et al. (2010) who used the data from permanent GPS stations of the BIFROST (Baseline Inferences for Fennoscandian Rebound Observations Sea Level and Tectonics) project. Strain-rate analysis resulting from the obtained velocities illustrates the overall extensional component trending NW-SE with local variations. Adding more campaigns in 2012 and 2013 will surely increase the reliability of our analysis. The velocity field obtained from this research will add more details to the tectonic picture generated by BIFROST. The results are also relevant to GIA modeling, geodetic vs. seismic strain accumulation, waste isolation and seismic hazards.

Reference:
M. Lidberg et al. 2010, Journal of Geodynamics 50, p. 8–18.