Deformation of the South-Eastern Baltic Shield from GNSS observations

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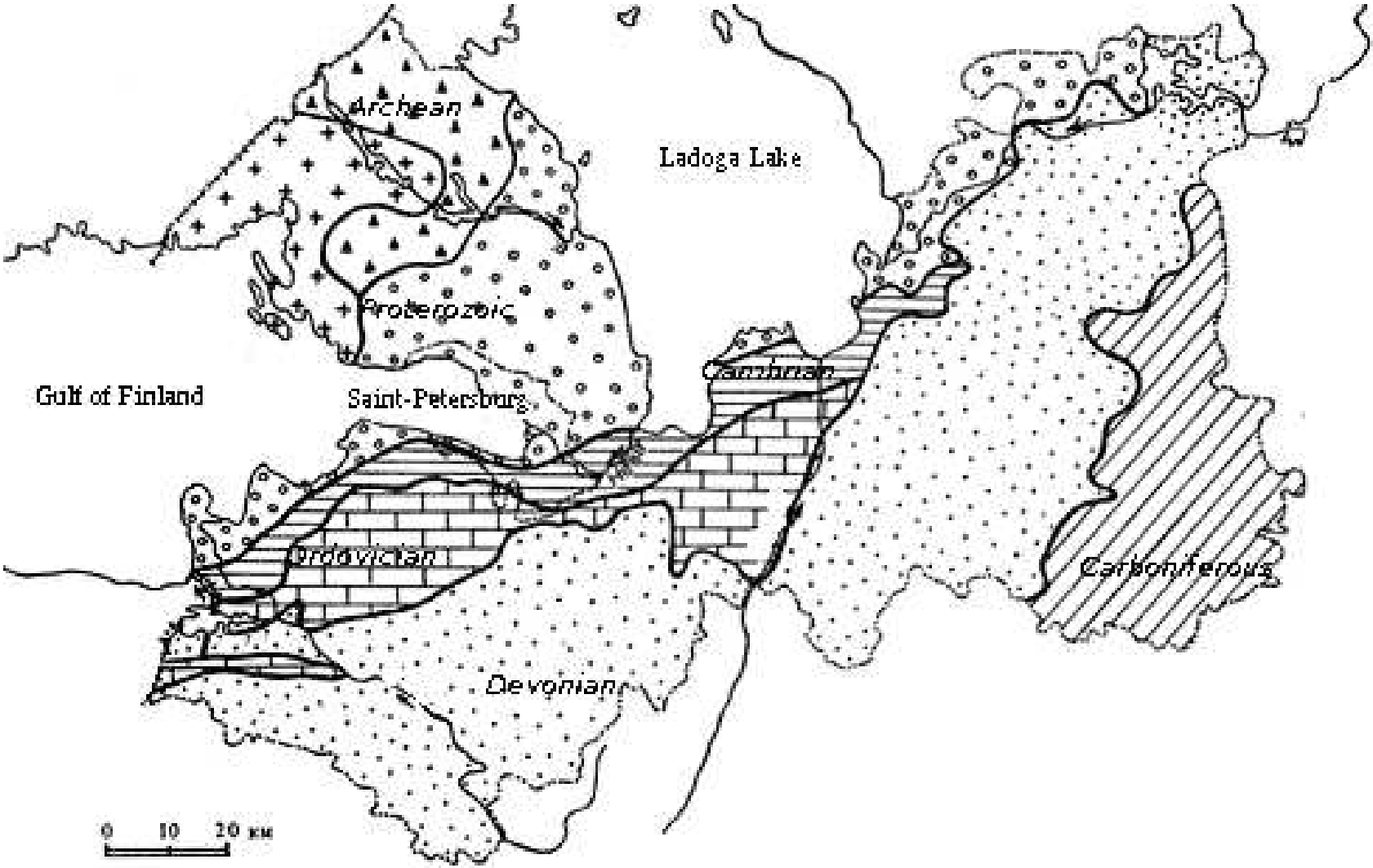
September 24, 2014

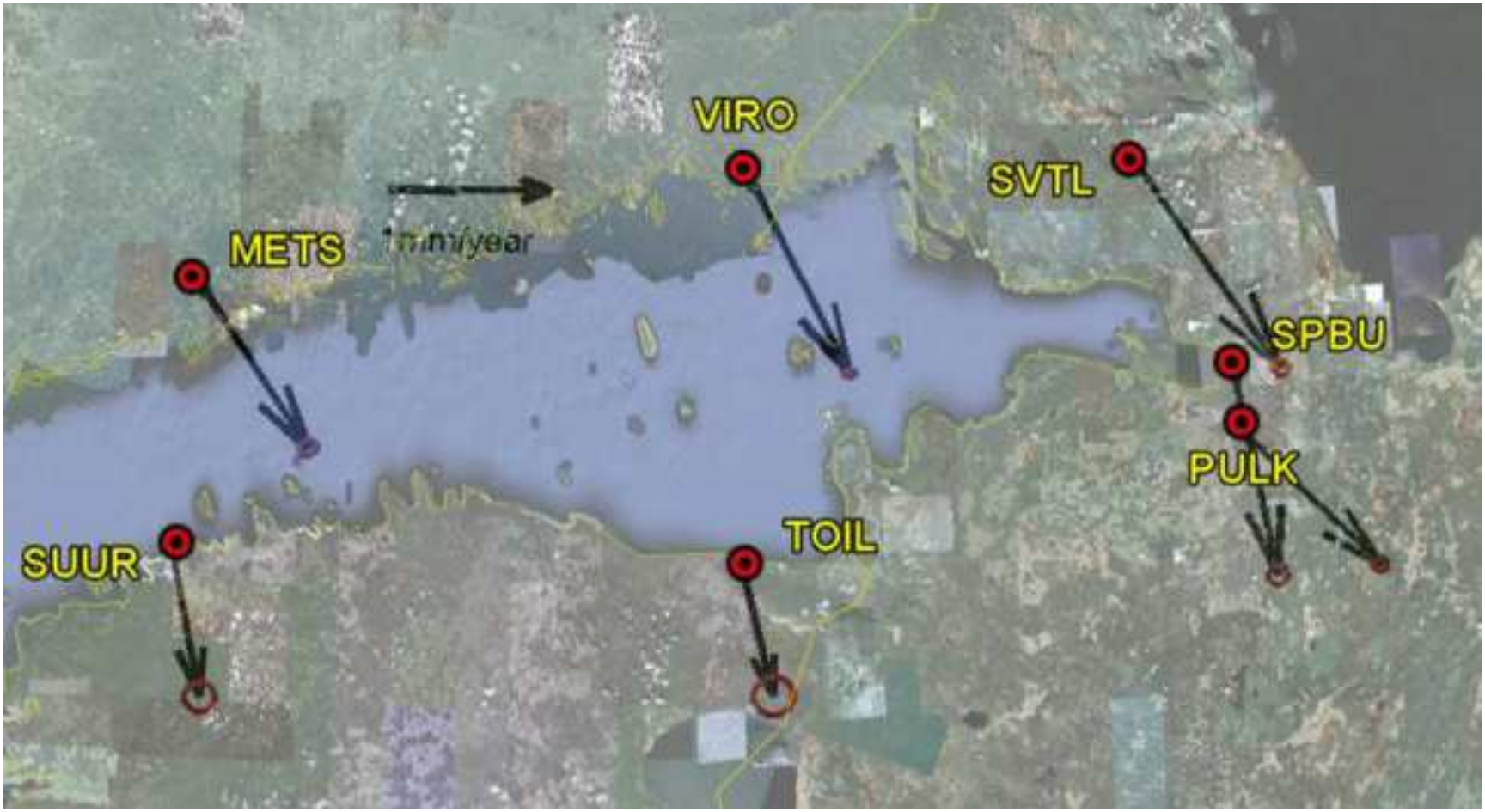
Geologic setting of the South-Eastern Baltic Shield

- City of St.Petersburg marks a border between Baltic Shield and East-European Platform;
- The landscape in the area changes from Archean (3.5 billion years) to Carboniferous (350 million yeears) along the line of 300 km from North to South;
- Previous GNSS-measurements revealed deformations in the area, confirmed by geologic and seismic studies;
- Recent GNSS-measurements (Gorshkov et al. 2012) revealed a possible slow rotation of the South-Eastern Baltic Shield with respect to the East-European Platform.

Geologic map of the South-Eastern Baltic shield



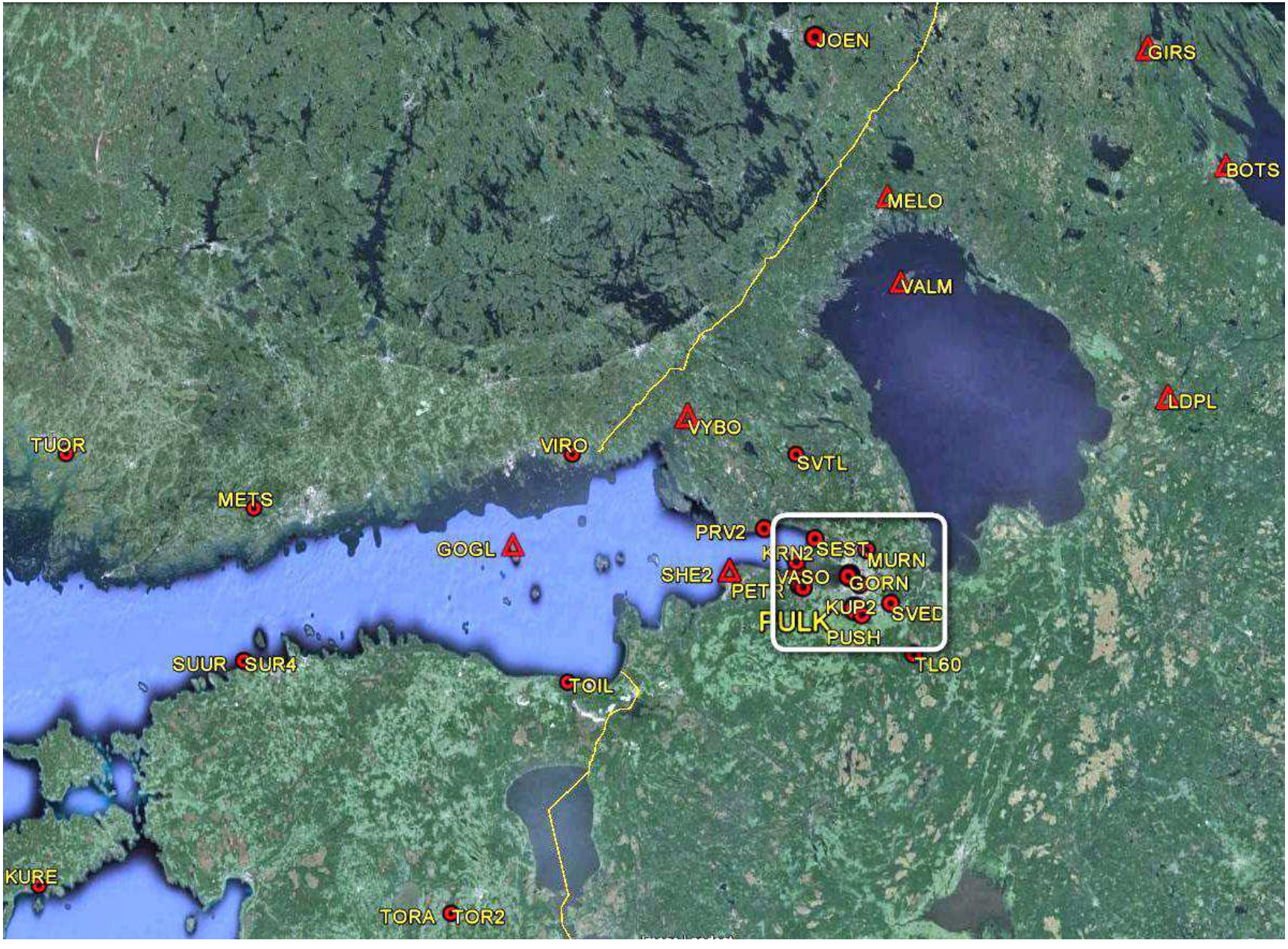
Previous results: Gorshkov et al. 2012



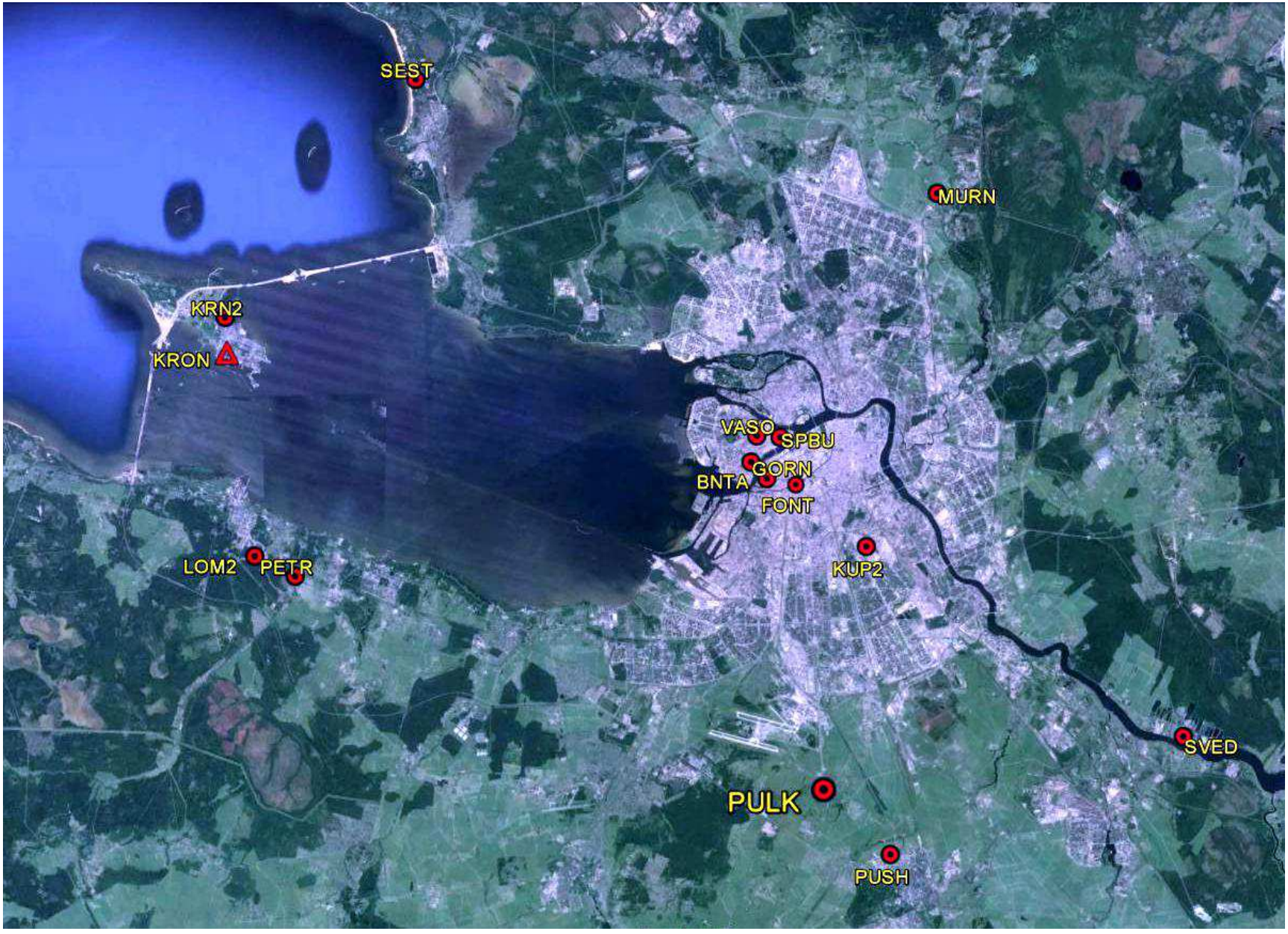
Aim of study

- Gather available GNSS-measurements in the area for the last few years;
- Process the GNSS-measurements within one common model;
- Examine the station coordinate time series;
- Estimate the latitudinal and meridional velocities from station coordinate time series;
- Estimate the deformation field from the station velocities.

GNSS stations



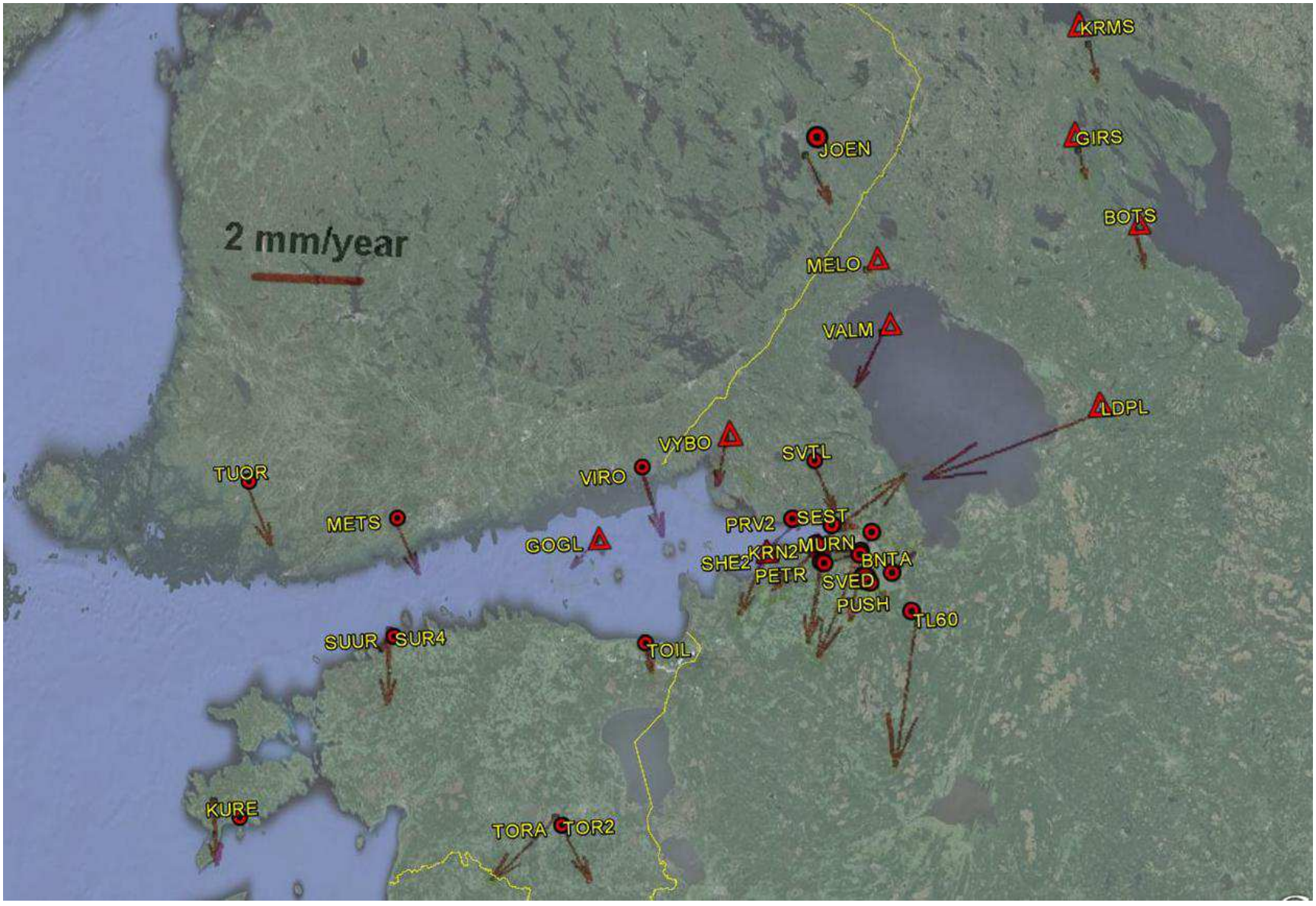
GNSS stations: closeup



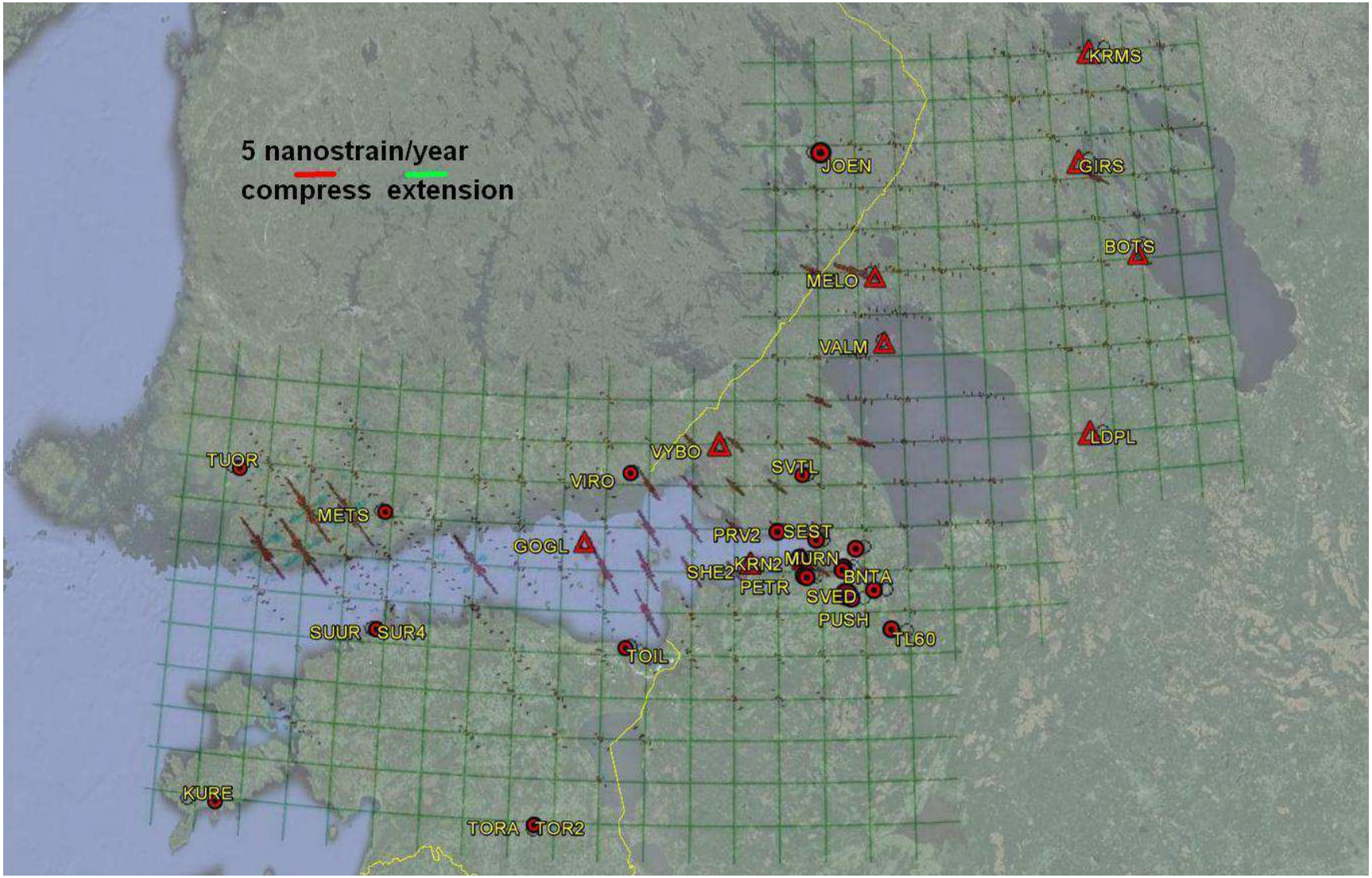
GNSS processing

- Input data: 38 stations for 1992-2014;
- Software: Gipsy/Oasis 6.3;
- Type of solution: PPP (Precise Point Positioning);
- Absolute antennae calibration, orbit and clock corrections IGb08, IERS EOPs, VMF1GRID troposphere, GOT4.8 ocean load tides, IERS solid Earth tides, GOT4.8ac geocenter model, IMLS atmospheric loading;
- Station coordinate time series edited for antennae changes and outliers;
- Station velocities estimated by linear fits;
- Deformation field estimated by use of the algorithm of Teza et al. (2008).

Station velocites



Deformation field



Conclusions

- The border area between the Baltic Shield and the East-European Platform is subject to a weak meridional compression;
- The slow counterclockwise rotation of the South-Estern Baltic Shield with respect to the East European platform is likely to be confirmed;
- Some stations show different (even opposite) velocities and need to be more carefully examined.