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Earth's surface movements in Latvia

D.Haritonova^{1,2}, J.Balodis¹, I.Janpaule^{1,2}, I.Jumare¹, M.Normand^{1,2}

¹Institute of Geodesy and Geoinformatics, ²Riga Technical University, Riga, Latvia

E-mail: diana.haritonova@inbox.lv

For more than two decades, Global Navigation Satellite Systems (GNSS) have played a central role in understanding the movements of the Earth's surface. Continuously operating base stations have recorded GNSS data. The data have been collected and processed to provide precise information on the continuous changes of the GNSS station positions.

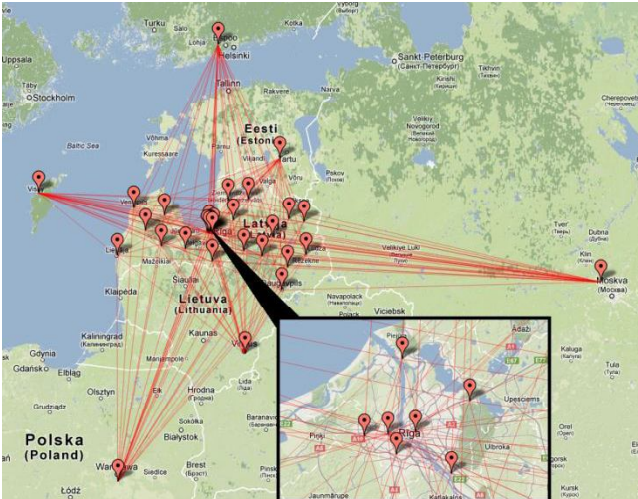


Fig.1. LatPos and EUPOS®-Riga network solution with reference stations from EPN: JOZE, MDVJ, METS, RIGA, TORA, VISO, VLNS.

The GNSS observations of both EUPOS®-Riga and LatPos permanent networks have been collected for 7-year period – from the year 2007 to 2013. With the reference stations from EUREF Permanent Network (EPN) in surroundings of Latvia and the input data sets from International GNSS Service's (IGS) data bases, the *Bernese GPS Software* Version 5.0 has been used to compute daily network solutions (Balodis 2011). As a result of post-processing computation the coordinate time series of all Latvian GNSS stations have been obtained [1].

The analysis of possible dependences between changes of GNSS station positions and different impact sources has been performed. The main factors which have been suspected are reference station problems, soil moisture content changes, and seismic activity of some areas of Latvia with local engineering-geological conditions which may increase the Earth's surface oscillations. As well as the impact of solid Earth tides and solar activity has been considered. The principal focus is on the site displacement identification excluding noises of obtained GNSS time series.

The data growing amplitude and periodic variations were identified for obtained coordinate series. From the year 2008 Latvian GNSS station Up-differences have been increasing, that might be caused by raising solar activity. To demonstrate oscillations in the coordinate time series the autocorrelation and spectral density functions have been used. As well as a distinctive behaviour of site coordinate changes was identified for some of EUPOS®-Riga and LatPos stations.

References

[1] Balodis, J., Haritonova, D., Janpaule, I., Morozova, K., Normanda, M., Silabriedis, G., Zarinsh, A., Zvirgzds, J. GNSS Network Station's Time Series Analyses. Proceedings of the International Symposium on GNSS, Space-Based and Ground-Based Augmentation Systems and Applications. Berlin, Germany, 10-11 October 2011. 5 pages.