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GNSS STATION KINEMATIC COORDINATE ANALYSIS

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The daily movements of EUPOS®-Riga permanent GNSS network stations have been studied. Bernese GPS Software, Version 5.0, in kinematic mode was applied. Eight EUREF Permanent Network (EPN) stations: JOZE, MDVJ, METS, PULK, RIGA, TORA, VISO and VLNS were fixed for datum definition in each kinematic network solution. The standard data sets were taken from International GNSS Service (IGS) data base.

The results of the kinematic coordinate estimation contain *a priori* coordinates in IGS05 coordinate system for all stations and estimated correction with RMS in North, East, and Up components in meters for kinematic station¹⁴. The data sampling interval was set to 5 minutes, and only GPS observations were considered.

The daily displacements in North, East and Up components for 45-day observation period from 15th to 59th day of the year 2010, at the 5 EUPOS®-Riga stations: ANNI, KREI, LUNI, MASK, VANG, have been obtained.

The smallest data amplitudes correspond to the East component, the largest to the Up. Observation data spread character of three components for all EUPOS®-Riga stations, except the ANNI station, is similar: for North component data span is about 4 cm, for East component two times smaller about 2 cm, and the Up component has kinematic coordinates ranging in the interval of 8 cm. In the case of the ANNI station, observation data span is about 1,5 times greater for each component separately. It can be easily explained by stations location next to the railway.

The standard deviation of site kinematic positions for each epoch and component has been calculated. The largest standard deviation values can be observed at the ends of daily periods and from 10:00 to 14:00 local time. Kinematic coordinate estimates of mentioned time interval are very similar to the errors caused by the ionosphere.

The impact of solid Earth tides on the site coordinate changes has been studied as well. The solid Earth tide caused displacements at the EUPOS®-Riga stations have been also obtained applying Bernese GPS Software in kinematic mode and modifying software routine computing tidal station displacements in accordance with the latest IERS Conventions¹⁵.

The maximum height of tidal wave in the Up component at the EUPOS®-Riga stations is about 35 cm. Obtained data of Up and North components correspond to the theoretical curves of tidal waves, but East component data coincide only partly with theoretical waves. Tidal displacement estimates for East component show delayed reaction to the tidal forces.

14 Beutler G., Bock H., Dach R., Fridez P., Gäde A., Hugentobler U., Jäggi A., Meindl M., Mervart L., Prange L., Schaer S., Springer T., Urschl C. and Walser P. (2007) User manual of the Bernese GPS Software Version 5.0. Astronomical Institute, University of Bern. 612 p.

15 McCarthy D. D. and Petit G. (2004) IERS Conventions (2003), IERS Technical Note No. 32. Frankfurt am Main: Verlag des Bundesamts für Kartographie und Geodäsie. 127 p.

Research findings have shown, although kinematic coordinates are obtained applying GNSS data post-processing method, still estimates are mainly affected by the ionosphere. The post-processing method in kinematic mode with additional information of possible influences on the data quality allows the detection of multipath effect, the signal noise affected by the impact of weather conditions, as well as site displacements due to heavy traffic impact loads.