11–12 October 2012, Riga

Riga Technical University 53rd International Scientific Conference

Dedicated to the 150th Anniversary and
The 1st Congress of World Engineers and
Riga Polytechnical Institute / RTU Alumni

DIGEST

ISBN 978-9934-10-360-5

RIGA TECHNICAL UNIVERSITY
53rd INTERNATIONAL SCIENTIFIC CONFERENCE

DEDICATED TO THE 150th ANNIVERSARY AND

THE 1st CONGRESS OF WORLD ENGINEERS AND RIGA POLYTECHNICAL INSTITUTE / RTU ALUMNI

11-12 October 2012
Rīga, Latvija

Rīga-2012

Table of contents

GNSS Station Kinematic Coordinate Analysis

Diana Haritonova (*Riga Technical University*)

Keywords **– GNSS, permanent network, kinematic coordinates, station displacement.**

I. Introduction

The daily movements of EUPOS®-RIGA and LatPos stations have been studied. EPN reference stations have been used and Bernese GPS Software, Version 5.0, was applied in kinematic mode. The standard data sets were taken from IGS data base – ionosphere and troposphere parameters, satellite orbits, satellite clock corrections, as well as the Earth rotation parameters.

II. Data processing

The Bernese GPS Software allows the estimation of kinematic, i.e., epoch-wise receiver coordinates. This feature has been applied and kinematic parameter estimation for LatPos and EUPOS®-RIGA permanent GNSS network stations has been carried out. Processing of mixed – kinematic and static, stations has been performed in the same solution allowing to process data from several stations in baseline mode, one of them kinematic, the others static. From seven to nine EPN stations (JOEN, JOZE, MDVJ, METS, RIGA, TORA, VAAS, VIS0, VLNS, WROC) were fixed, i.e., static for datum definition in each kinematic double-difference network solution.

The static processing strategies have been applied enabling the kinematic positioning for selected station at the last stage of data processing – after the ambiguity resolution.

The result file includes a priori station coordinates in the IGS05 coordinate system and estimated displacements and RMS in north, east, and up components of rover station in meters with 5-minute sampling interval.

Site displacements due to solid Earth tides as well as ocean tidal loading were considered for all types of stations irrespective whether they are static or kinematic.

Figure 1 shows daily vertical displacements at the AIZK station for 30-day observation period.

The results from a similar way obtained network solution for station LUNI displayed in Figure 2, where three components of station displacement with RMS values are shown.

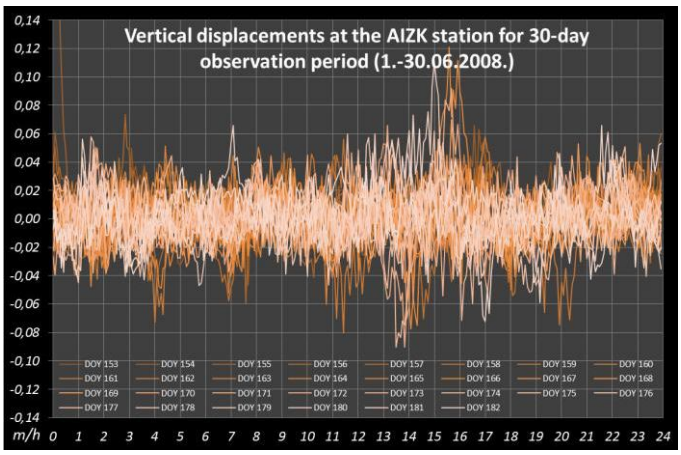

Fig. 1. Vertical displacements at the AIZK station for 30 days of June 2008.

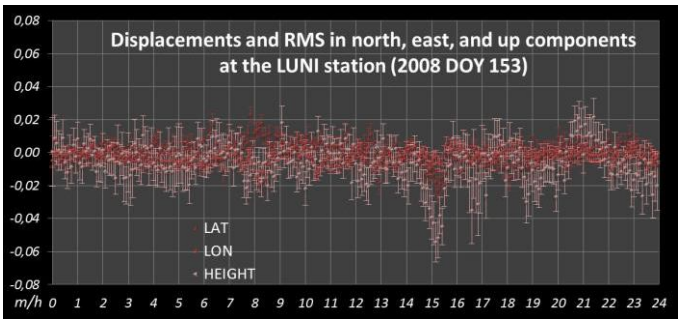

Fig. 2. Displacements and RMS for three components at the LUNI station.

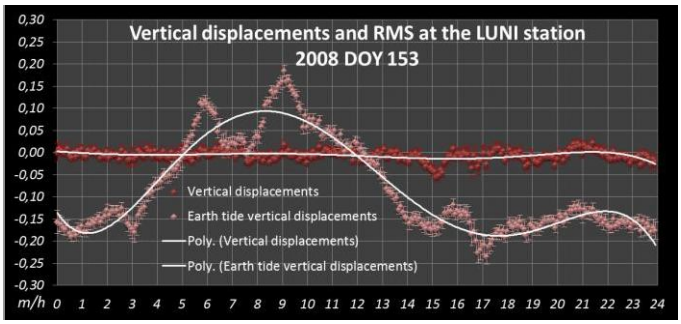

Fig. 3. Vertical displacements at the LUNI station.

Earth tidal vertical movements at GNSS stations have been studied as well. Figure 3 shows one-day vertical displacements and solid Earth tide caused vertical displacements at the LUNI station. Such displacements can be obtained by modifying the routine of Bernese GPS Software computing tidal station displacements. It is necessary to define that the tidal impact corrections will not be introduced for kinematic stations.

III. Results

Research findings have shown that the highest RMS values correspond to up component of GNSS station displacement and are more than 1 cm, the lowest RMS values can be observed for east component and reach 6 mm.

IV. Conclusions

The goal is to get as many epochs with reliable kinematic coordinate estimates as possible. However the low redundancy makes it difficult to detect bad observations. The results are very sensitive to data quality. This makes it difficult to give a ready-to-use recipe for a robust analysis of data from kinematic stations.

The study of the Earth's oscillations is a key part of the theory of the Earth's dynamic response to external or internal forces. However it is hard to reach necessary accuracy to register such phenomenon. The main problem is due to influence of ionosphere and weather conditions on GNSS observations. It would be better if each GNSS receiver was equipped with a meteorological station for data control.

V. References

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

SPONSORS AND SUPPORT