CENTRE OF APPLIED GEOMATICS: SCIENTIFIC ACTIVITIES IN THE FRAME OF EUREF PERMANENT NETWORK

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1. INTRODUCTION

The paper presents current activities of the Centre of Applied Geomatics (CAG), Warsaw Military University of Technology in the frame of EPN (EUREF Permanent Network). The Centre is the research unit, which operates within Military University of Technology. The main field of interests of its members covers GNSS (Global Navigation Satellite Systems) data processing and analysing. Since the end of 2009 CAG runs the newest, seventeenth Local Analysis Centre (LAC) of EUREF Permanent Network (EPN), which is a science-driven network of continuously operating GNSS reference stations with precisely known coordinates. The network processed by CAG consists of 114 sites distributed all over the Europe. The processing strategy is similar for all LACs, the weekly and daily processing is performed on the computer cluster specially designed for these purposes. Besides the Centre is one of the leaders in the EPN re-processing project. It is the venture for computing consistent precise coordinates, velocities and by-products (e.g. troposphere parameters) based on the EPN in support of the ETRS89 (European Terrestrial Reference System) using identical standards for the entire period of time. In 2008 CAG has successfully completed the test re-processing of the full European Permanent Network (EPN), consisting of the historical observation series for the period between 1996-2007 for almost 200 stations. CAG was one of two European research centres (at the same time another test reprocessing with a different strategy was performed at the Royal Observatory of Belgium) which were able to carry out this task. The test reprocessing is a starting point for the elaboration of an optimal processing strategy for the final, official EPN reprocessing. To increase the credibility of GNSS solutions in 2009, the work began on getting alternative software GAMIT/GLOBK. The comparison between processing results from these two software is essential for proper geodynamical and geophysical interpretation of the results. According to the agreement with the Head Office of Geodesy and Cartography the one of the CAG's task is the monitoring of the long and short term stability of the Polish multifunctional precise satellite positioning system ASG-EUPOS. The presentation shows the current activities of the CAG in the frame of EPN, presents the newest results of precise solutions and the strategy used for GNSS (GPS/GLONASS) data processing.

2. EPN PROCESSING

Within EPN processing activity the CAG is responsible for processing of the sub-network consisted of 114 permanent sites distributed all over the Europe (Fig. 1). Every week, the solutions are being sent to Regional Data Centre, which is run by Bundesamt für Kartographie und Geodäsie (BKG), where they are combined with other sub-networks in order to create European free-network solution that is transferred to International GNSS Service (IGS).
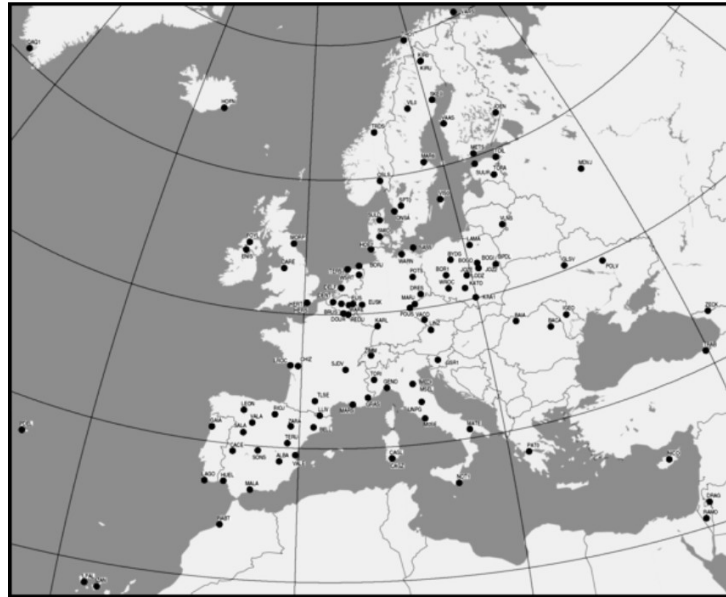

Fig. 1. CAG's sub-network.

In addition to processing of the sub-network the Center also conducts research to determine the stability of the position of selected stations in order to identify stable points for ETRF definition in Europe. Fig. 2 presents time series of XYZ coordinates in ITFR2005 reference frame of BOGO site (Borowa Gora, Poland) form 1996 up till now. As an result the parameters of regional geodynamics could be obtained. Fig. 3. presents regional velocity field for Europe obtained from adjustment of EPN network.
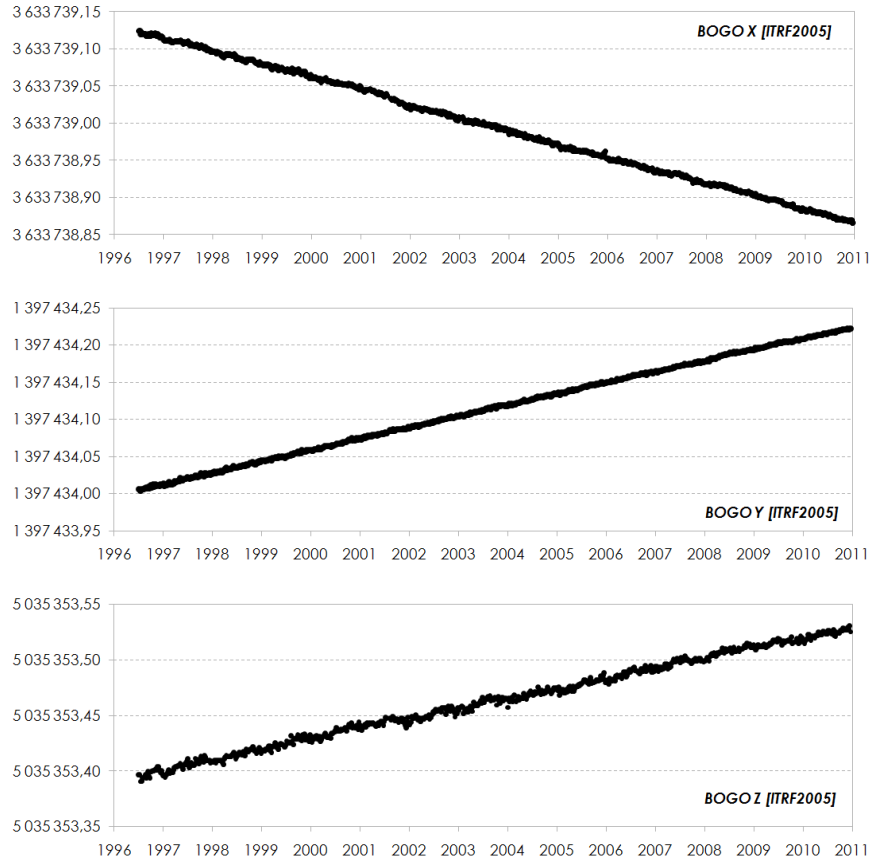
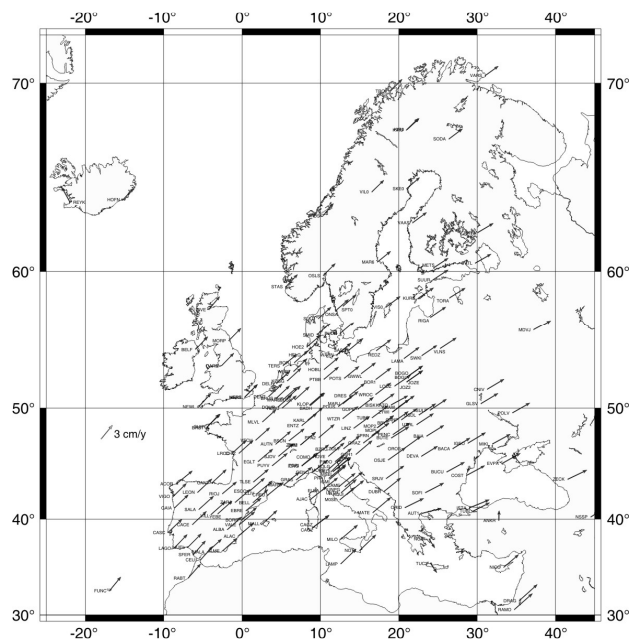**Fig. 2. Changes of geocentric coordinates of BOGO EPN site.**

Fig. 3. Velocity field for Europe [cm/y].

3. EPN RE-PROCESSING

Idea of EPN Re-processing is to elaborate the whole network using archive data and the newest models and strategies to obtain more homogeneous time series for ETRF definition and maintenance. Besides BERNESE software the CAG decided to perform tests using also another tool: GAMIT/GLOBK. These tests are being made in cooperation with Landmäteriet (Gavle, Sweden). EPN network was divided into 7 subnetworks. 3 of them (138 sites, on the right) are processed by CAG. Figure 4 presents the division of the EPN into subnetworks for GAMIT/GLOBK processing. Furthermore in March 2011 Centre of Applied Geomatics signed the agreement and obtained the licence for new tool for advanced GNSS data processing NAPEOS, used by European Space Agency (ESA).
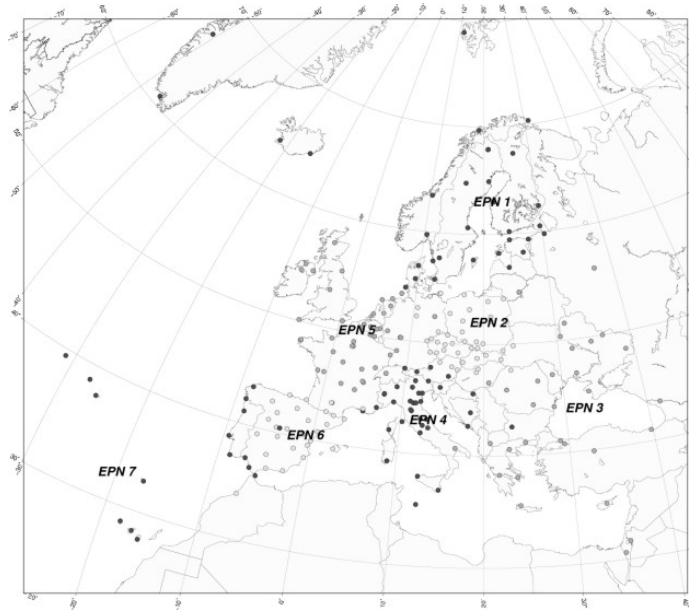

Fig. 4. Sub-networks for GAMIT/GLOBK data processing.

4. EPN DENSIFICATION

Since the beginning of 2008 the ASG-EUPOS (Active Geodetic Network) has operated as EPN densification on the area of Poland. It is Polish GNSS Ground Base Augmentation System (GBAS) consisted of more than 100 reference stations. According to the agreement between Head Office of Geodesy and Cartography (HOGC) and the Military University of Technology CAG processes the network in order to ensure additional control and monitoring of the system. Furthermore the geodynamic parameters by means of contemporary Earth's crust movement are determined. Figures 5-7 presents velocity fields (ITRF2005), intraplate velocities (ETRF2000) and vertical movements obtained from permanent GNSS measurements.
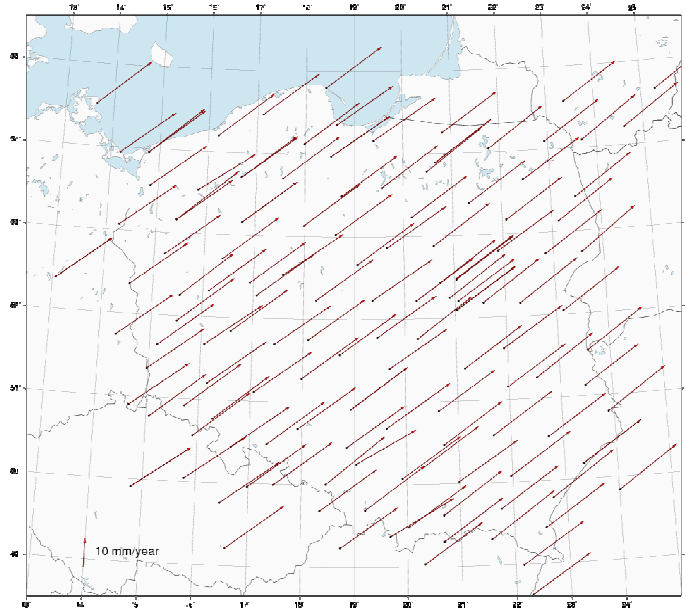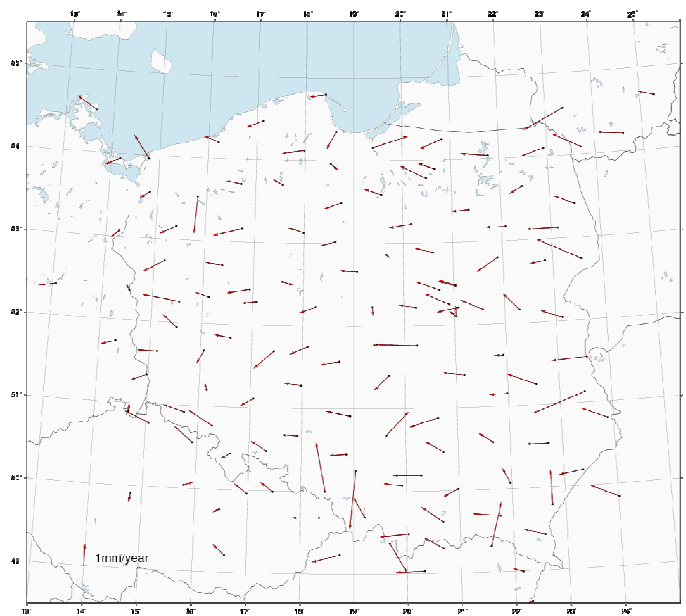
Fig. 5. Velocity field for Poland [mm/y].

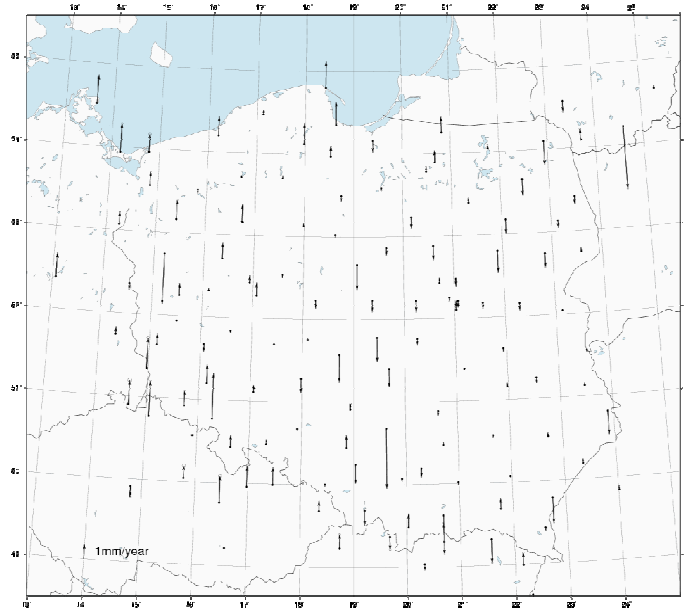**Fig. 6. Intraplate velocities [mm/y].**

Fig. 7. Vertical movements [mm/y].

5. ASG+ PROJECT

In 2010 the Military University of Technology signed the agreement with Polish Ministry of Science and Higher Education for the project of improving ASG-EUPOS. The detailed information about the project's assumptions are presented in the paper by Figurski et al., 2011.

REFERENCES

Figurski M., Bogusz J., Bosy J., Kontny B., Krankowski A., Wielgosz P. (2011): „„„ASG+": project for improving Polish multifunctional precise satellite positioning system". Reports on Geodesy, this issue.