

NATIONAL REPORT OF BULGARIA ÅUREF SYMPOSIUM IN DUBROVNIK 2001

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ABSTRACT

The principal activities on EUREF, mainly related to EUVN, Permanent GPS Station, National GPS Network and Network of Permanent Stations, and National Levelling Network, and data base of the EUVN, introducing of New Coordinate System in Bulgaria as a standard on the base of EUREF as well as other activities related to the EUREF have been outlined.

1. General principals

In the last few years the legal regularization of the organization and restructure of geodesy in Bulgaria has been put into practice. It mainly concerns the new law of cadastre and property register passed in the Parliament, new Agency of Cadastre, reorganization of Military Topographic Service and Civil National Geodetic Institution, works on the law of geodesy and cartography passed only the first reading in the Parliament, finalizing of the Land Reform and reinstatement of forests and lands property of the forestry found. Nowadays, for geodesy in Bulgaria it is the very difficult time. Geodesy is in inadequate position concerning structures and organization, institutional creation, legal and other normative regularization, putting and financing of activities, and normal functioning. In many aspects, in spite of the persisting actions of the Union of Surveyors and Land Managers in Bulgaria the turning point in the mentioned situation has not come, yet. Undoubtedly, that reflects in the further development of the EUREF activities

Here, the EUREF activities related mainly to EUVN, Permanent GPS Station, National GPS network and network of reference stations, National Levelling Network and data base of the European height system, introduction of a new coordinate system as a standard in Bulgaria on the base of EUREF as well as other activities related to EUREF have been outlined.

2. Activities related to EUVN

There are three EUVN stations on the territory of Bulgaria. One of them is the Permanent Station Sofia and two others are situated near the tide gauges in Varna and Burgas towns. The levelling at Burgas station was carried out for the second time. Geopotential numbers of all three stations have been determined and site description of these stations according to the respective requirements of the Project Coordinator has been submitted.

3. Permanent Sofia Station

The station named Sofia/Bulgaria has been established with the support of IfAG, now BKG and has operated since May 17, 1997. Information about the Sofia station can be found in the Internet web site, file - sofi00101.log.

In the period 29.11.2000 - 06.03.2001 the Turbo Rogue SNR-8000 was repaired, modified and upgraded to 12 channels and to the new ACT Benchmark technology. Because of the Upgrading the Mod. 7490540-050 have been changed to Mod. 7490930, and the letter "U" have been added to the S/N T-344, now S/N T-344U.

The station already operates as an IGS station.

It is equipped with:

- GPS receiver
- Sensors for meteo data
- UPS device
- Computer Celeron 366 MHz, with Internet connection, GSM modem.

The data (hourly and daily) are transferred via Internet FTP. An hourly data file with code and phase measurements is sent every hour.

Once in twenty-four hours (by 00.10 UTC) three-daily (of 24 hours) data files are transferred as follows:

- meteo file
- RINEX -code and phase measurement files
- RINEX -navigation file

4. National GPS Network

With the framework of the Project for cadastre in Bulgaria and with the support of the World Bank a Project for establishment of National GPS Network has been presented. It is foreseen the network to consist of the seventh, respectively 15 EUREF stations and to be extended with more 150 stations - first order, and about 250 stations - second order. The realization of the Project is actually the first step of the cadastre project realization.

5. Establishment of an analog of the German system SAPOS in Bulgaria

On a base of development of Bulgarian-German collaboration, some assessments and a proposal on the part of German colleagues and Berlin Senate for establishment in Bulgaria of a compatible with SAPOS Satellite position system have been done. A basic conception, respective requirements and principal information for establishment of such a system of reference stations have been proposed. Variants for the reference station numbers, their equipment, possibilities of practical use, financing, personal qualification, conception of the stage introduction and many-functioning have been proposed. Possibilities for realization of the system are seeking.

6. Introduction of a New Geodetic System in Bulgaria as a standard

The introduction of reference systems in Bulgaria including the EUREF is regulated by an act of the Council of Ministers*.

*A decree of Council of Ministers RB 140/4.06.2001 for defining of the Bulgarian Geodetic System 2000 according to the above described parameters is already available.

In this aspect, a special decree coordinated with Ministries and authorities of the country has been prepared. The Ministry of regional development and public works to which the civil geodetic national agency - Department of geodesy and cartography belongs is taking action on this problem.

The geodetic system in Bulgaria called "Bulgarian Geodetic System 2000" integrates: fundamental geodetic parameters determined in Geodetic reference system 1980 (GRS 2000); geodetic coordinate system ETRF'89 realized by European Reference Frame EUREF; Height system realized by levelling bench marks of National Levelling related to the European height system - levelling bench marks and data about the gravity in an unified gravity system ; System of plane coordinates on the base of ETRF'89 and conformal conic projection (Lambert projection) with two standard parallels and one central meridian; International map system up to the scale 1:2 000 including.

7. Preparation for integration the National Levelling Network of Bulgaria into the European Height System data base

Necessary data for the integration of the national levelling network of Bulgaria into the UELN became actual after including the Rumanian network. The Technical Working Group of EUREF has decided to perform the adjustment of UELN in geopotential numbers. The results are made available in geopotential numbers and normal heights.

Therefore the following data are necessary to integrate the levelling network of Bulgaria into UELN:

- Measured height differences between all points along the lines (not only between the nodal points)
- Gravity values at the beginning and at the end point of each measurement in the precision of about 1 mgal in order to compute geopotential number differences. The gravity values can be measured or interpolated from maps of Bouguer anomalies and convert
- The geodetic latitude of the points in the ETRS89 system in the precision of about 3 " in order to compute normal heights (up to a height of 500 m a precision of 10" is sufficient.)
- Also the geodetic longitude of all points or at least of the nodal points is desirable in order to create a map of the network
- The height of one point in the national height system in order to compute approximate values of the heights
- Border levellings to the neighboring countries (especially Romania) in order to connect the network with the UELN.

Difficulties have occurred in the stage of data preparation in two aspects.

On one hand it is the mentioned in issue 1 the legal regularization of organization and restructure of Bulgarian geodesy. It is mainly related to the institutional responsibility, change in the positions and rank of the responsible institutions as well as personal changes of institution leaders.

On the other hand it is the difficulty concerning the secret of a part of the necessary information.

Already, in some aspects these difficulties have been partially overcome and there are some proposals.

8. Activities related to EUREF - CERGOP, UNIGRACE, Cadastre in Bulgaria

“Geodetic and Geodynamic programs of the Central European Initiative (CEI)” and the project CERGOP – 2 have been included in the works accomplished with the framework of IAG Section V "Geodynamics". A new group for Geotectonic analysis of the region of Central Europe has been created. A special subgroup of this group is "Geodynamics of Balkan Peninsula".

A special GPS network - CEGRN has been established and for complex investigations on the project regular measurements - every two years have been carried out. Bulgaria actively participates in this program and projects on the base of EUREF - three stations are included in it. As a result of this activity two monographs devoted to the geodynamics of Bulgaria, related to earthquakes in two most active earthquake regions in Balkan Peninsula and Europe have been published in Report on Geodesy, Warsaw. Further GPS measurements on the base of EUREF stations in Central European region and the region in Balkan Peninsula have been foreseen.

Three absolute gravity stations have been established on the project UNIGRACE/Copernicus as the gravity and geopotential numbers of EUVN stations in Bulgaria have been determined as it is mentioned in issue 2.

Related to the implementation of the works on the project of Cadastre and Property Register of Republic Bulgaria with the financial support of World Bank, a renovation of the National Geodetic Network on the base of EUREF and GPS measurements is under preparation (see also issue 4).

Along with these activities there are others related to the re-allocation of the property in Bulgaria, geodynamic investigations in different regions of the country, applications of GPS in engineering survey etc.

Conclusion

Great institutional and financial difficulties at this stage of development of Bulgaria which have been presented in the first part of this national paper, make very difficult a realization of many activities of the international cooperation with the framework of EUREF. With great efforts and problems the works go on. The presented activities are the proof of it. The latest governmental resolutions are very important preconditions.