

National GPS Network of Romania

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Key words: GPS, positioning, geodesy, network

SUMMARY

Starting with year 2001, National Office of Cadastre, Geodesy and Cartography (ONCGC) installed, over Romania's territory, 5 Permanent GPS Stations in municipalities of **SUCEAVA, CLUJ, TIMIȘOARA, SIBIU** and **BRĂILA**. Few years ago, Federal Office for Cartography and Geodesy from Germany (**BKG**) has donated to the University of Constructions from Bucharest a Permanent GPS Station which is used like **EUREF**. Within Institute of Cadastre, Geodesy, Photogrammetry and Cartography (**ICGFC**) is functioning a Data Processing and Control Center for GPS Permanent Stations.

In the 2003 summer time was started the process of creation the homogeneous GPS National Network from Romania. This network will be constitute, in year 2005, from about 4000 points uniform distributed over the Romanian territory (which have a surface of approximately 237000 km²). The nucleus of this network it is constitute by the GPS Permanent Stations mentioned above, and by the **EUREF** points from Romania territory.

From this project was already made over than 300 points (with coordinates determined in **WGS84**) which include old geodetic points from the National Triangulation Network (with coordinates determined on **Krasovski** ellipsoid), so it will be possible to make coordinate transformations between these two reference systems. The tridimensional determination precision of point's coordinates is situated under 1 centimeter.

The GPS processing of nucleus of the new GPS Romanian National Network was made to Graz, Austria, to the **Österreichische Akademie der Wissenschaften – Institut für Weltraumforschung**, by technical assistance and amiability of Mr. Dr. P. Peseć and Mr. G. Stangl, to which we address again our many thanks.

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Starting with year 2001 over Romania's territory there have been installed 5 Permanent GPS Stations in municipalities of **SUCEAVA, CLUJ, TIMISOARA, SIBIU** and **BRAILA**. As it is already known, a few years ago, **BKG** has donated to the University of Constructions in Bucharest a Permanent GPS Station, which is functioning perfectly, in real time and with no delays.

From administration reasons, and not only, there was impossible, yet, to unite the Permanent GPS Stations mentioned above, within a network that may function at adequate parameters. At the present, the records effected at the first 5 stations are periodically transmitted on CD-s, to a Processing and Control Center, which is functioning within the **Institute of Cadastre, Geodesy, Photogrammetry and Cartography**. This one is acting at present only as data collector.

- We are about to create the Network of Permanent GPS Stations for Romania.
- We have to consider this development trend, for the future.
- Unfortunately, as noticed, the points from the CEGRN network, CERGOP-1 Project
IASI,
VATR,
GILA

have suffered new position alterations, fact that makes them less reliable, for the future.

For these reasons, there was decided the replacement of **IASI** and **VATR** points with the **SUCE** Permanent GPS Station and the replacement of **GILA** point with **CLUJ** Permanent GPS Station. The first replacement concerns the points situated on the same tectonic plate – EAST EUROPEAN PLATFORM, and the second replacement concerns the points situated on the OROGEN CARPATHIAN tectonic microplate.

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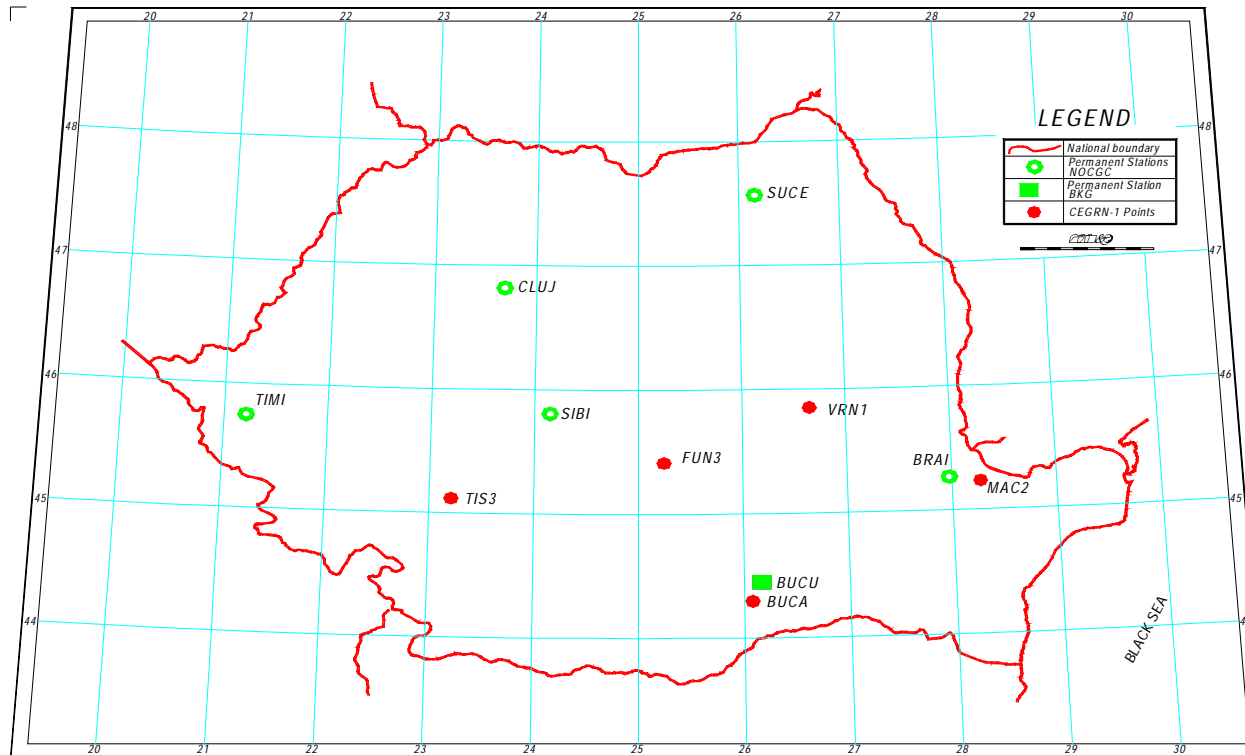


Fig. 1 – CEGRN 2003 Campaign on Romanian territory

Table 1 - CEGRN 2003 ROMANIA

Classification of the GPS Points	Site	Code	Lat	Long	Tectonic area
Old CERGOP Point	Tismana	TIS3	45 ⁰ 08'	23 ⁰ 08'	South Carpathian Orogeny
	Macin	MAC2	45 ⁰ 15'	28 ⁰ 11'	Dobrogea Orogony
	Magurele	BUCA	44 ⁰ 21'	26 ⁰ 03'	Moesian Platform
	Fundata	FUN3	45 ⁰ 25'	25 ⁰ 15'	Southern Carpathians
	Vrancea	VRN1	45 ⁰ 51'	26 ⁰ 39'	Vrancea zone
Old permanent GPS Station (BKG)	Bucharest	BUCU	44 ⁰ 28'	26 ⁰ 08'	Moesian Platform
New permanent GPS Stations	Suceava	SUCE	47 ⁰ 38'	26 ⁰ 14'	East-European Platform
	Braila	BRAI	45 ⁰ 16'	27 ⁰ 58'	North Dobrogean Orogen
	Timisoara	TIMI	45 ⁰ 45'	21 ⁰ 14'	Pannonian Depression
	Sibiu	SIBI	45 ⁰ 47'	24 ⁰ 09'	Transylvanian Depression
	Cluj	CLUJ	46 ⁰ 45'	23 ⁰ 35'	Carpathian Orogen

This proposal was approved during the first **CERGOP-2/Environment** Working Conference organized in Graz, Austria in May 2003 and it was included in the minutes made to the end of conference.

At present, Romania is beginning the process of creating the homogenous GPS National Network.

The nucleus of this network is formed by:

- points mentioned in **Table 1**
- **EUREF** points from Romania territory (**Table 2**)

The GPS measurements in all points mentioned above was made respecting **CEGRN 2003 Campaign – General Rules**.

Table 2 – EUREF ROMANIA

Classification of the GPS Points	Site	Code	Lat.	Long.
EUREF-Romania	Dealul Piscului astronomic point	PISC	44°24'	26°07'
	Dealul Piscului geodetic point	PIS1	44°24'	26°07'
	Constanța	CONS	44°11'	28°34'
	Moșnița	MOSN	45°44'	21°20'
	Oșorhei	OSOR	47°04'	22°01'
	Sârca geodetic point	SIRC	47°14'	27°12'
	Sârca astronomic point	SIRA	47°14'	27°12'
	Sfântu Gheorghe Stănculești	GHEO STAN	45°51' 44°46'	25°49' 23°56'

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*GPS processing software
- BERNESE ver. 4.2-*

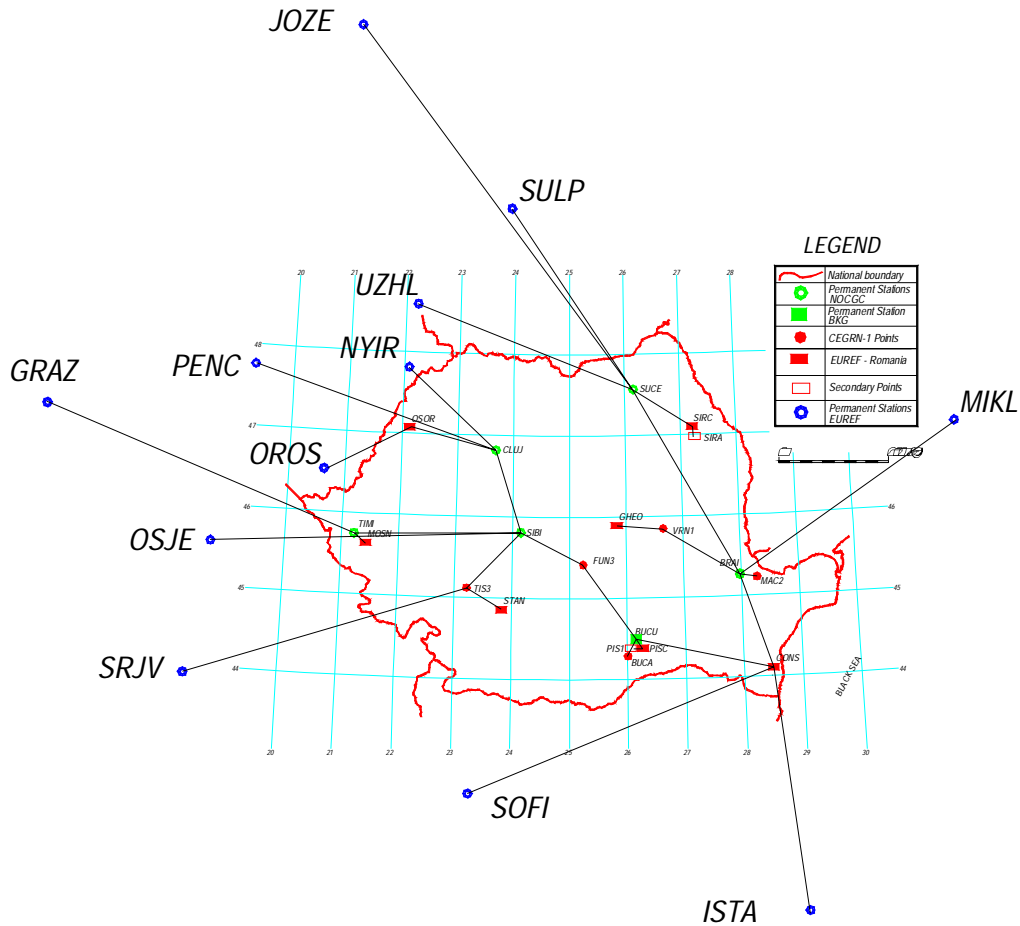


Fig. 2 – Adjustment of GPS Romanian Network nucleus

The GPS processing of nucleus of new GPS Romanian Network was made to Graz, Austria, to **Österreichische Akademie der Wissenschaften Institut für Weltraumforschung**, in **August 2003**, by amiability of Mr.Dr. Peter Pesec, to which we address again our many thanks.

Also, we thank a lot to Mr. Günter Stangl for his technical assistance gave to Ms. Daniela Dumitraşcu for utilization of BERNESE ver.4.2 software.

The adjustment sketch is shown in **Fig. 2** and the precision obtained in **Table 3**.

Table 3 – Residual RMS

ROMANIA EUREF 2003 BUCU ITRF2000/2003.0 FIX						

PROCESSED FILES	:	6				
TOTAL NUMBER OF STATIONS:		32				

STATION	#FILES	RESIDUAL RMS IN MM				
		123456	N	E	U	

GRAZ 11001M002	6	MMMMMM	2.6	1.8	8.1	
TIMI	6	MMMMMM	3.5	2.6	6.3	
BUCU 11401M001	6	FFFFFF	-	-	-	
BUCA	6	MMMMMM	2.5	1.2	6.8	
FUN3	6	MMMMMM	1.7	2.0	7.4	
PISC	6	MMMMMM	1.3	0.6	1.4	
BRAI	6	MMMMMM	2.2	1.6	4.3	
MAC2	6	MMMMMM	2.1	1.5	4.6	
SUCE	6	MMMMMM	1.7	1.5	5.1	
VRN1	6	MMMMMM	2.1	1.9	10.2	
CLUJ	6	MMMMMM	2.8	1.5	6.8	
OSOR	6	MMMMMM	2.6	2.2	6.7	
CONS	6	MMMMMM	3.7	0.7	6.3	
SIBI	6	MMMMMM	2.9	2.0	3.5	
ISTA 20807M001	6	MMMMMM	2.2	3.0	3.4	
JOZE 12204M001	6	MMMMMM	1.3	1.9	6.6	
MIKL 12335M001	6	MMMMMM	2.5	2.5	4.8	
NYIR 11208M001	6	MMMMMM	2.2	1.5	5.4	
OSJE 11902M001	6	MMMMMM	3.1	3.0	1.5	
TIS3	6	MMMMMM	5.6	2.0	2.3	
OROS 11207M001	6	MMMMMM	3.0	2.8	8.5	
PENC 11206M006	6	MMMMMM	2.5	3.1	4.0	
PIS1	6	MMMMMM	1.8	0.6	3.6	
SOFI 11101M002	6	MMMMMM	1.7	2.9	11.3	
SRJV 11801S001	6	MMMMMM	2.2	2.2	2.3	
SULP 12366M001	6	MMMMMM	2.1	1.9	5.7	
SIRC	6	MMMMMM	2.3	2.4	5.2	
MOSN	6	MMMMMM	4.5	3.0	9.2	
UZHL 12301M001	6	MMMMMM	2.0	1.5	3.7	
GHEO	6	MMMMMM	2.6	2.1	9.1	
SIRA	4	MMMM	2.8	6.5	10.5	
STAN	2	MM	3.6	2.7	16.0	

FLAGS:		M: MEAN, F: FIXED, N: FREE NETWORK RESTRICTIONS				

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