

National Report on Geodetic Activities Romania



Petre Dragomir¹, <u>Tiberiu Rus</u>², Neculai Avramiuc³, Paul Dumitru⁴, Mihaela Fădur⁴

1 – Prof.Dr.Eng. - National Agency for Cadastre and Land Registration - Head Division of Geodesy and Cartography

- 2 Dr.Eng. National Agency for Cadastre and Land Registration Head Geodesy Department
- 3 Dr.Eng. National Agency for Cadastre and Land Registration Department of Geodesy

4 – Dipl.Eng. - National Agency for Cadastre and Land Registration – Department of Geodesy

- 1. Introduction;
- Status of Geodetic Networks;
- ◆ 3. EUREF and Romanian GNSS Network
- 4. ROMPOS as part of EUPOS;
- 5. (Quasi)geoid in Romania;
- 6. National-European CRS connection;
- 7. Conclusions.



1. Introduction



National Agency for Cadastre and Land Registration *Profile:*

• <u>state</u> organization dedicated mainly to the realization of the new cadastre system in Romania together with the land registration ;

• <u>self financing</u> institution of the Ministry of Administration and Internal Affairs;

• organized in the central divisions, local county offices for C&LR (42) and National Centre for Geodesy, Cartography, Photogrammetry and Remote Sensing (NCGCPRS);

• represents also the NMA (National Mapping Agency) including central divisions Geodesy and Cartography, National Geodetic Fund, and NCGCPRS;

•Products and services for C&LR but also as NMA:

- Realization and maintenance of geodetic networks in Romania: classical and satellite technologies;

- Cartographic products at different scales (1:100000, 1:50000, 1:10000, 1:5000 etc.) in analog and digital format (raster, vector); ERM, EBM, Euro DEM et al.

- Orthophoto maps based on photogrammetry and remote sensing > 2006 all Romania covered at 1:5000 scale; This year will start products at 1:1000 and 1:500 scale for main cities;

- Cadastral maps et al.

• National Geodetic Network: classical terrestrial network;

satellite based network

http://www.ancpi.ro





- a. Triangulation network (Ist-Vth order) > New Inventory (60%)
- b. Leveling network > New adjustment (1990 edition)
- c. GNSS network (after 2001) > accent on development

GNSS network

Applications	Class	E (cm)	Realization by
Global and regional geodynamic investigations	AA	0.5	Epoch stations (>10 years obs.) 8 (CEGRN in Romania) ✓
First class national geodetic network Regional and local geodynamic, deformation projects, engineering surveying, et al.	Α	1.0	Permanent stations 47 ANCPI ✓ +1 TUCE ✓ + 25 new = 73 (2008/2009)
Second class national geodetic network connections to primary network, engineering surveying, landslides	В	2.0	Epoch stations 306 points (2003)
Third class national geodetic network GIS, engineering surveying, cadaster et al.	С	3.0	<i>about 4750 points</i> (<i>1pt/50km</i> ²)~ <i>100 pt/county</i> Realization for B and IF; Partially for BC and VN





ORDIN / CI	ASA PUNCT	1/NP\/		the second se
COD PUNCT / ID		BC-1/ZELE		
DENUMIRE PUNCT		POIANA ZELETIN		
SEMNALIZ	ARE			and the second second
TID BODN		Baread extent (20134-20-40x0-40x1-80m-)		1 The second sec
TIP MARC/	ù	Borna pilastru DTM (0.40x0.40x1.80m.) Marcá tip A DTM 1963		and the second s
COMUNA		Izvorul Berheciulu	i	
JUDETUL		BACĂU		and the second sec
TARA		ROMANIA		
REȚEAUA GULAȚIE	DE TRIAN- DE ORD. I-IV.	MAI-ANCPI-CNGCFT, Bucureşti, B-dul Expozitiei, nr. 1A, Sect.1, e-mail: cngcft@ancpi.ro		The same
Trapez (1:25000)	Stare punct	L- 35 - 55 - A - b	Bunā	Station Lange of
PROPRIET	AR TEREN	Primăria		
AURESA P	RUPRIETAR	INVENTARIEREA	PUNCTELOR RETE	
LUCRARE		LEI DE TRIANGUL	ATIE DE ORD. I-IV.	
ANUL REC	UNOAŞTERII		2006	
COORDON	ATE APROXI	MATIVE (KRASOVSK	ŋ	
B ^K =46 ⁰	22 15*	L ^K = 25°17'26°	H"= 504m	
ACCES PI	UNCT			
Zeletin. De mărăciniș) De deoarece clasa C.	e aici se mei găsim punct iși este într-o nu se oriente	rge la dreapta (spri ul de ordinul I, Poia stare f bună consic ază decât pe un pu	e Est)prin pädure na Zeletin. Jer că punctul nu e nct, fiind necesare	cca.1 km.unde pe cel mai înalt loc (înt ste avantajos pentru măsurători cadastri determinări GPS de indesire în zonă pri
Zeletin. De mărăciniş) De deoarece clasa C. S	e aici se mei găsim punct iși este într-o nu se oriente CHITA AMPI	rge la dreapta (spri ul de ordinul I, Poia stare f bună consic ază decăt pe un pu "ASARII PUNCTULI	e Est)prin pâdure na Zeletin. ter că punctul nu e nct, fiind necesare	cca.1 km unde pe cel mai fnall foc (int ste avantajos pentru mäsuråtori cadastr determinäri GPS de indesire In zonä pri PLAN AMPLASAMENT 1 50000
Zeletin. De mărăciniș) De deoarece clasa C. S	e alci se me găsim punct rși este într-o nu se oriente CHITA AMPI	rge la dreapta (spri ui de ordinui I, Poia stare f bună consic ază decăt pe un pu ASARII PUNCTULI	e Est)prin pådure na Zeletin. Jer cå punctul nu e nct, fünd necesare	cca.1 km unde pe cel mai inali loc (int ste avantajos pentru másurálos codastr determinán GPS de indesire in zoná pri PLAN AMPLASAMENT 1 50000
Zeletin. Dr mārāciniş) De deoarece clasa C. S	e alci se mei gâsim punct iși este într-ci nu se oriente CHITA AMPI	rge la dreapta (spr ul de ordinul I, Poia stare f bună consis ază decăt pe un pu ASARII PUNCTULI	e Est)prin pêdure na Zeletin. Ier câ punctul nu e nct, fiind necesare	cca.1 km unde pe cel mai inall loc (int ste avantajos pentru misurilitori codastri determinán GPS de indesire in zonā pri PLAN AMPLASAMENT 1 50000
Zeietn Dr mārāciniş) Dr decarace clasa C. S	e alci se mei găsim punct și este într-o- nu se oriente CHITA AMPI	rge la dreapta (spr ul de ordinul I, Poia stare f bund consis ază decăt pe un pu ASARII PUNCTULI Pd Pd Tetesa Abello ⁵ A	e Estprin pâdure na Zeletin. Brec da punctul nu e nct. fiind necesare	Cca.1 km unde pe cel mai inalt loc (int determinari GPS de indesire in zonă pri PLAN AMPLASAMENT 1 5000 PLAN AMPLASAMENT 1 5000
Zeietin. Du mărăciniş) De deoarece clasa C. S	e alci se mei găsim punct găsim punct nu se oriente nu se oriente	rge la dreapta (spr ul de ordinul I, Poia stare f bund consis ază decăt pe un pu ASARII PUNCTULI Pd Reference de la constructure Pd Reference de la constructure Reference de la constructure	e Estprin pâdure na Zeletin. Bre câ punctul nu e nct. flind necesare	cca.1 km unde pe cel mai inalt loc (int determinåri GPS de indesire in zonå pri PLAN AMPLASAMENT 1 5000

New Inventory

1		
	POIANA ZELETIN	F87
ų	500 KIN	VEST























+



<u>Antennas:</u> Choke ring / individual calibrated (20)



EQUIPMENTS















+





Leica (10 GPS + 20 GNSS)

Topcon (15 GNSS)



3. EUREF and Romanian GNSS Network







3. EUREF and Romanian GNSS Network







4. ROMPOS as part of EUPOS















- (Quasi)Geoid determination = Part of geodetic infrastructure
- Local solutions in Romania (not official)

10.3	
the state	
(And the second	
144	
and the second s	

No	Year	Author	Method	Coverage
1	1974	Mihăilescu, M.	Astro-geodetic method	100%
2	1993	Ioane, D.	Stokes / Based on OSU91 model	100%
3	1996	Serediuc, C.	Based on Finite Element Method	20%
4	2007	Tomoiagă T.	Stokes / remove restore / EGM96	100%
5	2008	Klees/Tenzer Rus/Avramiuc	Innovation function (modeling of EGG regional distorsions in RO)	100%

Short term realization: model based on European model and GNSS/leveling national data / due to lack of gravity data

Medium/long(?) term realization: model based on dense gravity data and GNSS/leveling national data







Gravity data availability (Tomoiaga T., 2007)







EUVN97 – 4 stations in Romania

EUVN_DA-43 GPS/leveling stations in Romania







Regional Distortions of the EGG97 (Case study for Romania)





The innovation function approach was applied to combine the gravity and GPS/leveling data in Romania. The combination shows a presence of regional distortions of the EGG97 at the border of the country. The reason may be due to inconsistencies with data sets from Bulgaria, Moldova and Ukraine. The regional trend of these distortions was estimated to be between -36 cm and 24 cm with uncertainty of about ± 4 cm, providing that the height reference surface can be defined with the sub-decimetre accuracy. Since the low spatial density of the GPS/levelling points and their irregular distribution especially at the areas where large distortions were documented, further investigation should be conducted using a better quality of GPS/levelling data sets.





Need for transformation from National CRS <> European CRS (ETRS89): TransDat Software and model (2D) realized on a common set of points (~ 500): not yet implemented / availability of necessary common points by end of 2008









CONCLUSIONS

- ANCPI unified cadaster/land registration/mapping agency in Romania
- Geodetic Networks: triangulation/leveling not so well maintained / reconstruction infrastructure projects / new inventory / leveling on GNSS net
- Romanian GNSS Network (Class A-perm. stations, B-epoch stations) integrated in the IGS and EUREF-EPN by 5 permanent stations
- ROMPOS (2008) realized according to EUPOS standards;
- Need for (quasi)geoid in Romania based on different approaches (gravity + GPS/leveling);
- National-European CRS connection: software realized / data not ready







http://www.ancpi.ro