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# NATIONAL REPORT OF SLOVENIA

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## ADOPTION OF THE NEW (EUROPEAN) REFERENCE SYSTEM IN SLOVENIA

- Adoption of the Land Registry Law (January 1 2008),
- Official establishment of ESRS in Slovenia,
- New Slovenian reference system:
  - horizontal system (ETRS89),
  - height system (EVRS),
  - gravimetric system (IGSN71),
- Cartographic projection(s):
  - Modulated Transverse Mercator projection (large scale)
  - Lambert conformal projection (small scale)
  - Military cartography: UTM projection and WGS-84 reference ellipsoid (NATO standards)

### **PROJECT FOR THE ESTABLISHMENT** OF THE NEW REFERENCE SYSTEM **OF SLOVENIA** eea 🖴



- **Establishment in the frame of the International project:** •
  - Grant Agreement with Norwegian Financial Mechanism (financial donation)
- **Overall Objectives:** lacksquare
  - Establishment of a modern national geoinformation infrastructure
  - Higher quality of spatial data (long-term)
  - Providing conditions for determining position in ESRS with GNSS and terrestrial survey at the entire state territory
- About the project: •
  - Main contractor: Surveying and mapping authority of Slovenia
  - Patners: Geodetic Institute of Slovenia, University of Ljubljana, Faculty of Civil and Geodetic engineering
  - Letters of interest: Association od Surveyors of Slovenia, Chambers of Engineers, Bussines assocation of chartered Surveyors, Statens Kartwerk (Norway)

# **NEW GRAVIMETRIC NETWORK**

- Zero order gravimetric network
  6 absolute gravimetric points
- First order gravimetric network is consisted of 29 relative gravimetric points
- 4 points in Croatia
- 1 point in Austria



## **NEW GRAVIMETRIC NETWORK**

- Relative gravimetric measurements:
  - duration: September 5, November 9, 2006.
  - two SCINTREX CG-3M gravimeters (SLO and CRO),
  - parameters: 5 cycles on point with 60 s read-time
- Computations:
  - gravity differences CRO SLO  $\Rightarrow \Delta$  = 9.2 µgal ;
  - loop closures  $\Rightarrow \Delta_{SLO} = 7.4 \ \mu gal; \Delta_{CRO} = 7.7 \ \mu gal;$
- Adjustment results:
  - free  $\Rightarrow \sigma_{\text{SLO}} =$  7.7 µgal;  $\sigma_{\text{CRO}} =$  7.2 µgal;  $\sigma_{\text{SLO+CRO}} =$  9.5 µgal;
  - constrained (6 abs. points) ⇒  $\sigma_{SLO}$  = 10.5 μgal;  $\sigma_{CRO}$  = 9.2 μgal,  $\sigma_{SLO+CRO}$  = 10.2 μgal

## NEW HORIZONTAL REFERENCE SYSTEM OF SLOVENIA

- ETRS89 is new national horizontal reference system for cadastral purposes:
  - National non permanent GPS network and permenent GPS network (SIGNAL) are official reference networks,
- Regulations for cadastral survey are prepared,
- Procedures for the transformation of old coordinate system to the new are defined for all the types of official survey data,
- Regulations for transformations are prepared.

## **SIGNAL NETWORK**

### • THE OBJECTIVE:

- Geodetic accuracy (cm rank) over the whole national territory
- 15 stations
- Average distance 50 to 70 km
- GPS service in operation at the Geodetic Institute of Slovenia
- Exchange of data with neighbouring countries

### • STATUS:

- 15 networked stations
- 5 station from APOS
- 1 station from Croatia
- 1 of them part of EUREF-EPN (Ljubljana)
- Trimble GPSNet VRS/FKP in operation
- 350 registered users
- Data available for no charge (real time, post processing)
- Outside SIGNAL 5 private GPS stations exist (not networked)

### **SLOVENIAN GPS NETWORK-SIGNAL**



# MINI "EUREF2007" CAMPAIGN

- Purpose:
  - Connection of national EUREF "non permanent network" and "permanent network"
  - Determination of ETRS89 coordinates of SIGNAL network sites,
- Observations:
  - 72 hours
  - 5 Official EUREF sites,
  - 15 sites SIGNAL network
  - 5 sites APOS network
- Computations:
  - Uiversity of Ljubljana , Faculty of Civil and Geodetic Engineering
  - Geodetic institute of Slovenia
- Procedure:
  - Computation in ITRF2005 (2007.258)
  - Transformation from ITRF2005 (2007.258) to ITRF96 (2007.258)
  - Transformation from ITRF96 (2007.258) to ITRF96 (1995.554) (NNR-NUVEL-1A)
  - 7-parameter transformation from ITRF96 (1995.554) to ETRF89 (5 common points: official EUREF sites)
- (Comparison: Boucher, C., Altamimi, Z., 2007. Memo: Specifications...)

# MINI "EUREF2007" CAMPAIGN



# RESULTS

#### • Performed procedure:

ТС	∆X [mm]	∆Y [mm]	∆ <b>Z</b> [mm]	∆φ [mm]	Δλ [mm]	∆h [mm]	∆P [mm]
DONA	-12.1	4.3	-2.2	6.1	7.4	-8.8	13.0
KORA	-26.2	-2.8	7.4	23.9	3.4	-12.8	27.3
KUCE	-17.5	-7.1	7.1	18.4	-2.4	-7.9	20.2
MALJ	-41.4	-7.5	4.0	32.8	2.5	-26.6	42.3
VEKO	-16.2	4.4	-10.8	3.1	8.5	-17.8	20.0

### • Boucher, C., Altamimi, Z., 2007. Memo: Specifications...

ТС	∆ <b>X [mm]</b>	∆Y [mm]	∆ <b>Z [mm]</b>	Δφ <b>[mm]</b>	Δλ [mm]	∆h [mm]	∆P [mm]
DONA	10.6	15.2	25.4	7.1	12.1	28.3	31.6
KORA	-7.3	7.2	34.9	28.2	8.8	21.4	36.5
KUCE	4.7	3.0	36.4	21.7	1.8	29.9	37.0
MALJ	-22.9	1.6	31.6	38.2	7.0	7.2	39.5
VEKO	6.0	15.6	17.3	4.7	14.0	19.4	24.4

### WE USE RESULTS OBTAINED BY "OUR PROCEDURE"

# TRANSFORMATIONS FROM OLD TO THE NEW REFERENCE SYSTEM

- Transformation of official SMAS data sets:
  - Definition of data sets to be transformed
  - Definition of data sets <u>not to be</u> transformed
  - Definition of the required quality of transformed coordinates
  - Definition of transformation activities:
    - permanent
    - one step transformation
  - Definition of transformation models
- Transformation of data sets outside SMAS:
  - Definition of the required quality of transformed coordinates
  - Definition of transformation models
  - Identification of consequences for data providers
  - Definition of supporting activities

# TRANSFORMATIONS FROM OLD TO THE NEW REFERENCE SYSTEM

**Changes of (transformed) coordinates** 

