

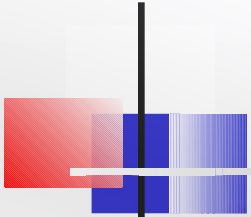
National report of Slovakia 2012

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Department of theoretical Geodesy

EUREF 2012, annual symposium
6-8.june 2012, Paris, France



Outline

- Activities related to *EPN*
- National Reference Frames - positioning
 - *SKPOS* – Slovak real time positioning service
- National Reference Frames - heights
 - National Height System - Bpv
- Gravity activities
- Geodynamics

Activities related to EPN

4 EPN stations

MOPI

- from: 1996
- GPS only
- admin: SUT



GANP

- from: 2003
- GNSS
- frek.: L1,L2,L5
- IGS/EPN
- SKPOS
- admin: GKU



MOP2

- from: 2008
- GNSS
- SKPOS
- admin: SUT



BBYS

- from: 2007
- GPS only
- admin: GKU+TOPU



EUREF Permanent Network

NETWORK & DATA

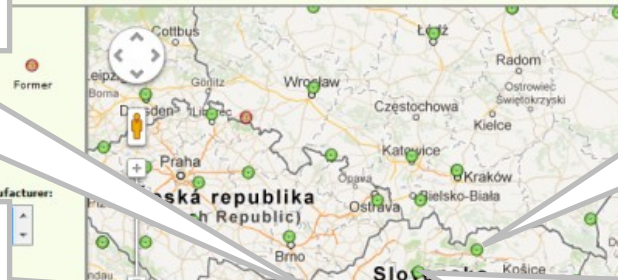
Maps, Tracking status,
s. Proposed sites, Site log
n. Site picture submission

PRODUCTS & SERVICES

Data analysis, Weekly EPN solutions,
Coordinates, Time series,
Tropospheric delays, ETRSS/ITRS
transformation

DOCUMENTATION

Formats, Guidelines, Equipment &
calibration, Papers, FAQ



Activities related to EPN **EUREF-IP** (2 stations)

Legend

Active Inactive Corrupt

Site selection on map

- Select a station -

Site criteria selection

Receiver type: AOA ASHTECH JAVAD JPS

Format: RTCM 2.1 RTCM 2.2 RTCM 2.3 RTCM 3.0

System: GPS GLO GAL SBAS

Active: Yes No All

Corrupt: Yes No All

View

Last update : May 28, 2012 11:24 UTC

■ **GANP** (active)

■ RTCM 3.0

■ **MOP2** (inactive)

■ RTCM 3.1

REAL-TIME



ACCESS : free, using [Ntrip](#)

AVAILABLE FROM

ASI ([broadcaster](#), [registration](#))

GANP0 : RTCM 3.0
(1004(1),1006(10),1008(10),1012(1),1013(10),1033(10))

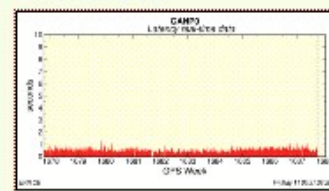
BKG ([broadcaster](#), [registration](#))

GANP0 : RTCM 3.0
(1004(1),1006(10),1008(10),1012(1),1013(10),1033(10))

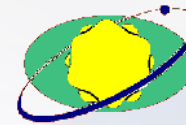
ROB ([broadcaster](#), [registration](#))

GANP0 : RTCM 3.0
(1004(1),1006(10),1008(10),1012(1),1013(10),1033(10))

DATA LATENCY

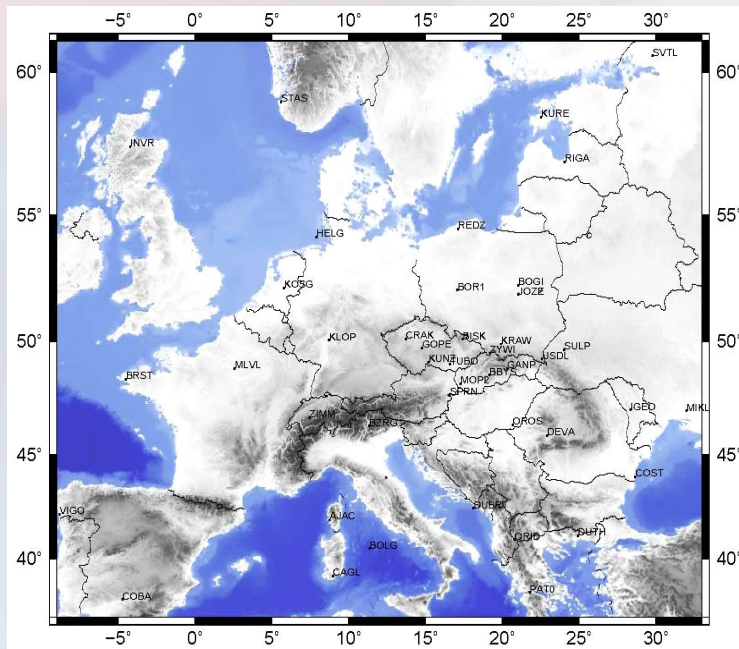


Activities related to EPN



LAC SUT

- **Local Analysis Center of Slovak University of Technology**



Current network configuration (out of boundary: REYK, QAQ1)

- Standard continual processing of EPN subnetwork

- Future planned: extension of network

- 5 stations (Croatia, Serbia)

PROCESSING STRATEGY

Software	: Bernese GPS Software, version 5.0
Orbits and EOPs	: IGS final
Observations	: GPS
Elevation Cutoff	: 3°
Antenna PCV Model	: absolute
Ambiguity Resolution	: QIF
Troposphere	: dry Niell (a priori), wet Niell (estim.), gradients
Ocean Loading	: FES2004
Reference Frame	: IGS05 / IGS08 (since week 1632)
Reference Point	: BOR1
Products submitted	: SUTWWWW7.SNX weekly snx file SUTWWWWN.SNX daily snx file SUTWWWWN.TRO daily troposphere solution

ALL PROCESSING OUTPUTS

Daily solution	: CRD, COV, SNX, ION, INX, TRO, TRP
Weekly combination	: CRD, COV, SNX, OUT, SUM
4-hour solution	: CRD, COV

National reference frames

Positioning

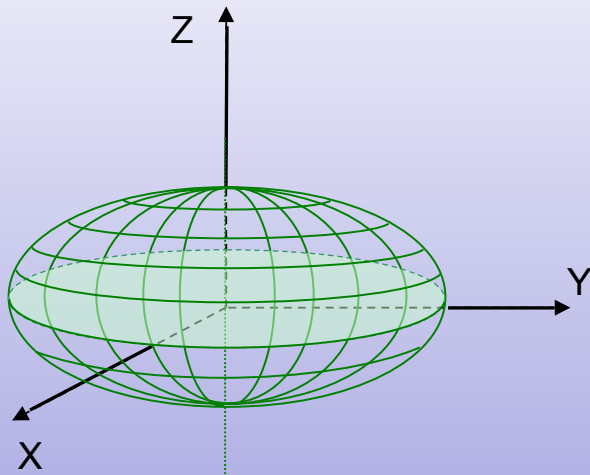
7 Helmert transformation parameters (2 sets)

3 translations + 3 rotations + Scale factor = 0 (1m = 1m on both ellipsoids)

Spatial coordinates (XYZ or $\phi\lambda h$)

ETRS89 system

SKTRF2009 = ETRF2000 (epoch 2008.5)



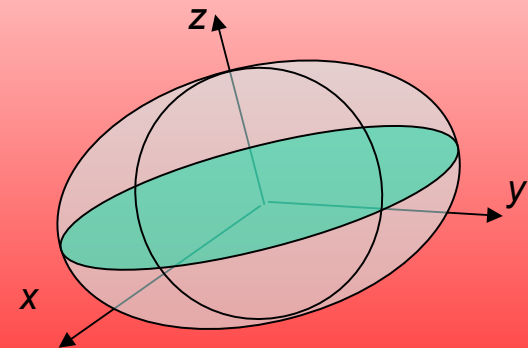
-GRS80 ellipsoid

-physical representation: National Spatial Network

Plane coordinates (X,Y)

S-JTSK system

JTSK03 realization



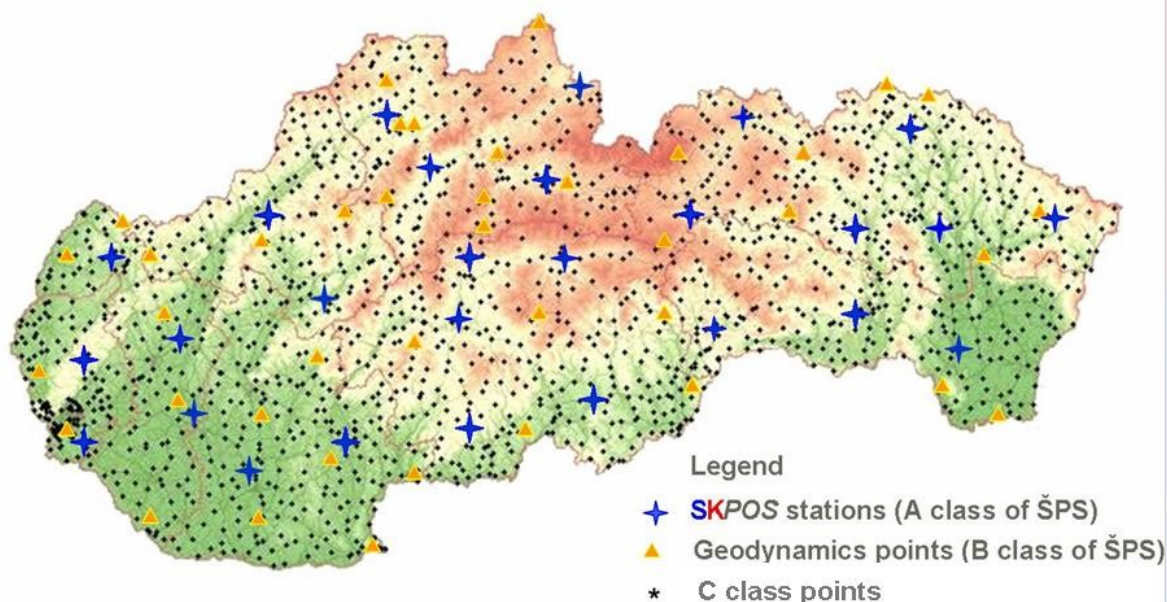
-Bessel 1984 ellipsoid + Křovák projection

-physical representation: National Spatial Network

National spatial network

ETRS89 & JTSK03 physical representation

- Active part (permanent stations) – **A** class (**SKPOS**)
- Passive part (stabilized points)
 - **B** class – points for geodynamical research (Hz 5-6mm, V 12-15mm)
 - **C** class – reference points (Hz 1cm, V 2cm)
 - **D** class – other points with ETRS89 coordinates (Hz 3cm, V 5.5cm)

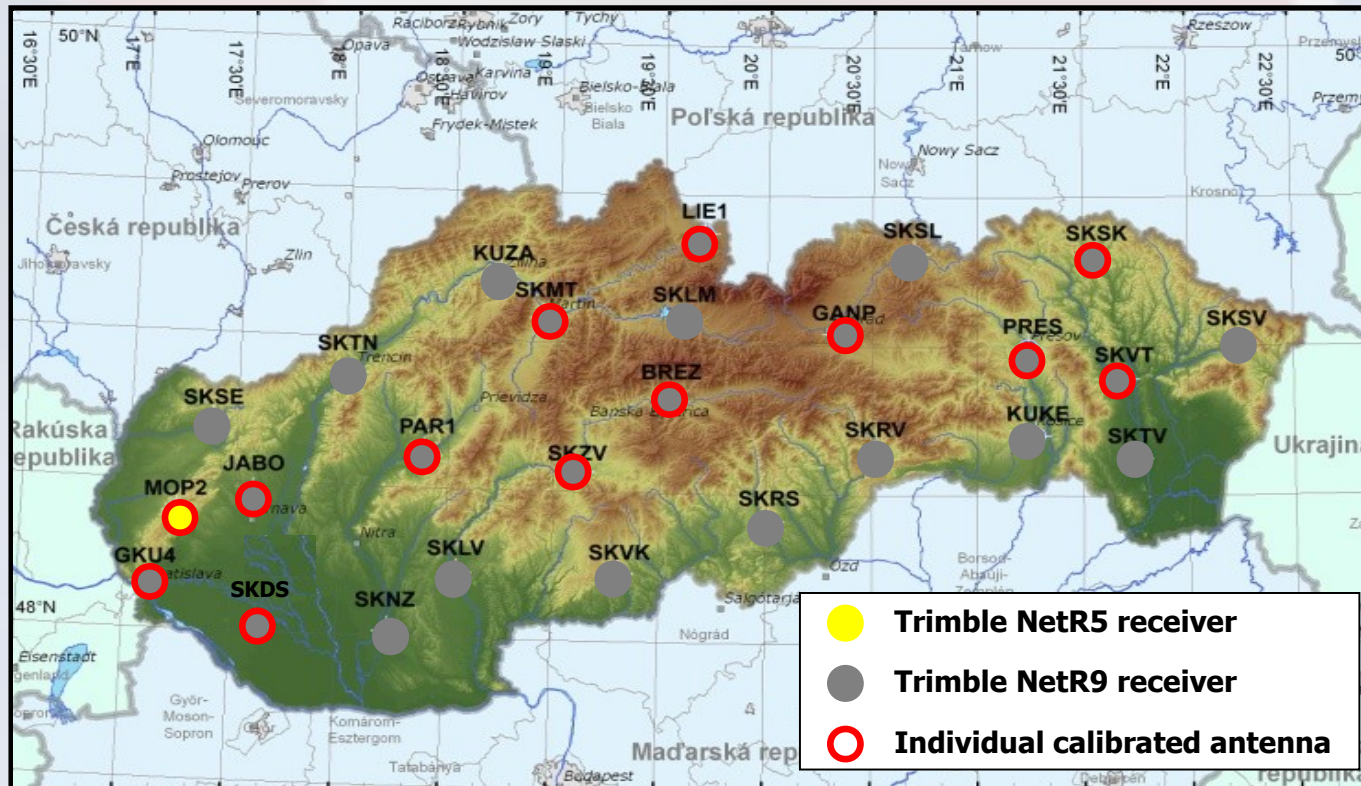


ŠPS class	Number of points
A	27
B	71
C	1 650
D	2 900

Slovak real time positioning service - **SKPOS**

- **26 permanent stations (May 2012)**

- All stations equipped with TRIMBLE receivers and antennas
- All stations observe GPS+GLONASS signals + ready for Galileo



2012

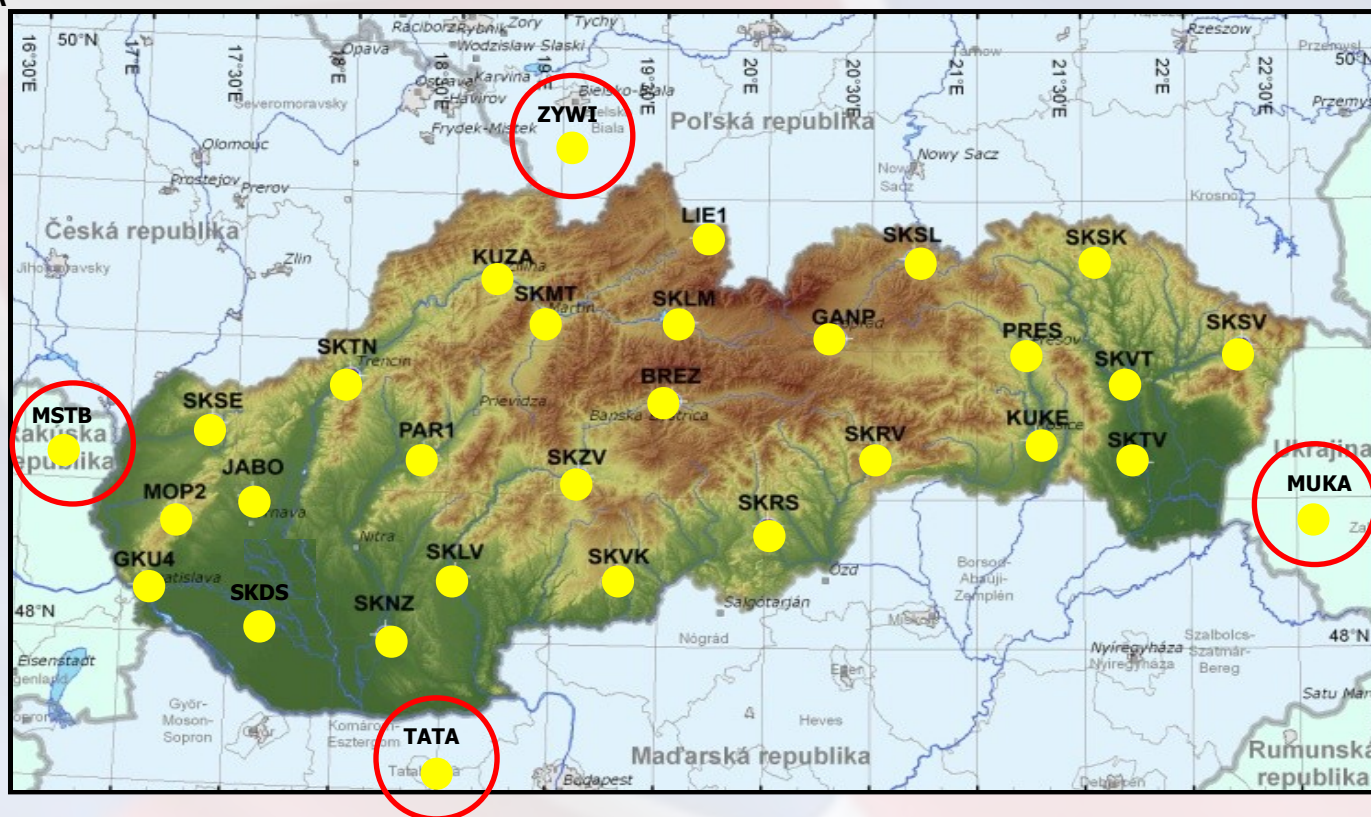


Foreign permanent station introduction

- **11.11.2011** - 4 foreign permanent station was introduced into SKPOS solution

- Hungary: TATA
- Poland: ZYWI
- Ukraine: MUKA
- Austria: MSTB

- **30 permanent stations**
all
GPS+GLONASS



■ Trimble GPSNet

- Former SKPOS software
- Replaced in 11.11.2011



■ Trimble VRS³Net

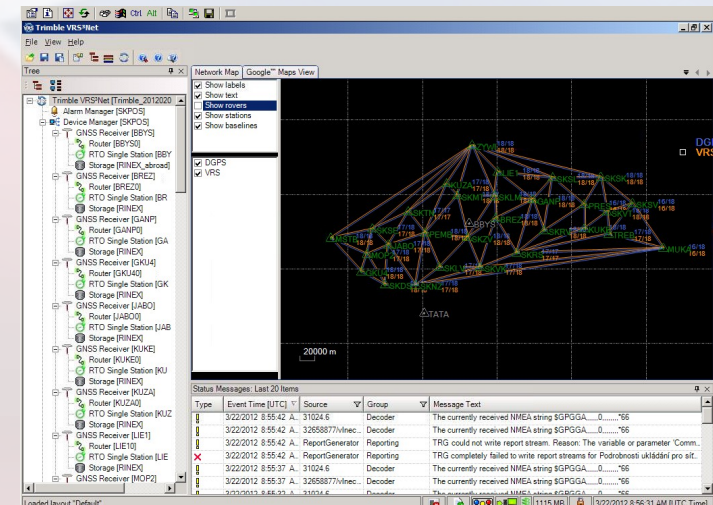
- Successfully tested
- Introduced into routine operation in 11.11.2011

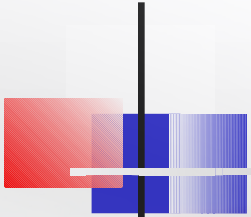
■ Formats:

- RTK – RTCM2.3, RTCM3.1, CMR+ and CMRx
- DGPS – RTCM2.1, RTCM2.3(+Glonass)

■ RTCM 3.1 format contain also:

- Message 1021 =7 Helmert transformation parameters (**ETRS89->JTSK03**)
- Message 1023 =geoid undulation corrections (DVRM – Bpv vertical datum)



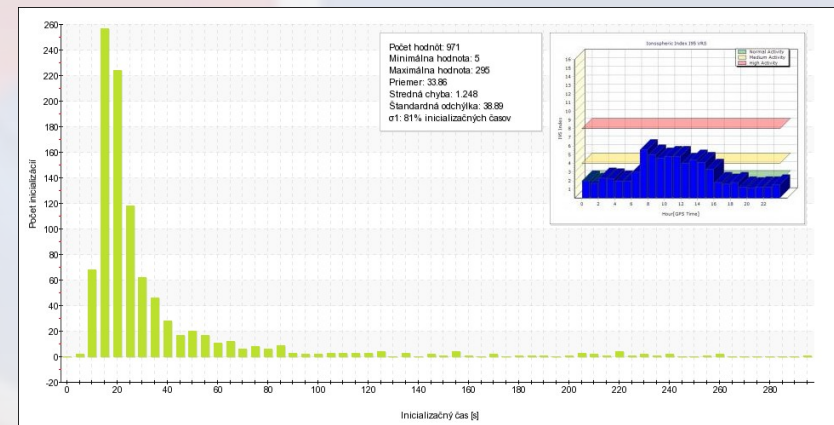
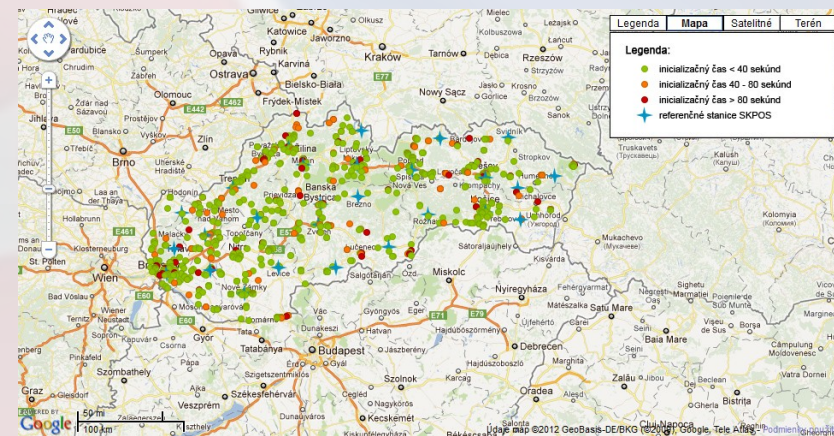
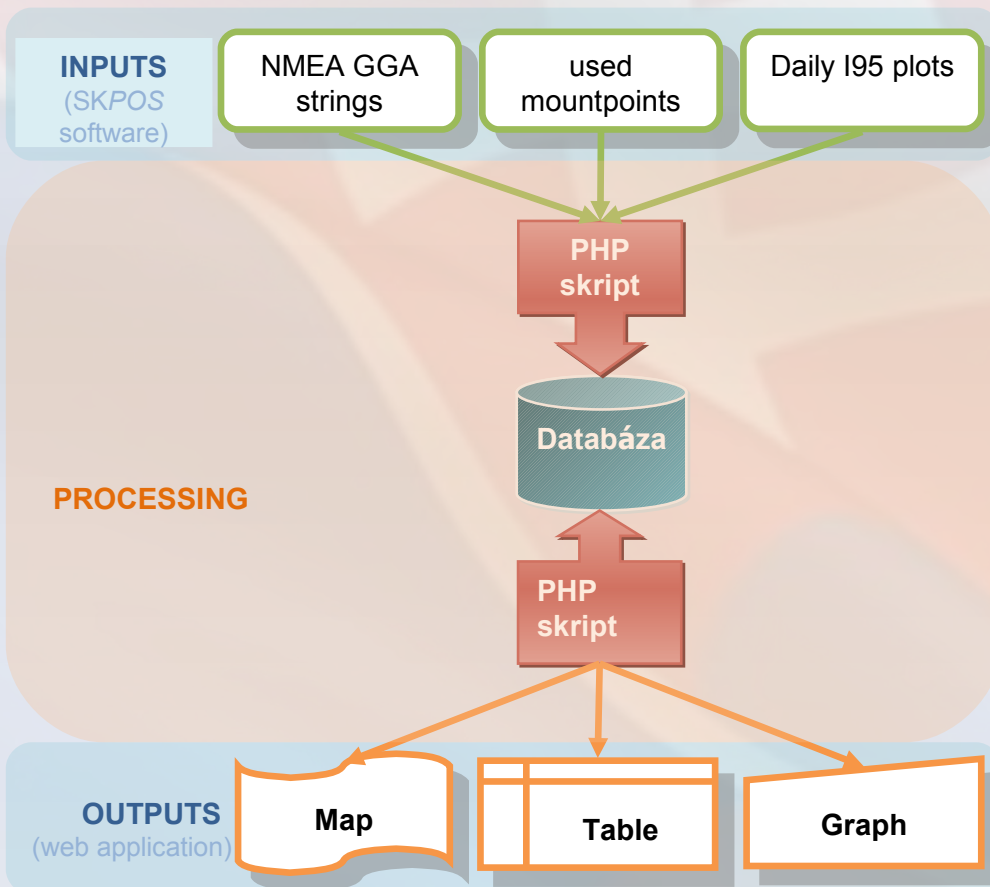
A decorative graphic in the top left corner consisting of a vertical black line, a horizontal white line, and several overlapping squares in red, blue, and white.

users, field of applications, charges

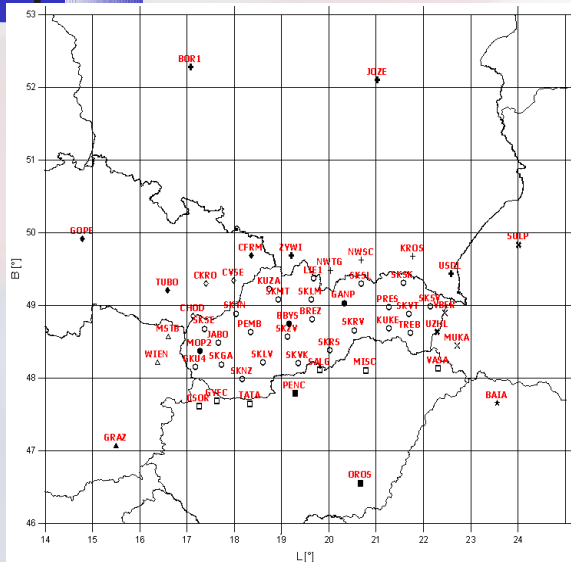
- Number of users (registrations)
 - **750 users** - status in May 2012
 - 650 users – status in November 2011
- Field of applications
 - 98% - surveying, cadastral, cartography geodesy and GIS
 - 2% - precise farming etc.
- RTK service - charges
 - flat rate **90 EUR** per technical year (365 days from the date of registration)

New application for **SKPOS** users monitoring

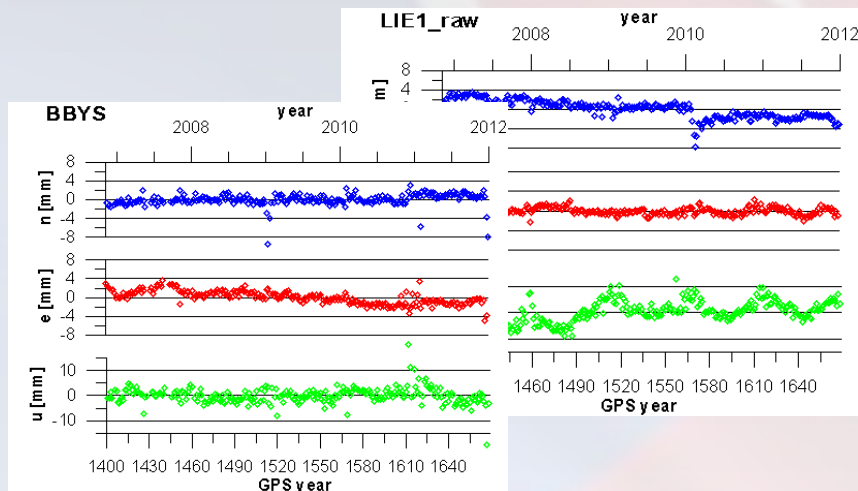
- serve for administrator to monitor RTK users performance e.g. we can monitor users performance and its dependence on Ionosphere

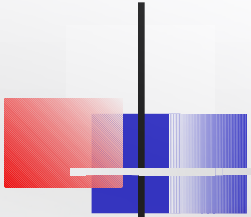


Computations, data processing, time series



- Daily solution + weekly combination in Bernese 5.0
- 60 permanent stations processed together (**SKPOS** + EPN + border stations)
- IGS08 ephemeris (from GPS week 1632)
- ETRF2000 coordinates
 - *Memo* document - transformation parameters from ITRF2008 to ETRF2000
- Time series
 - raw
 - clean (without jumps)



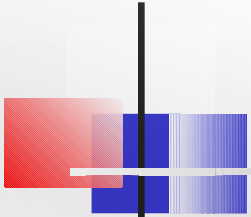


National reference frames

Height System

- National Height system is **Balt** with Bpv realization (Balt after adjustment)
- New Challenge for future = **new Bpvyy realization & new national EVRS realization**
 - Measurement:
 - remeasuring of all leveling lines of National Leveling Network
 - 1st order lines measured during 1997-2003
 - 2nd order leveling lines measured 2003-2015
 - Adjustment:
 - 1st order leveling lines separate adjustment
 - 2nd order tied to 1st order results

-

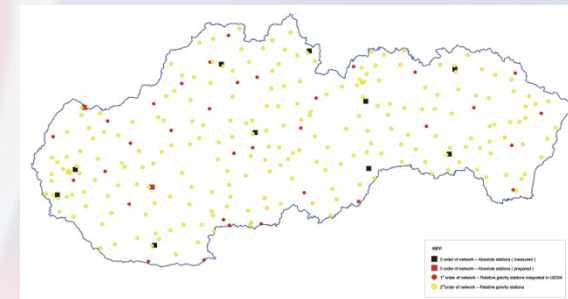


Gravity activities

National gravity network (ŠGS)

Status in 2012

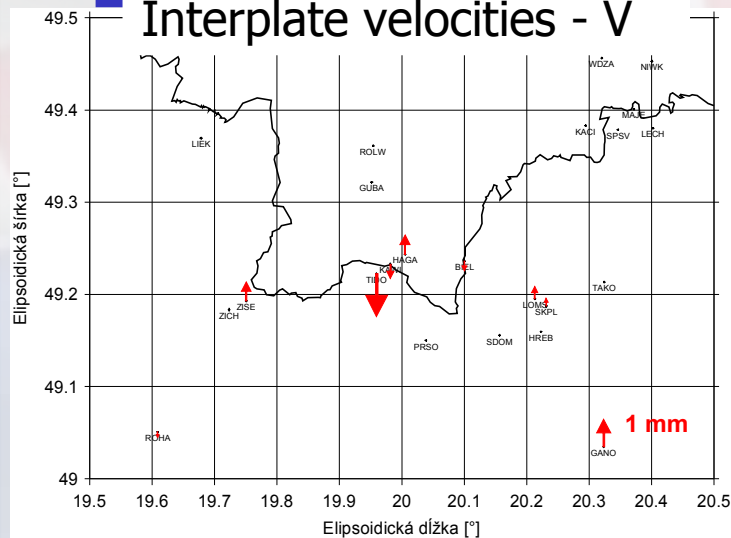
- 0.order ŠGS
 - 11 points (absolute measurement)
- 1.order ŠGS
 - 30 points
- 2.order ŠGS
 - 246 points
- 3.order ŠGS
 - over 1500 points



Geodynamics

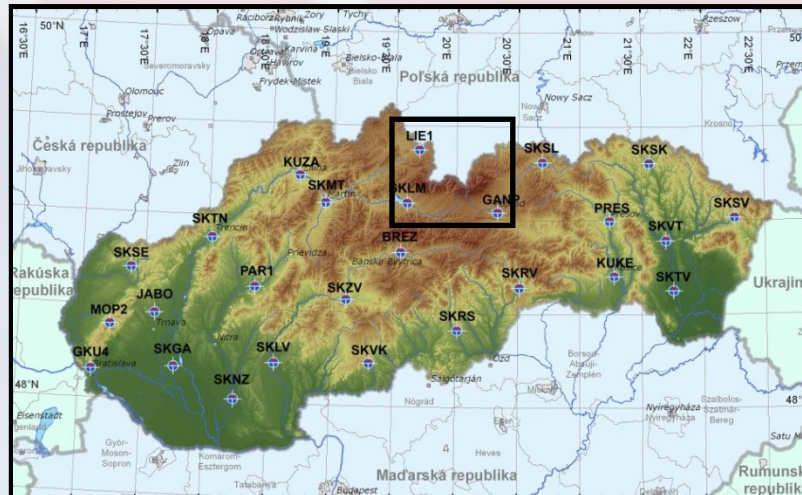
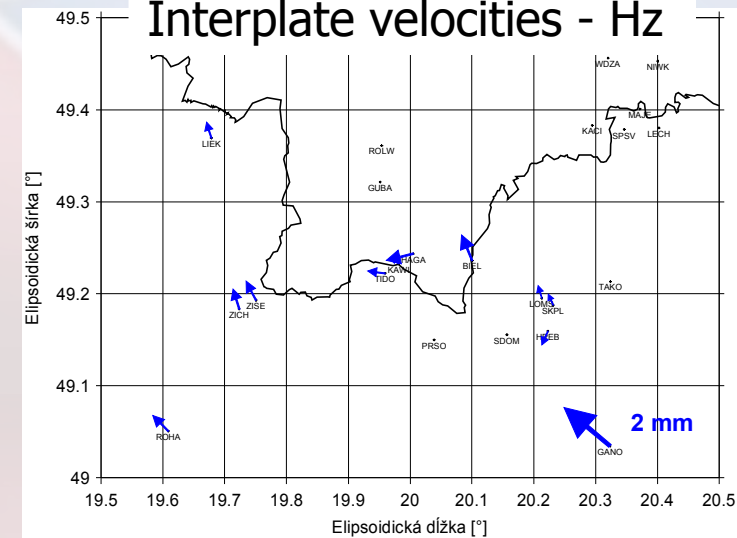
Local geodynamic network **TATRY**

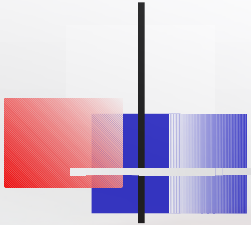
Interplate velocities - V



- campaign measurement (96 hours)
- every year from 1998
- 1998-2011
- cooperation with Poland

Interplate velocities - Hz





Thank you
for your attention