



National report of Slovakia 2014

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EUREF 2013, annual symposium
3-7.June 2013, Vilnius, Lithuania



Outline

- Slovakian activities related to EPN
- Status, activities and news from
 - national spatial network and **SKPOS** (Slovak real time positioning service)
 - national levelling network
 - national gravimetric network
- Activities of Slovak university of Technology
- Other news from Slovakia

Activities related to EPN

Slovakian contribution to EPN (May 2014)

MOPI

From 1996
only GPS
 admin: SUT

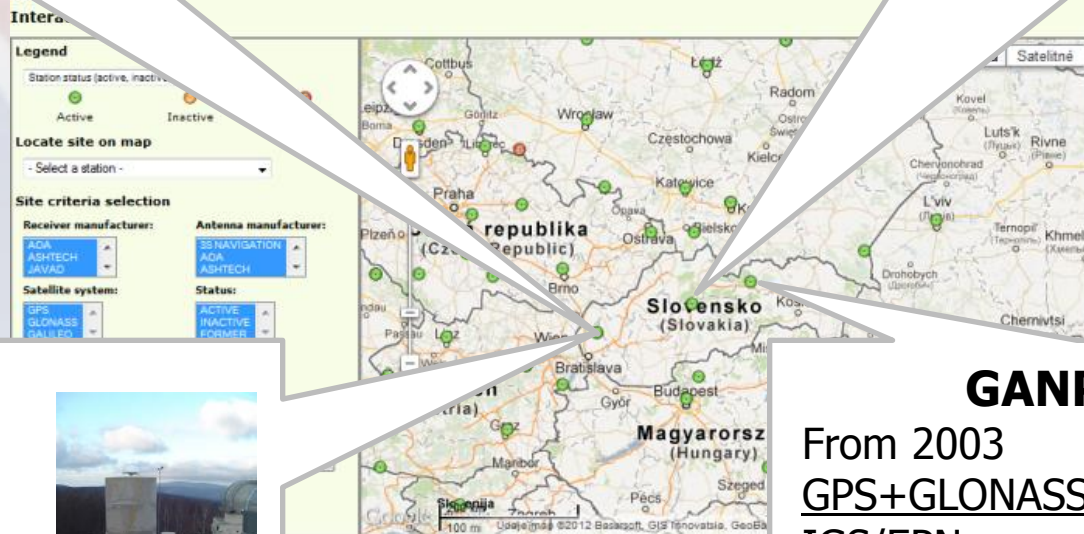


EUREF Permanent Network

NETWORK & DATA	PRODUCTS & SERVICES	DOCUMENTATION
List, Maps, Tracking status, Access, Proposed sites, Site log submission, Site picture submission	Data analysis, Weekly EPN solutions, Coordinates, Time series, Tropospheric delays, ETR589/ITRS transformation	Formats, Guidelines, Calibration, Papers

BBYS

From 2007
GPS+GLONASS+Galileo
SKPOS
 admin: GKU+TOPU



MOP2

From 2008
GPS+GLONASS
SKPOS
 admin: SUT



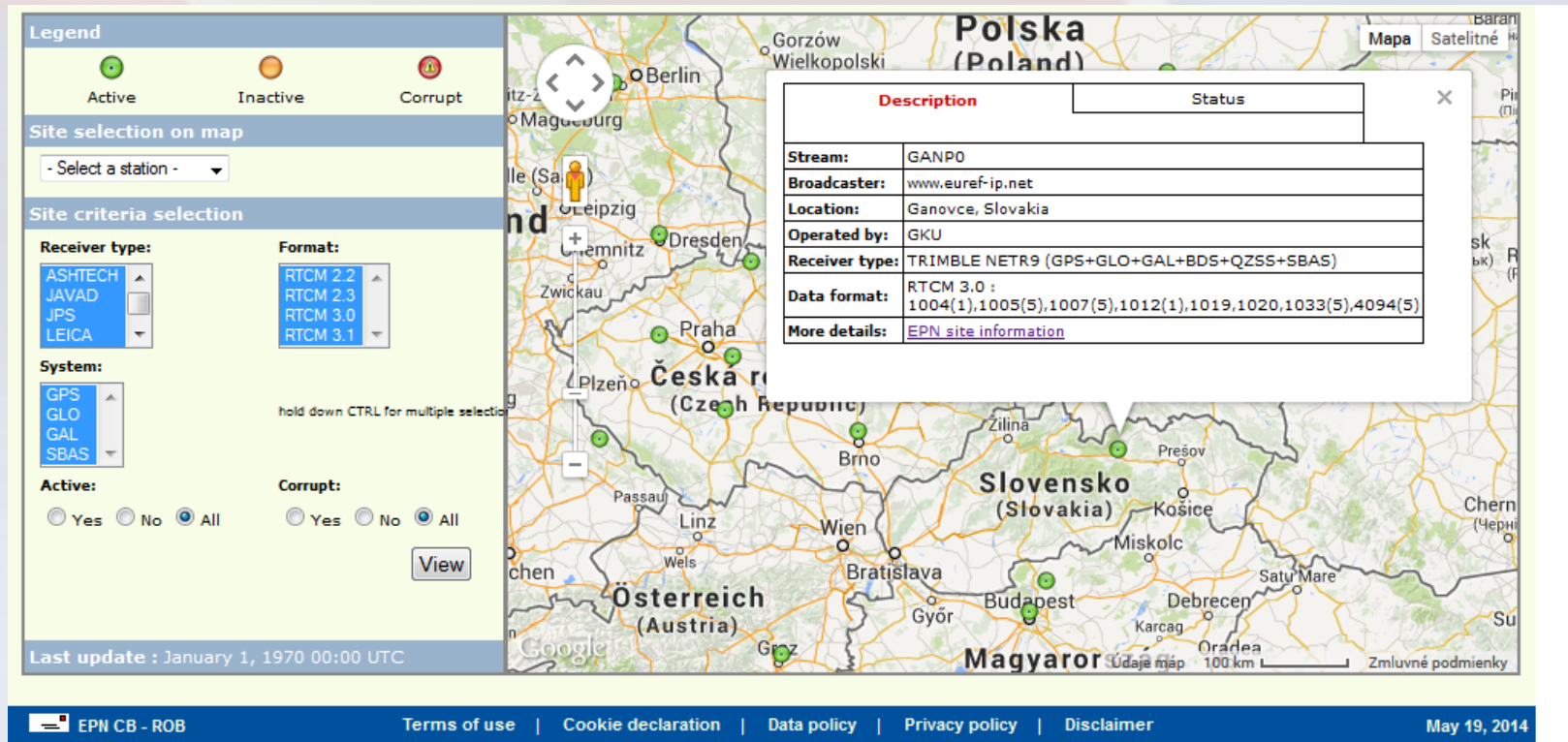
GANP

From 2003
GPS+GLONASS+Galileo
 IGS/EPN
SKPOS
 admin: GKU



Activities related to EPN EUREF real-time

- **GANP** station contributes to real-time project
 - RTCM 3.0



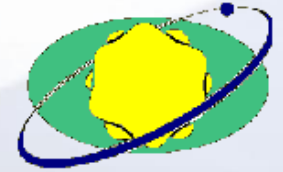
The screenshot shows the EPN website interface. On the left, there is a 'Legend' section with three status indicators: Active (green circle), Inactive (orange circle), and Corrupt (red circle). Below this is the 'Site selection on map' section with a dropdown menu set to '- Select a station -'. The 'Site criteria selection' section includes filters for Receiver type (ASHTECH, JAVAD, JPS, LEICA), Format (RTCM 2.2, 2.3, 3.0, 3.1), System (GPS, GLO, GAL, SBAS), Active status (Yes, No, All), and Corrupt status (Yes, No, All). A 'View' button is located at the bottom of the criteria section. The main area is a map of Central Europe, showing parts of Poland, Czech Republic, Slovakia, Austria, and Hungary. A pop-up window titled 'Description' is open over the map, displaying the following information:

Description	Status
Stream:	GANP0
Broadcaster:	www.euref-ip.net
Location:	Ganovce, Slovakia
Operated by:	GKU
Receiver type:	TRIMBLE NETR9 (GPS+GLO+GAL+BDS+QZSS+SBAS)
Data format:	RTCM 3.0 : 1004(1),1005(5),1007(5),1012(1),1019,1020,1033(5),4094(5)
More details:	EPN site information

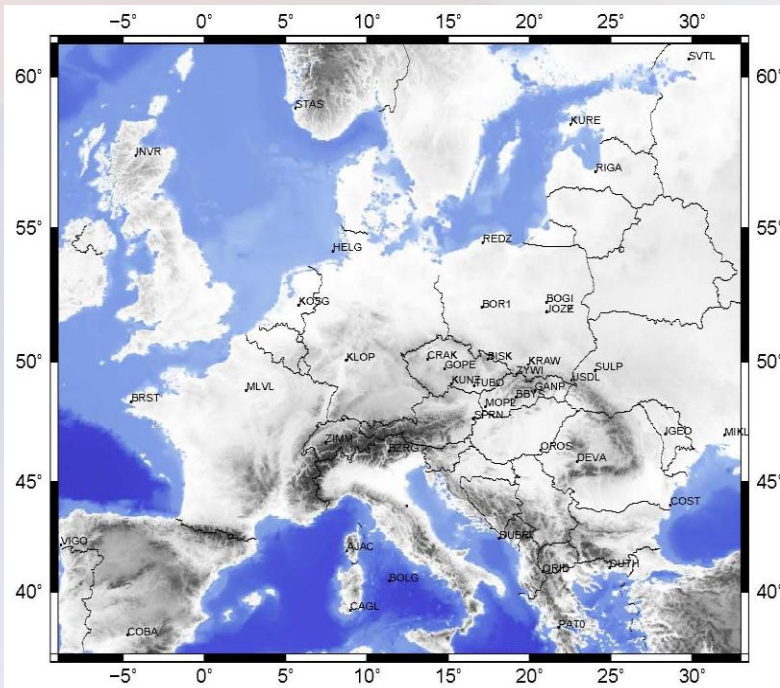
At the bottom of the page, there is a footer with the EPN logo and text: 'EPN CB - ROB', 'Terms of use | Cookie declaration | Data policy | Privacy policy | Disclaimer', and the date 'May 19, 2014'.

Activities related to EPN

EPN Local analysis center SUT



- EPN Local Analysis Center - Slovak University of Technology



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

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 : SUTWWW7.SNX weekly snx file
SUTWWWN.SNX daily snx file
SUTWWWN.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

- Standard continual processing of EPN subnetwork



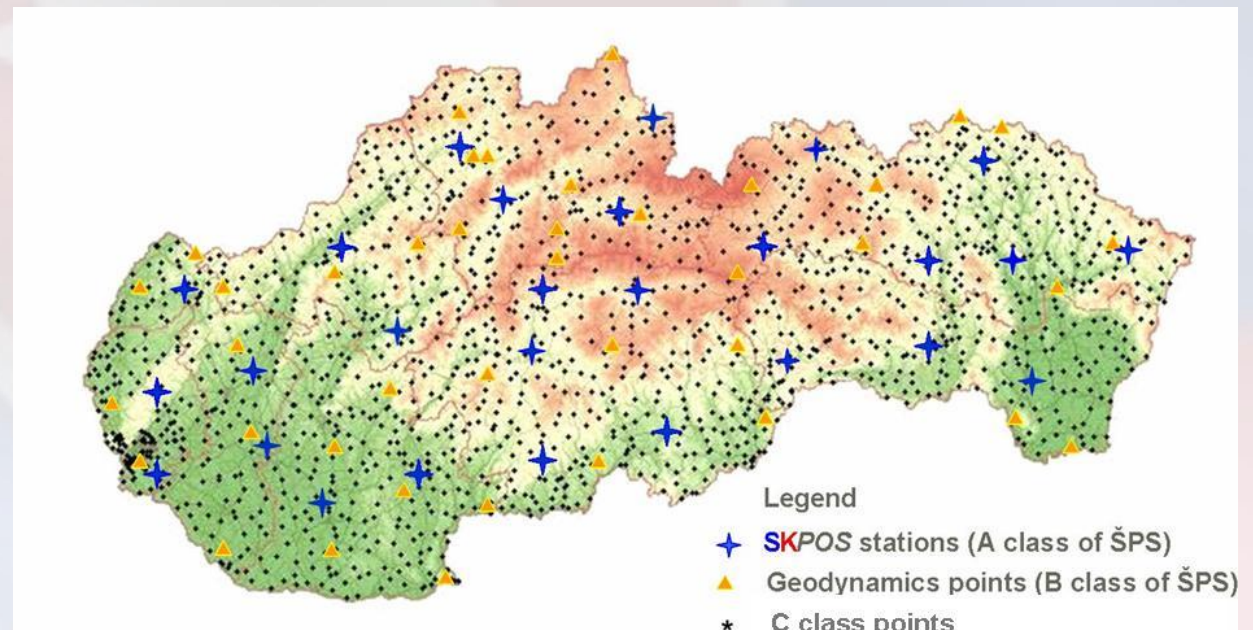
Status, activities and news from national
spatial network (GNSS positioning)

National spatial network (ŠPS)

national ETRS89 representative in Slovakia

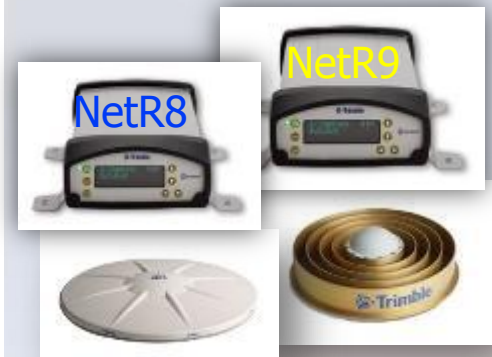
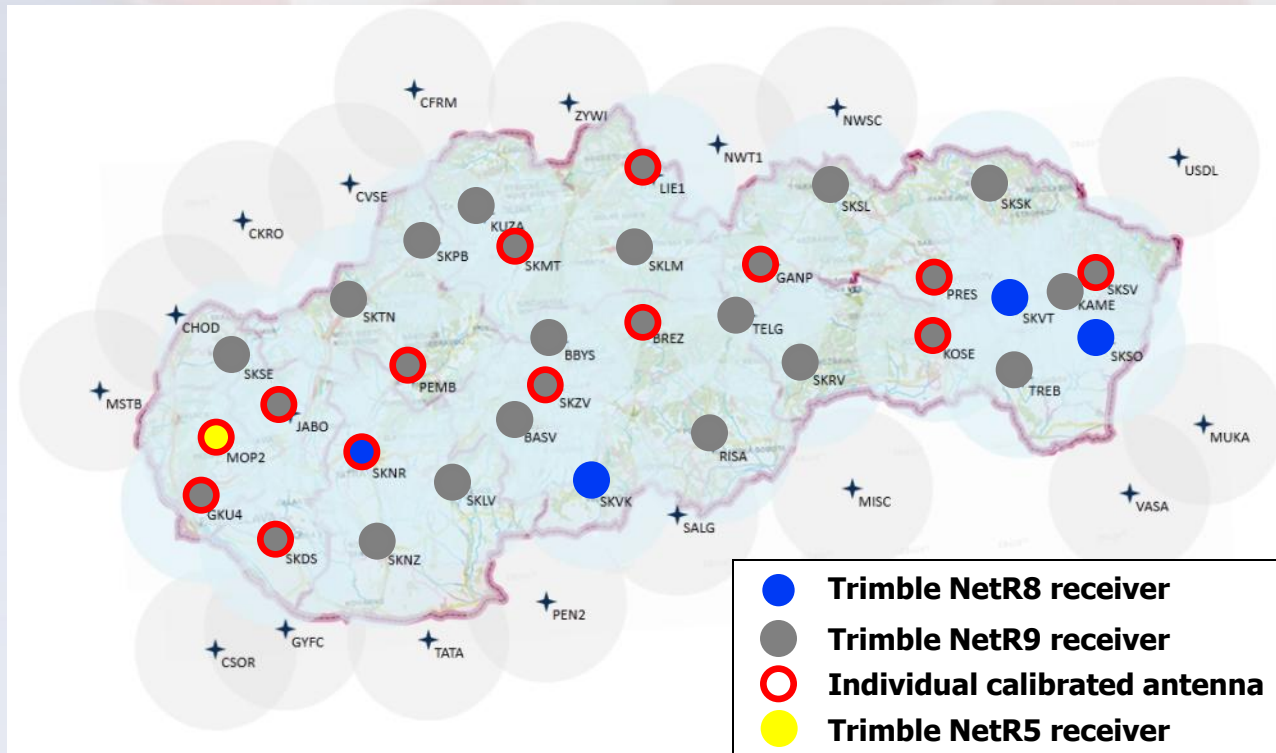
- Active part (permanent stations) – **Class A** = **SKPOS**[®]
- Passive part (geodetic controls fields)
 - **Class B** – geodynamics points (Hz 5-6mm, V 12-15mm)
 - **Class C** – reference geodetics points (Hz 1cm, V 2cm)
 - **Class D** – other points with ETRS89 coordinates (Hz 3cm, V 5.5cm)

Class	Number of points
A	33 + 17
B	71
C	1 650
D	2 900



SKPOS[®] Slovak real time positioning service infrastructure (status in May 2014)

- **33 Slovakian permanent stations (14 individual calibrated)**
 - All stations with TRIMBLE receivers and antennas
 - All stations observe GPS+GLONASS signals (few Galileo)
- **17 foreign permanent stations (APOS, gnsnet.hu, CZEPOS, ASG-EUPOS, ZAKPOS)**

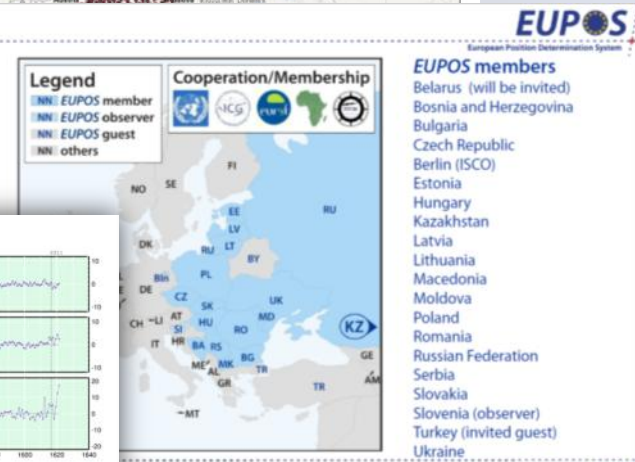
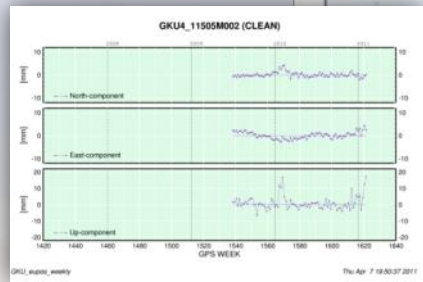
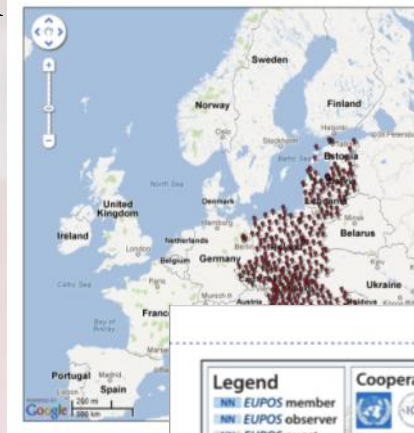
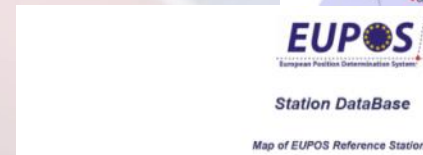
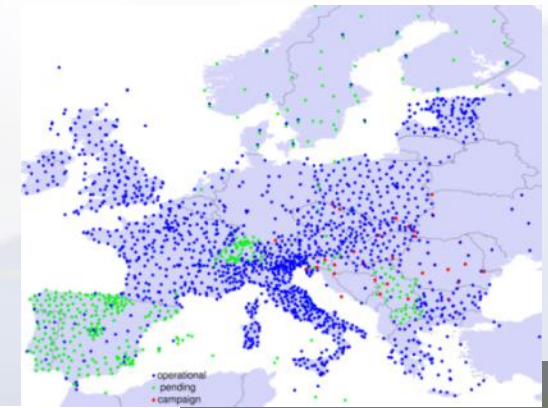


SKPOS®

active part of **EUPOS**®

European Position Determination System

- Follows *EUPOS* standards
- Keeps information in EUPOS station database
- Contributes to *EUPOS* combination centre (SINEX GKU)
- Leads EUPOS working group on service monitoring



SKPOS®

National service center and its activities

- National service centre
 - GKÚ Bratislava
- Web
 - www.skpos.gku.sk
- Routine activities
 - Service administration
 - Service quality monitoring
 - Data archivation and service backups
 - Users administration and contracts managment



SKPOS® control software

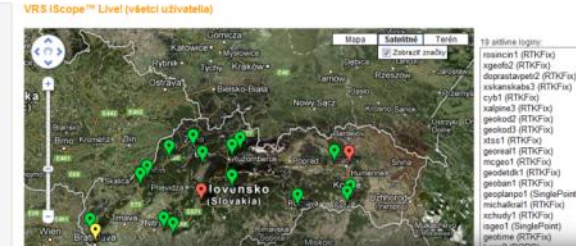
Trimble Pivot Platform ver. 2.5.7

SKPOS®

Portál Slovenskej priestorovej observačnej služby GNSS



- Domov
- Mapa referenčných staníc
- Gráf rozptylu staníc
- Činnosť SKPOS
- Informácie o sieti siete
- ISD (ISO15924)
- ISD (ISO15924)
- Online stanice
- Mýšľeň
- Časové údaje
- Zmeny hesla
- Zoznam prístupov
- Historia prístupov
- VRS (Scope)
- VRS (Scope Live)
- Adresa prístupní
- Adresa
- VRS (Scope Live)
- Činnosť SKPOS
- Prístup uznaný
- Upraviť uznaný
- Registraj
- Prístup registraj
- Upraviť registraj
- Správka užívateľov
- Správka užívateľov
- Vyhľad. užívateľa
- Pokročil. užívateľa
- Export užívateľských údajov
- Detailné info o užívateľoch



I-Scope modul

Trimble Pivot Platform

Tree: Alarm Manager [SKP], Device Manager [SKP], Disk Watch [SKPOS], Ephemeris Download, Ephemeris Manager [NtripCaster [SKPOS], NMEA Distributor [NtripCaster [SKPOS], Reference Data Shop, Router Manager [SKP], Router [SKPOS_N], Raw Storage [RTO Net DGPS [DGP], RTO Net DGPS [DGP], RTO Net VRS [CMRpl], RTO Net VRS [CMRx], RTO Net VRS [RTCM], RTO Net VRS [RTCM], Synchronizer [SKPOS], Network Motion E, Integrity Monit, Network Processo, Network Processo, Transformation Gener

Network Map: Show labels, Show text, Show rovers, Show stations, Show baselines. DGPS, VRS

Type	Event Time [UTC]	Source	Group	Message Text
i	28. 5. 2014 7:19:33	35729023/remingcons...	Decoder	The received NMEA messages are valid again.
i	28. 5. 2014 7:19:33	31029.29	Decoder	The received NMEA messages are valid again.
i	28. 5. 2014 7:19:33	35729023/remingcons...	Decoder	The currently received NMEA string \$GLGGA,.....0.....7A
i	28. 5. 2014 7:19:33	31029.29	Decoder	The currently received NMEA string \$GLGGA,.....0.....7A

Loading of system configuration "Trimble_TPP_21_20140527" finished.

EN 9:19 28. 5. 2014

SKPOS[®]

services (mountpoints)

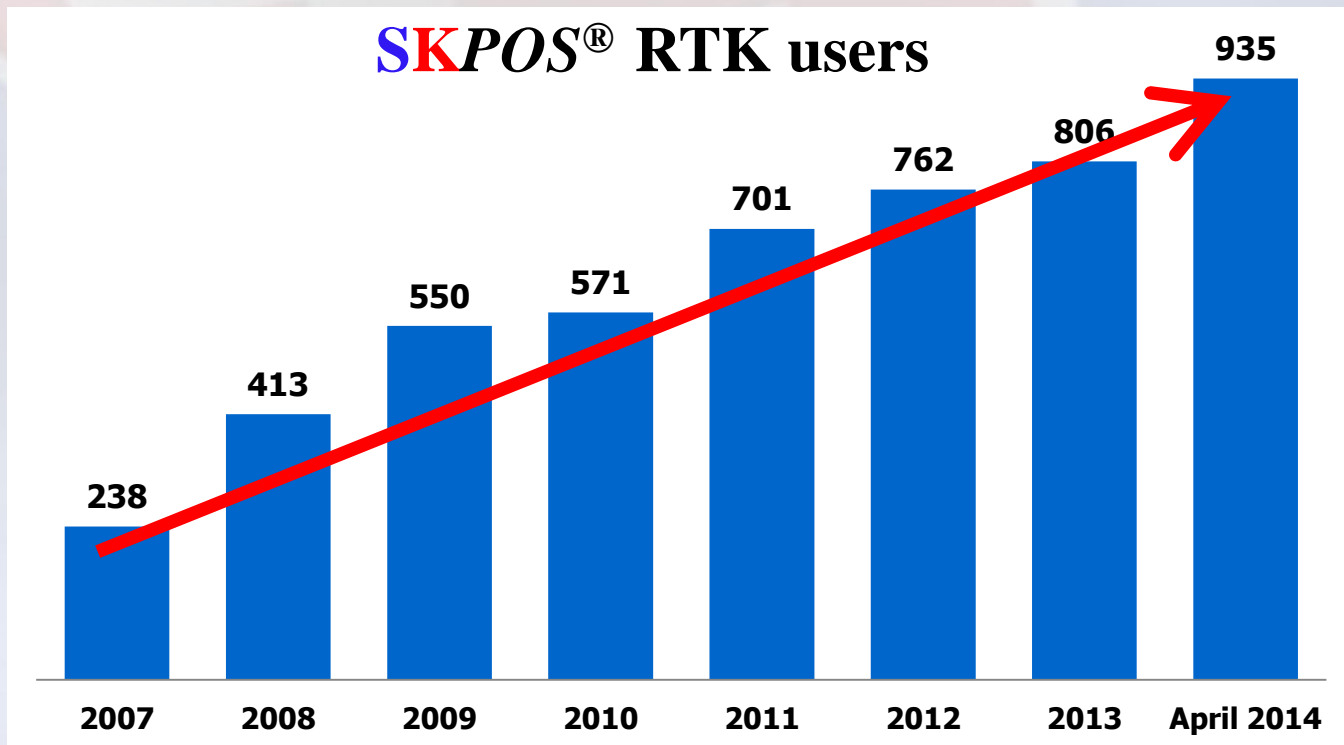
Only network solution (Network RTK in VRS concept) no
Single RTK is provided!

Service (mountpoint)	Accuracy	Data format	Interval
SKPOS_MM post-processing (VRS or permanent station data)	mm - cm	RINEX: 2.10, 2.11, 3.0 DAT, TGD, T01, T02	1 sec. – x sec.
SKPOS_CM_23 SKPOS_CM_31 SKPOS_CM_CMRX SKPOS_CM_CMR+	2 – 4 cm	RTCM 2.3 RTCM 3.1 CMRX CMR+	1 sec.
SKPOS_DM_SVK SKPOS_DM_SVK_23	0,3 – 1 m	RTCM 2.1 RTCM 2.3	1 sec.

SKPOS®

number of registrations (users)

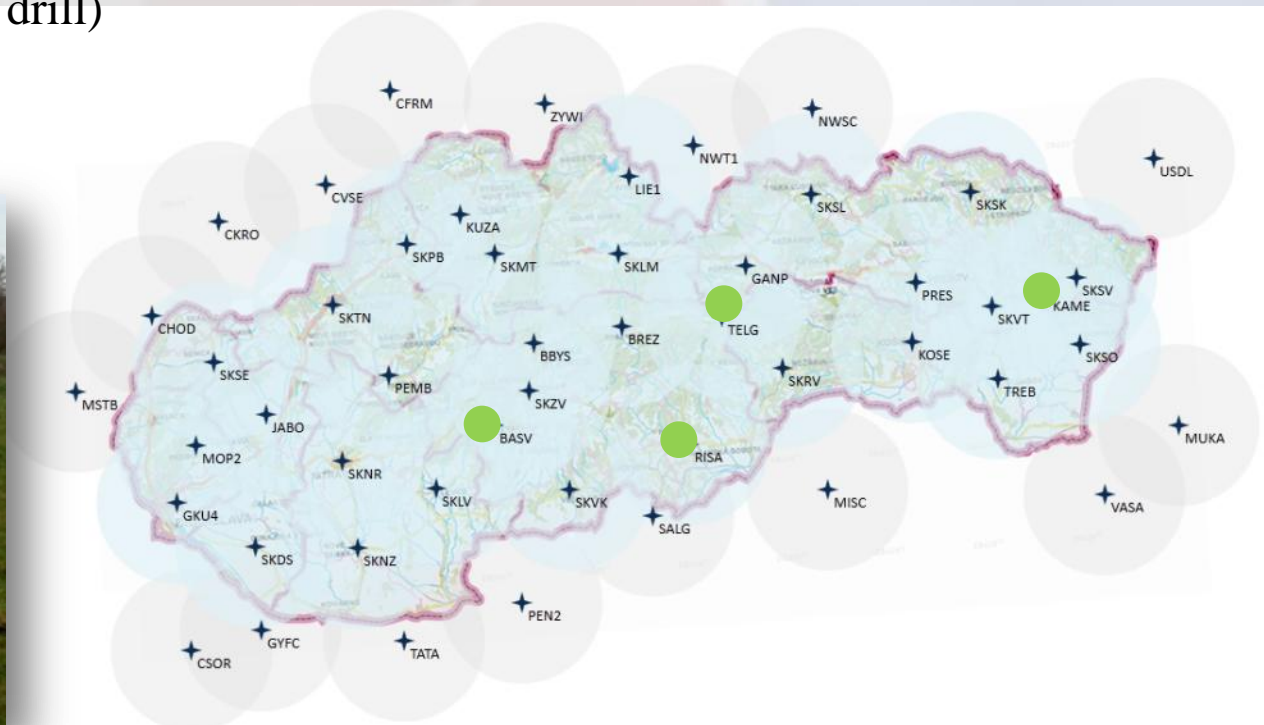
- over 935 registrations (April 2014)
- number is still increasing



SKPOS[®] infrastructure

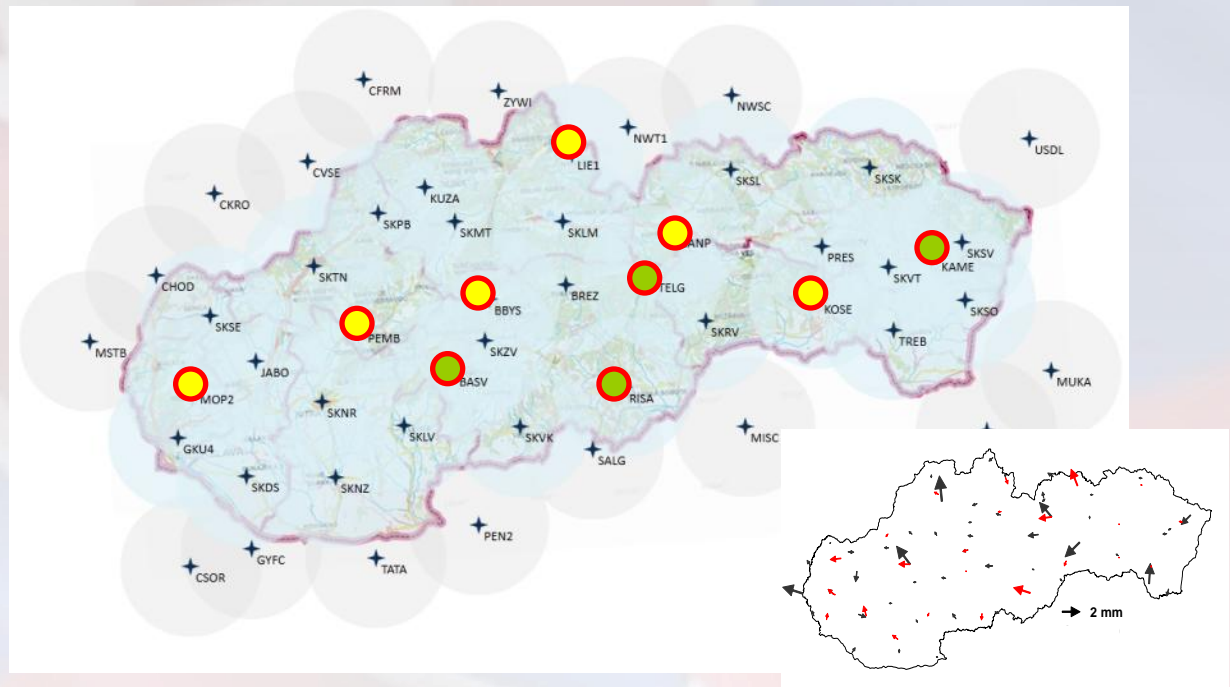
New type of stations monumentation

- 2013 year - 4 new permanent stations entered into SKPOS[®]
 - geodynamic monitoring purpose (Slovak University of Technology geodynamics project)
 - special type of monumentation (Unavco web page = deep drilled braced mark – more than 4m deep drill)



SKPOS[®] geodynamics infrastructure

Pilier/pier & deep drilled braced monumentation




SKPOS®

web survey about SKPOS® usage

- questionnaire about SKPOS® usage
- distributed during March 2014
- sent 727 emails
- received 383 responses (53%)
- 3 questions:
 - For what field of application do you use the SKPOS® service?
 - How do you grade the service (1=best – 5=worst)
 - Your comments and suggestions related to service



SKPOS® 

DOTAZNÍK VYUŽÍVANIA SLUŽBY SKPOS®

1. V akej oblasti využívate službu SKPOS®?

Zememerašská, geodetická a fotogrametrická činnosť

Podmienka: Vyberte všetky možnosti, ktoré sa týkajú vašej činnosti.

Kataster nehnuteľností	<input type="checkbox"/>	Mapovanie - tvorba účtovných máp	<input type="checkbox"/>
Pozemkové úpravy	<input type="checkbox"/>	Mapovanie - tvorba podkladov pre inú činnosť	<input type="checkbox"/>
Inžierska geodézia - stavebníctvo	<input type="checkbox"/>	Pozemná fotogrametria a skenovanie	<input type="checkbox"/>
Inžierska geodézia - dopravné stavby	<input type="checkbox"/>	Letecká fotogrametria a skenovanie	<input type="checkbox"/>
Inžierska geodézia - kontrolné a deformačné merania	<input type="checkbox"/>	GIS - zber údajov	<input type="checkbox"/>
Iné (prosím špecifikujte)	<input type="text"/>	GIS - tvorba tématických máp	<input type="checkbox"/>

2. Označte službu SKPOS®

1 - úplne 5 - najlepšie

3. Vaše pripomienky a návrhy na zlepšenie činnosti služby SKPOS®:

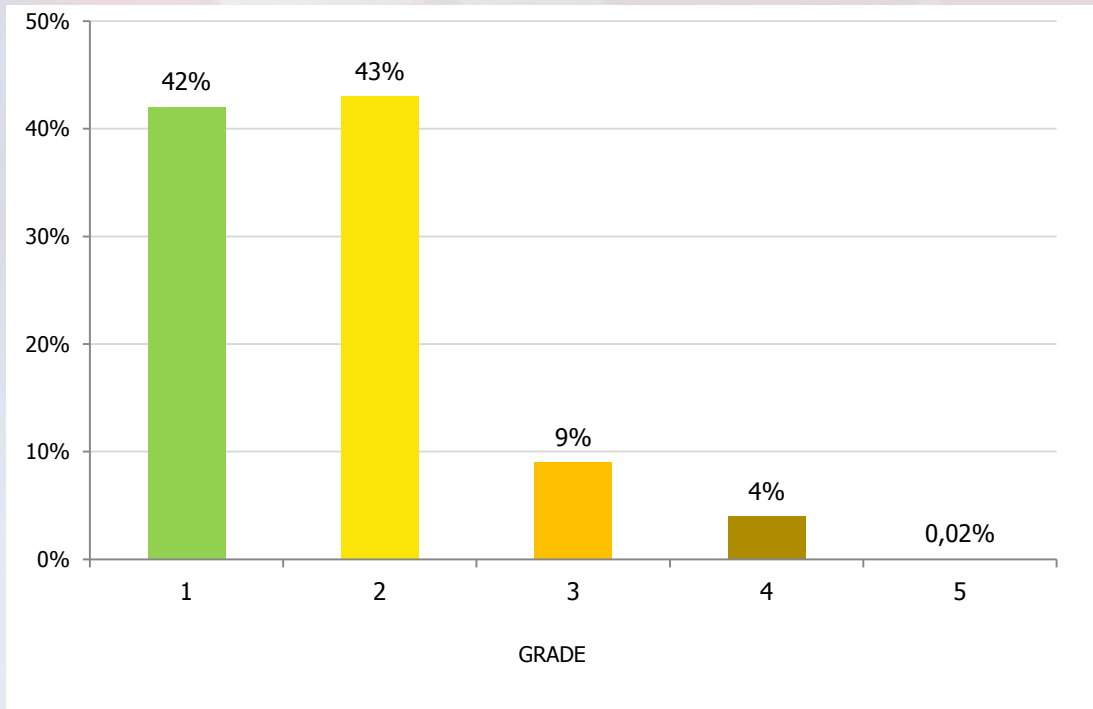
Odoslať dotazník

© GÚ Bratislava 2014

SKPOS®

survey results

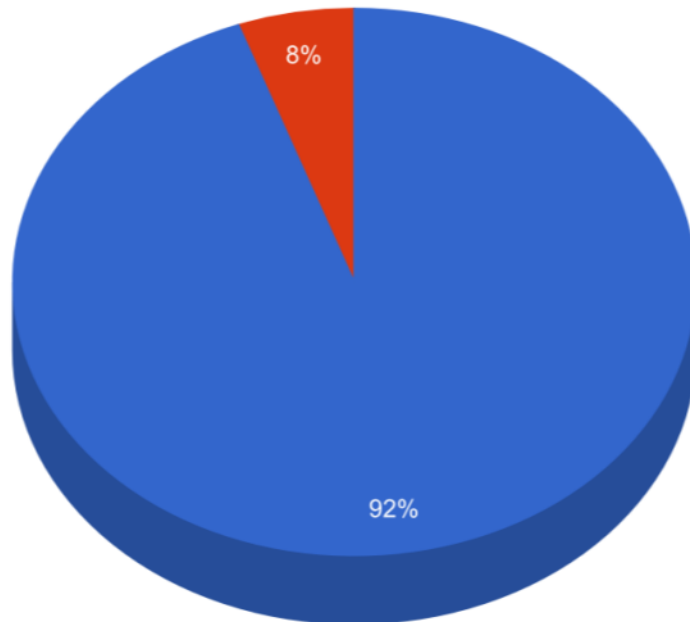
- Q: How do you grade the service? (1=best – 5=worst)
- Result: Average grade **1.8 (A-)**



SKPOS®

survey results

- Q: For what field of applications do you use the SKPOS® service?
 - Surveying fields (cadastre, surveying, mapping, GIS) - **92%**
 - Other fields - **8%**



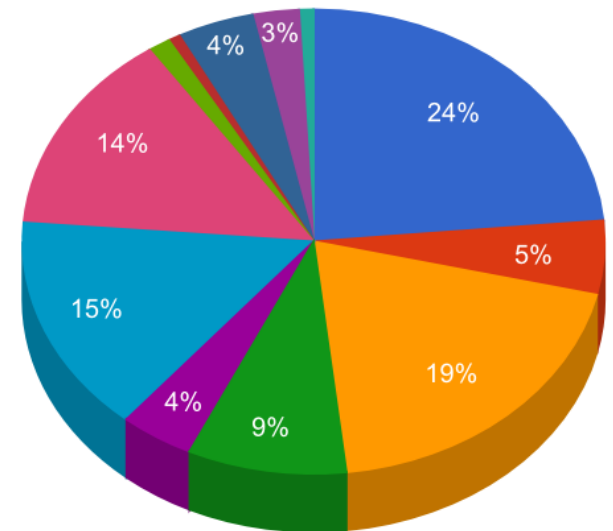
- surveying, cadastral, cartography geodesy and GIS
- other than surveying, cadastral, cartography geodesy and GIS

SKPOS®

survey results

- Q: For what field of applications do you use the SKPOS® service?
 - Surveying fields (cadastre, surveying, mapping, GIS) - **92%**

■ Cadastre	24%
■ Engineering - construction	19%
■ Mapping – thematic maps	15%
■ Mapping – different activity	14%
■ Engineering – road construction	9%
■ Land consolidation	5%
■ GIS – data collection	4%
■ Engineering – control and deformation measurements	4%
■ GIS - thematic maps	3%
■ Terrestrial photogrammetry and scanning	1%
■ Aerial photogrammetry and scanning	1%
■ Other	1%



SKPOS®

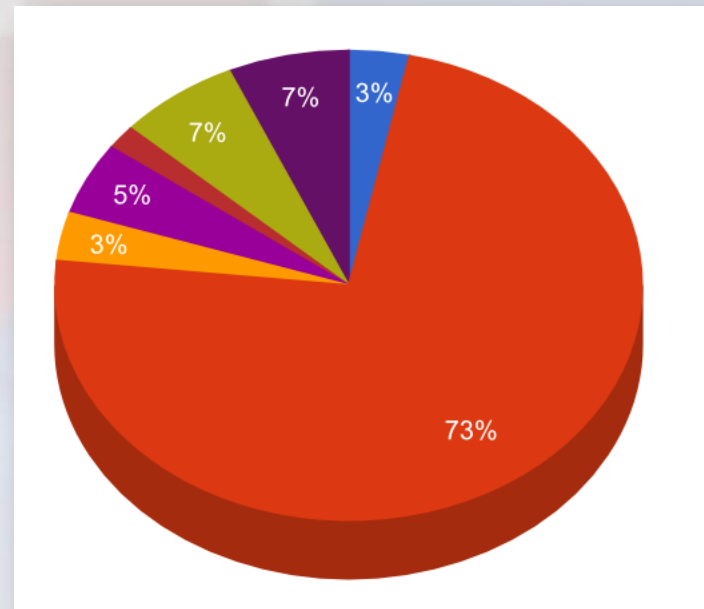
survey results

■ Q: For what field of applications do you use the SKPOS® service?

- Other fields - 8%

Other than surveying, cadastre, cartography, geodesy, GIS etc.

■ Precise farming	73%
■ Other	7%
■ Pipeline transport	7%
■ Mining	2%
■ Construction – control of machines	3%
■ Air transport	3%



SKPOS®

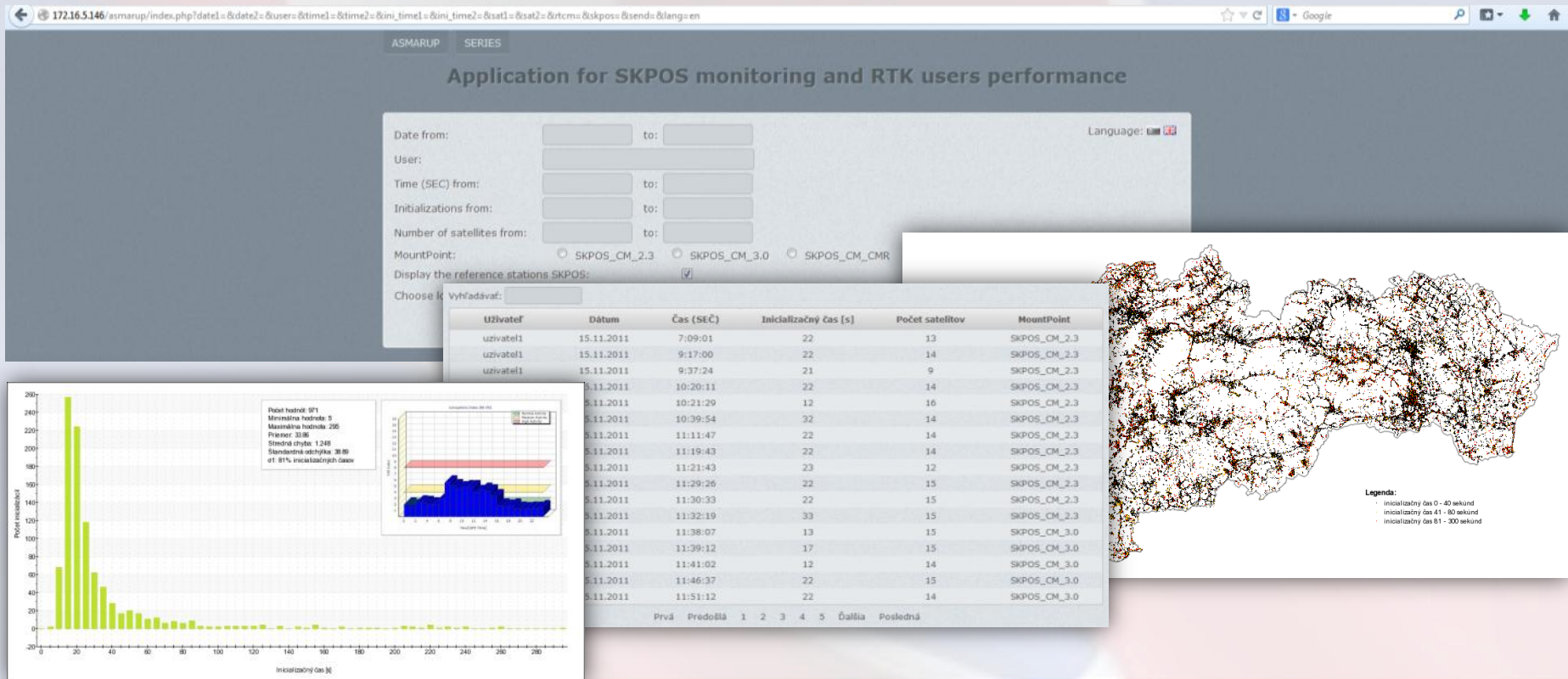
Charges (flat rate pre 365 days)



New! Post processing 1000 hours RINEX files	RINEX 2.x, 3.x	50 € / 365 days
Network RTK (year) 1000 hours network RTK 50 hours RINEX files	RTCM 2.3, 3.1, CMR _x , CMR+	90 € / 365 days (until 30.4.2014) 50 € / 365 days (from 1.5.2014)
Network RTK (month)	RTCM 2.3, 3.1, CMR _x , CMR+	19 € / 30 days
DGNSS	RTCM 2.1	20 € / 365 days

Application for **SKPOS**[®] Monitoring And RTK Users Performance (ASMARUP)

- application for **SKPOS**[®] user initialisation time analysis
- available only for administrators (GKU)
- Analysis according to: date and time, particular user, length of the initialisation time, number of satellites, used mountpoint, user position

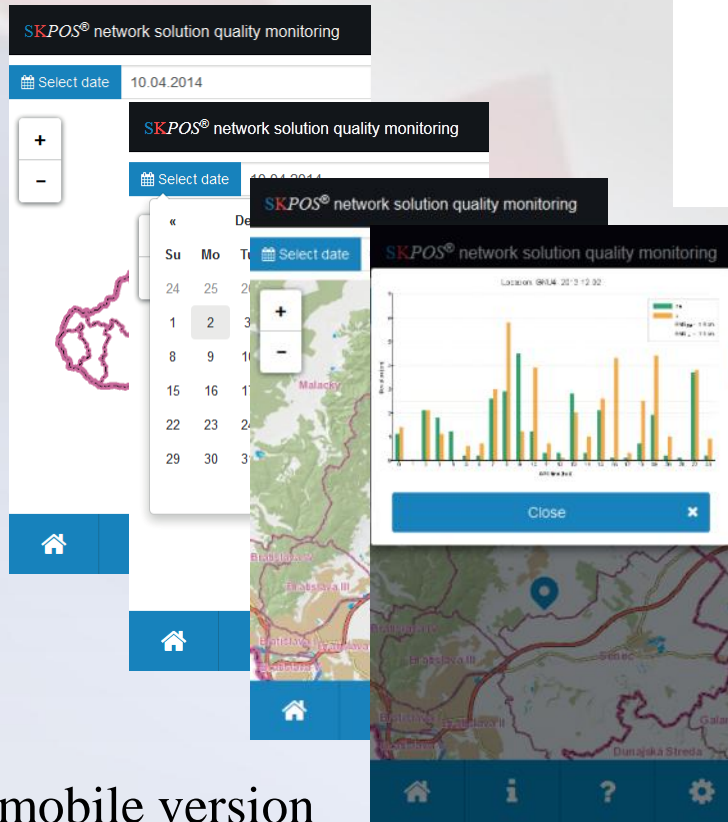


Application „SKPOS[®] network solution quality monitoring“ (see poster)

<http://monitoringskpos.gku.sk>



desktop version



mobile version

New application: Number of online connected **SKPOS**[®] users

Pripojení uživatelů

GPS čas	RTK uživatelů	Single station uživatelů
27.05.2014 10:50:03	57	44
27.05.2014 10:45:03	56	44
27.05.2014 10:40:02	53	44
27.05.2014 10:35:02	50	44
27.05.2014 10:30:02	54	44

Max. počet pripojení

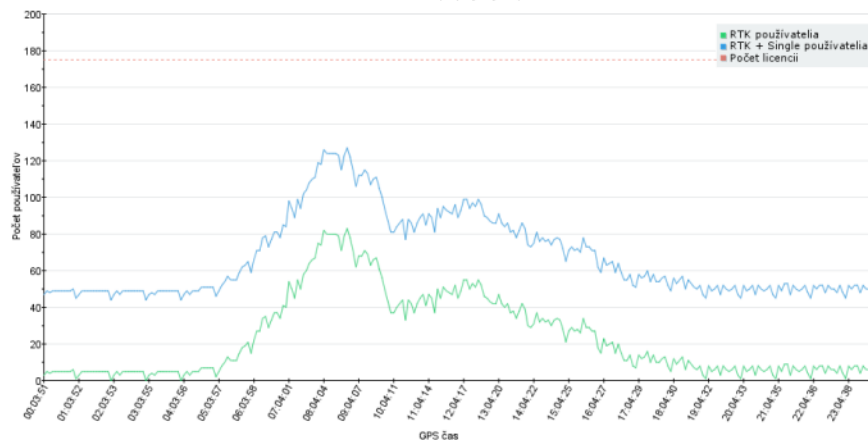
21.05.2014 08:10:21

RTK Single
107 + 44 = 151

Vyber datum:

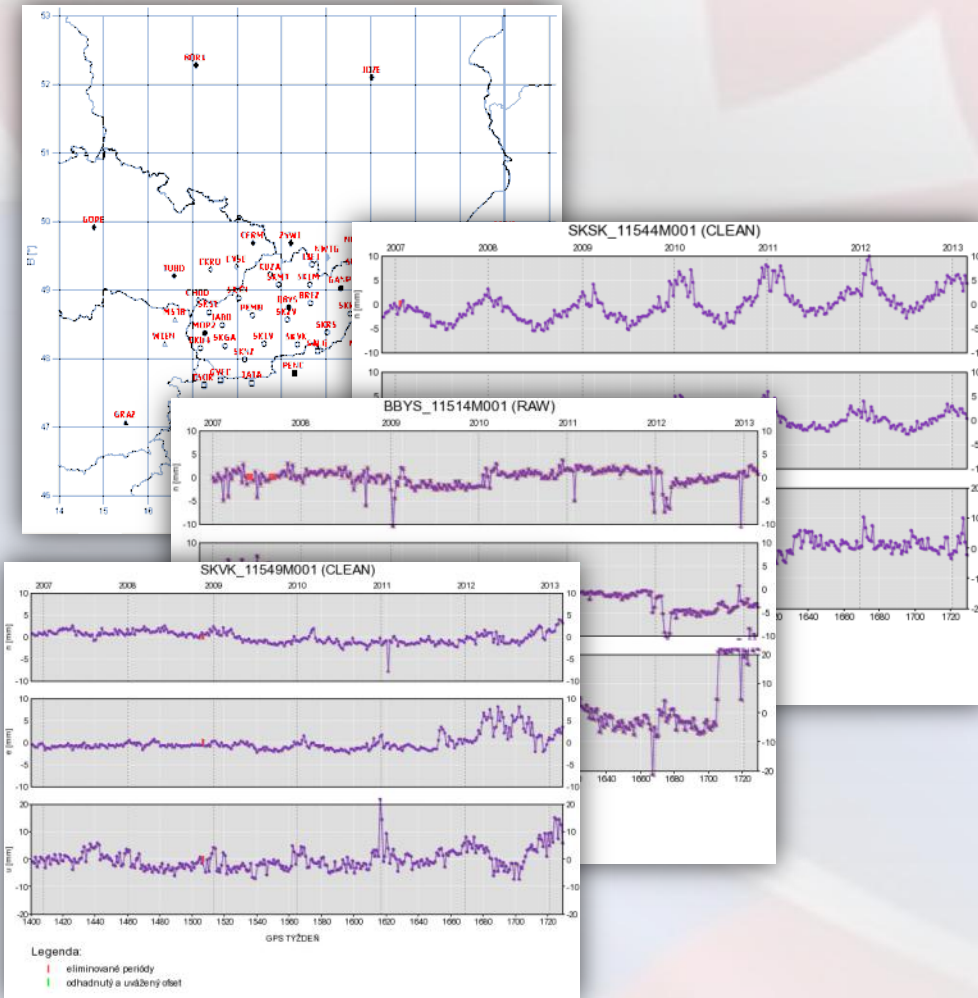
26.5.2014

26.5.2014 - Počet pripojených uživatelů



SKPOS®

time series analysis

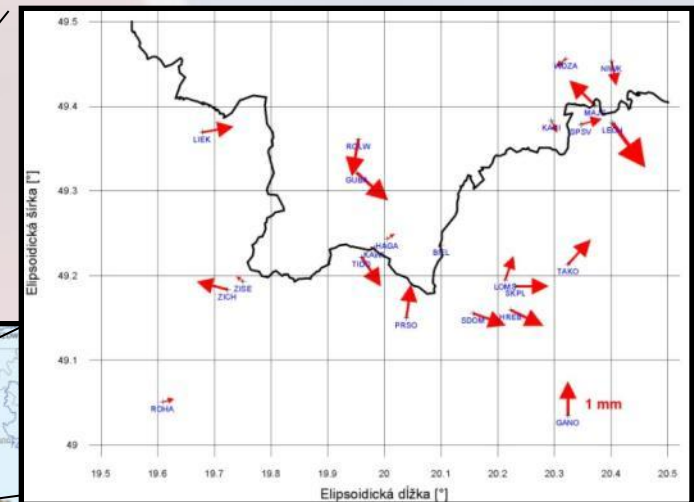
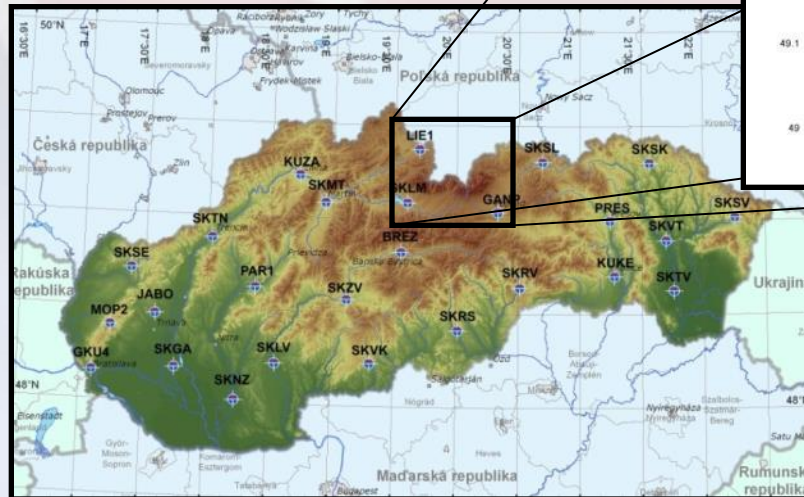


- Precise processing
 - Bernese software 5.0
 - January 2007 - February 2013
 - Bernese software 5.2
 - March 2013
- Times series analysis
 - jump determination
 - trend & season variation estimation
- Experience from analysis
 - jump estimation
 - unknown jumps estimation
 - seasonal variation
 - anomaly behaviour
 - stabile behaviour

Local geodynamics network Tatra

Geokinematics of Tatra mountines

- 5 days GNSS campaign (every year)
- Cooperation with other slovakian institutions (TOPU, STU) and Poland
- 18 epoch points + permanent stations
- Processing in Bernese software



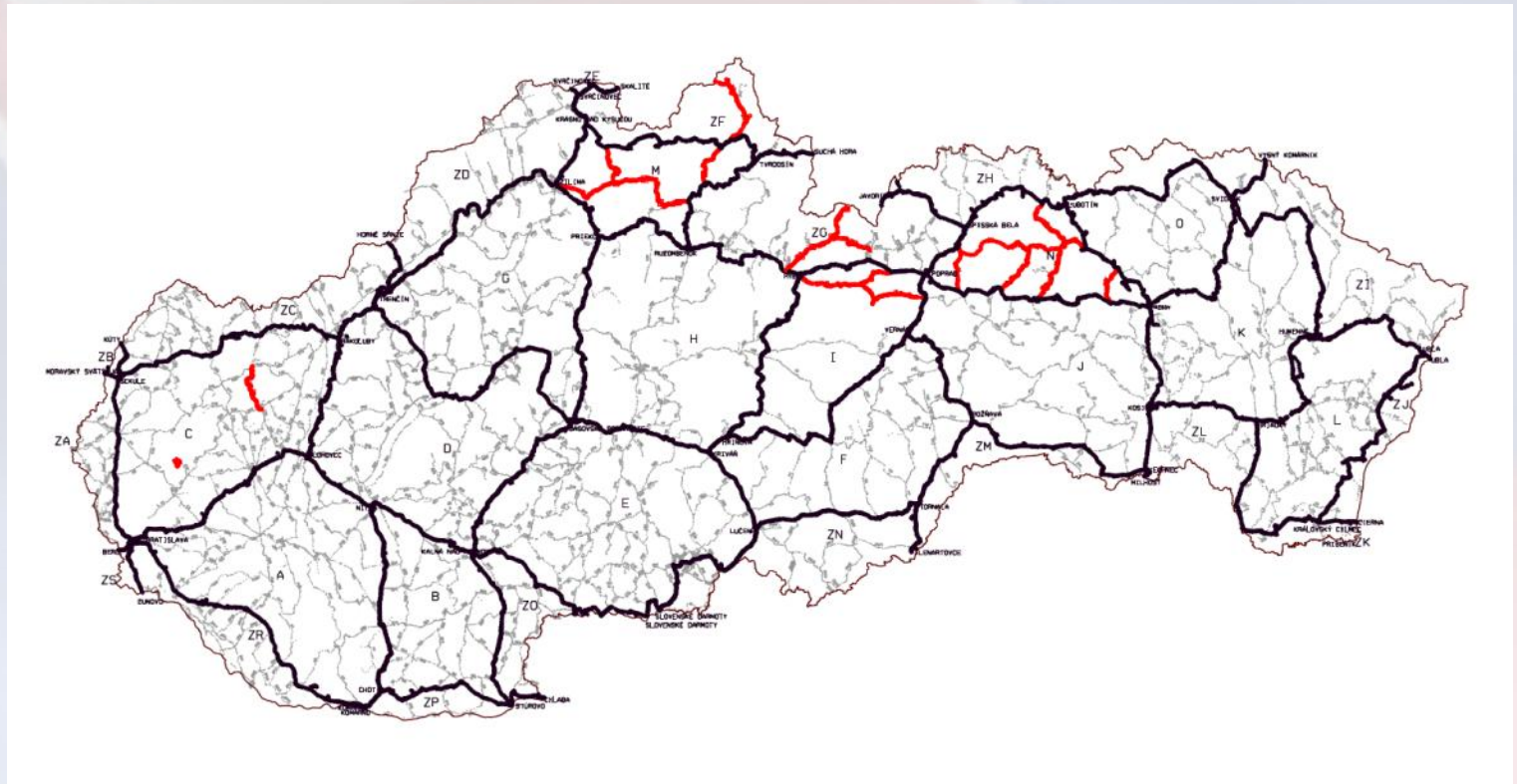


Status, activities and news from national
levelling network

National levelling network (ŠNS) Measurements in 2013



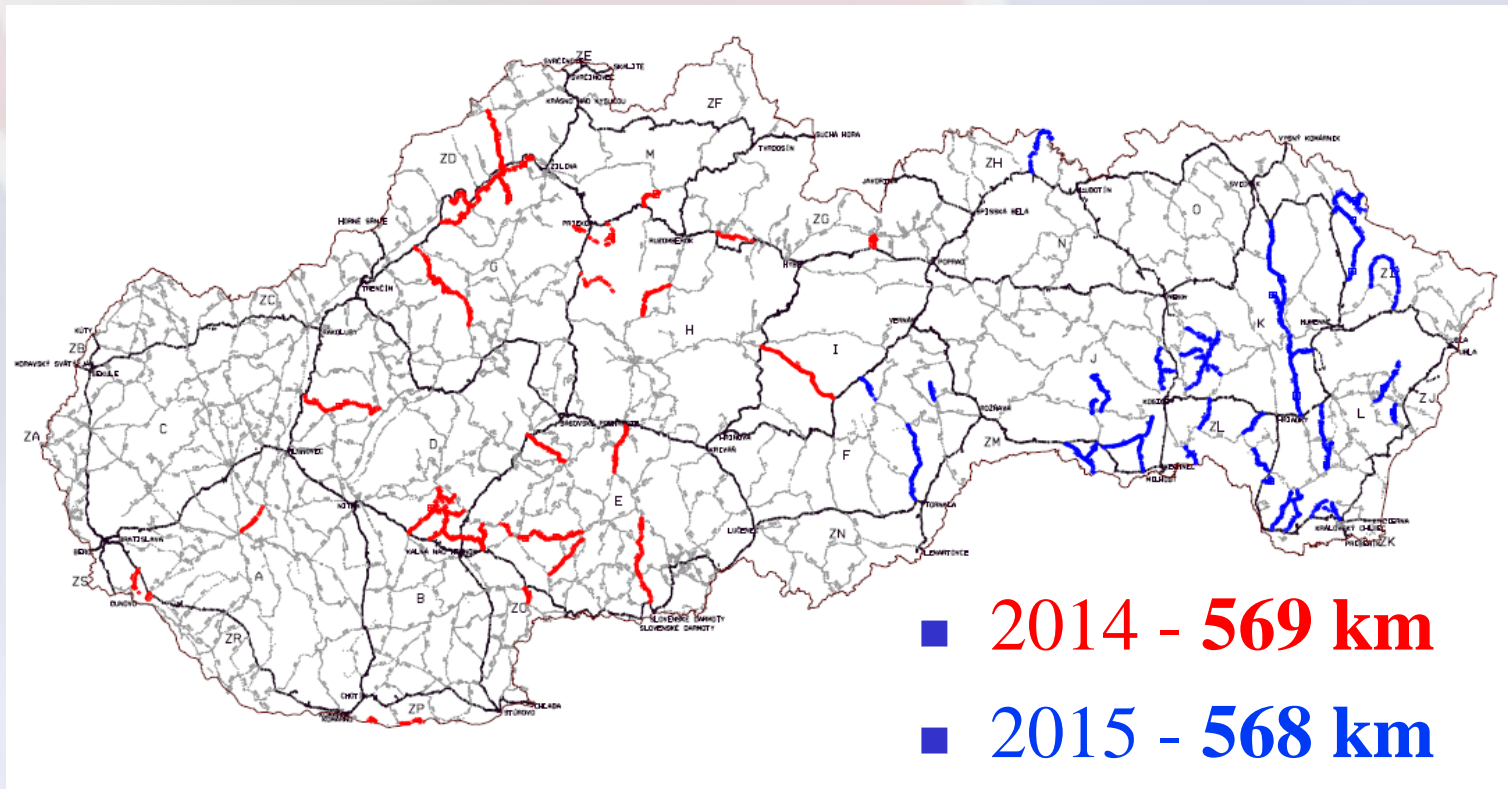
- Measurements performed on 2nd order levelling lines
- Totally 560 km
- 3 measuring groups



National levelling network (ŠNS) Measurements plan for 2014 - 2015



- Plan to finish measurements on the 2nd order levelling lines
- 3 measuring groups



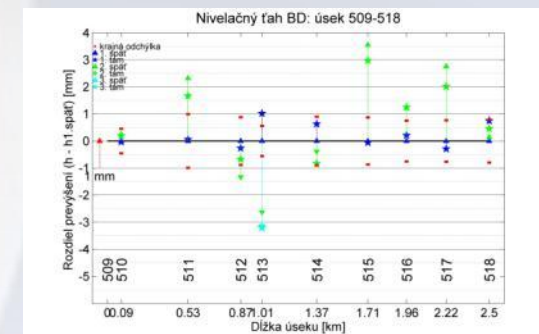
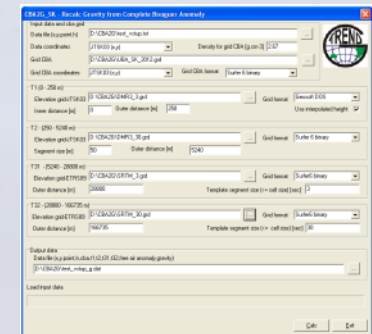
National levelling network (ŠNS) Reprocessing – Aim and strategy



- Aim:
 - New national **Balt after adjustment** realisation (Bpv_{yy})
 - New $SKVRF_{yy} = EVRF2007$ national realisation
 - New **quasigeoids** from ETRS89-h to Bpv and $EVRF2007$

- Inputs:
 - 1st order levelling lines measurements (1997-2005)
 - 2nd order levelling lines measurement (1987-2015)

- 2 step strategy
 - Reprocessing of 1st order levelling lines
 - New map of Bouguer anomalies (software CBA2G_SK)
 - 1st order levelling lines control measurements
 - 2nd order levelling lines adjustment onto 1st order polygons

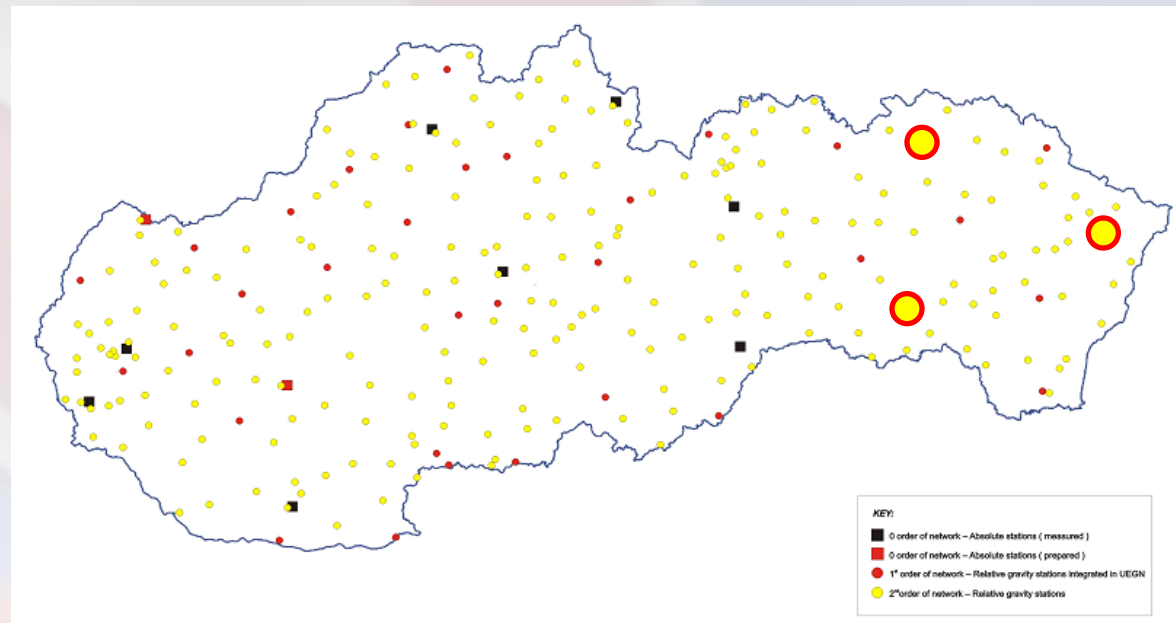


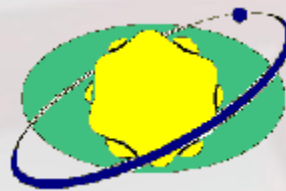


Status, activities and news from national
gravimetric network

National gravimetric network (ŠGS) Measurements in 2013

- Absolute gravimetric measurements on ŠGS 0.order points (3 points)
- Measurement orderd and performed by VUGTK (research institute – Czech republic)





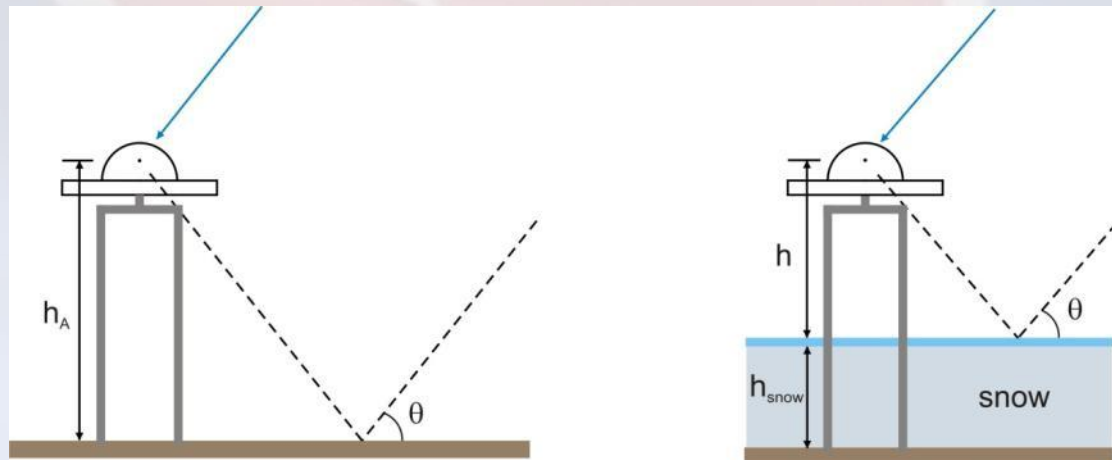
Slovak University of Technology activities

Snow depth sensing using GPS multipath

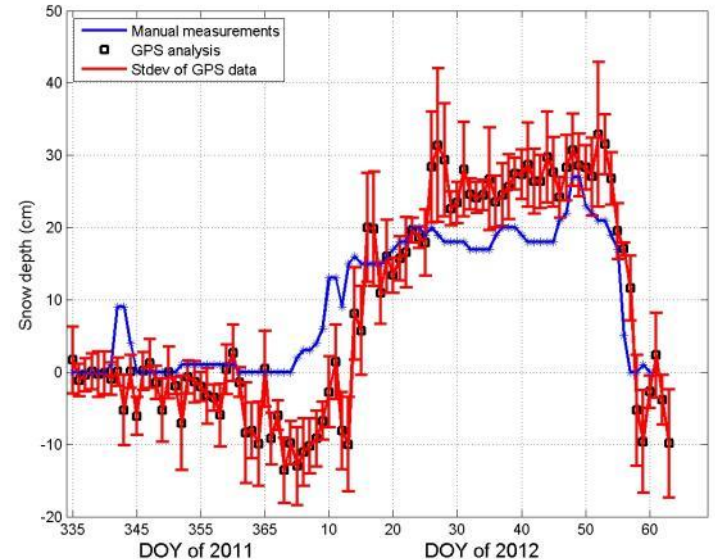
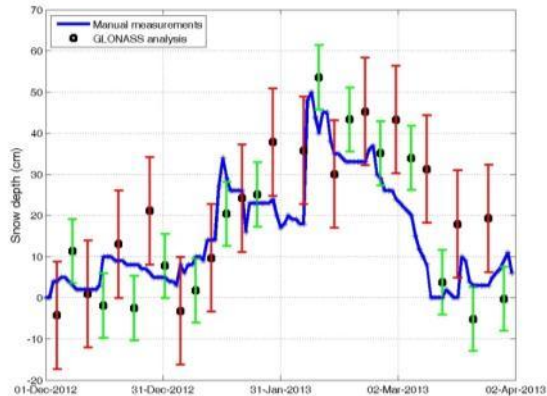
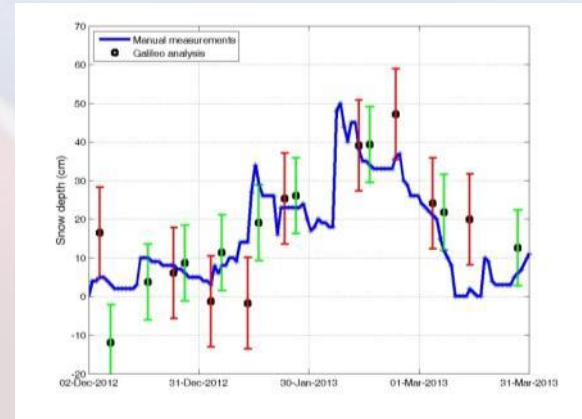
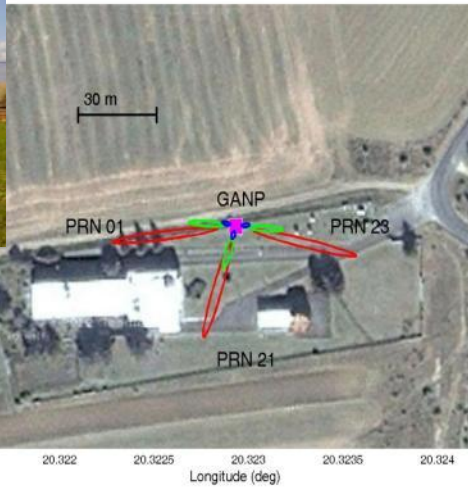
- Analysis of GPS multipath allows to detect actual the antenna height h above the reflecting surface and enables to monitor the time variability of the depth of the reflector.
- Snow cover in the vicinity of GPS antenna causes decrease of effective h relatively to antenna height h_A above the terrain related to surface without snow. The time variability of h is then interpreted as variability of snow depth (Larson, Billich, Ozeki, Heki and others).

$$h_{SNOW} = h_A - h$$

Variation of height h of reflection surface due to height h_{SNOW} of the actual snow cover



Variations of effective depth of reflector at IGS and EPN permanent station GANP



National center for diagnosing the earth surface deformations in Slovakia

gúbor Upravíť Zobrazíť História Záložky Nástroje Pomocník

Droscak Branislav - Outlook ... x Špičkový prístroj spresní mera... x Národné centrum diagnostiko... x

www.geokinematika.sk/en/

Najobľúbenejšie Ako začať Prehľad správ Gmail - Doručená pošt...

WE SUPPORT RESEARCH ACTIVITIES IN SLOVAKIA
THE PROJECT IS CO-FINANCED FROM THE EU
SOURCES

Agentúra
Ministerstva školstva, vedy, výskumu a športu SR
pre štrukturálne fondy EÚ

NATIONAL CENTER FOR DIAGNOSING THE EARTH SURFACE
DEFORMATIONS IN SLOVAKIA

ITMS: 26220220108

START OF THE PROJECT: 1 DECEMBER 2010 / END OF THE PROJECT: 30 NOVEMBER 2013

ABOUT THE PROJECT

MONITORED SITES NETWORK

SATELLITE AND GRAVIMETRIC MEASUREMENTS ANALYSIS

PROJECT OUTPUT

CONTACT

ABOUT THE PROJECT

The aim of the National Center For Diagnosing the Earth Surface Deformations in Slovakia is to identify the Earth surface deformations on the basis of research results by applying the satellite, gravimetric and tropospheric measurements.

The output of the national center is a permanently updated database of earth crust dynamics in Slovakia focused on determination of risk areas for construction and monitoring of large structures.

The national center carries out the measurements of geometric and physical variations on the Earth's surface on 9 reference stations of the monitoring network.

The position variations at all sites of the monitoring network and absolute and relative gravimetric measurements are carried out vertical deformation information.

Sieť monitorovaných bodov

Zemepisná dĺžka (°)

Zemepisná šírka (°)

Copyright © 2014 Národné centrum diagnostikovania deformácií zemského povrchu na území Slovenska

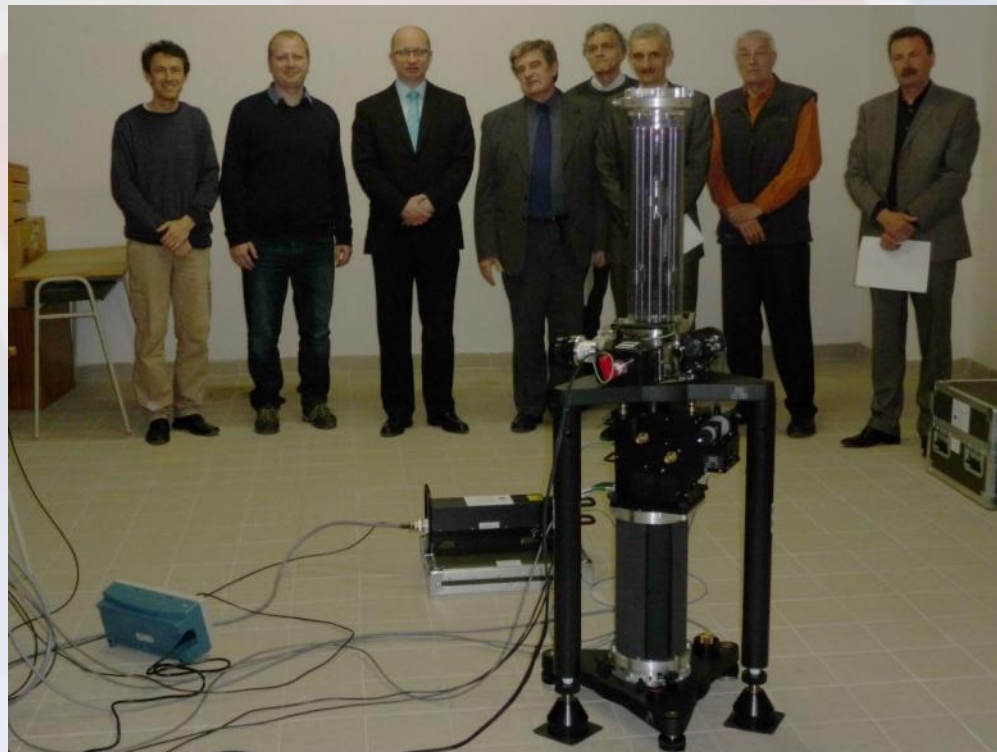
Čaká sa na www.geokinematika.sk...

Start Total Commander 6.5... SLOVAKIA_National_j... Národné centrum dia...

SK 22:51

National center for diagnosing the earth surface deformations in Slovakia

- New absolute gravimeter FG5X-247 was purchased for project



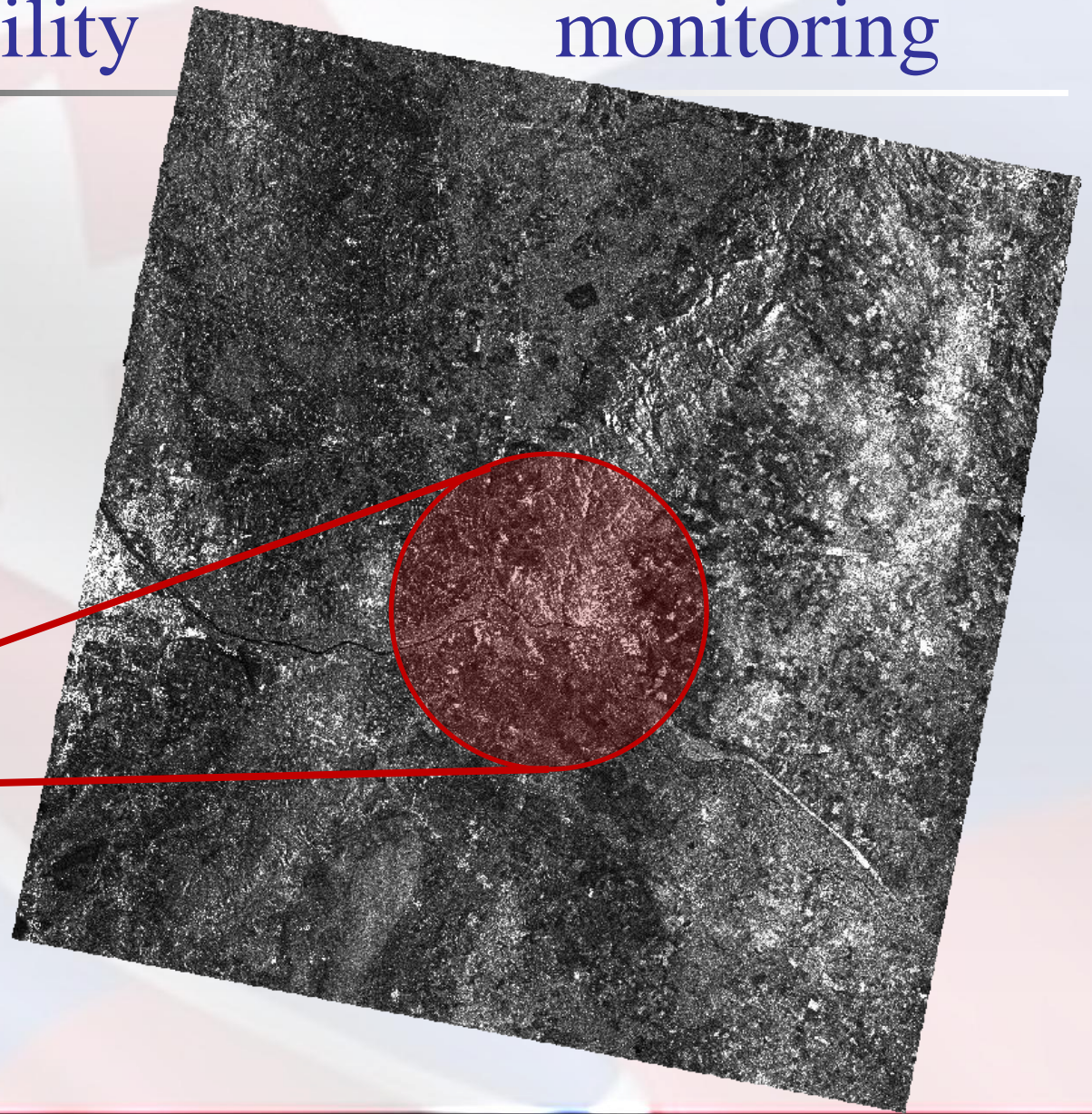
PS InSAR technology tests

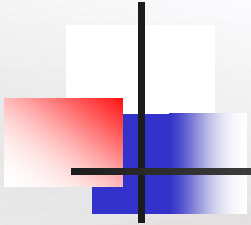
Earth stability

monitoring



Bratislava





Other news



Map client ZBGIS

Mapo
aplik
s úda
v



Metadata editor

Metaúdajový editor (MDE) je webová aplikácia, ktorá slúži na vytváranie nových alebo na editáciu existujúcich metaúdajových záznamov.

Vstúpiť

Conversion service

Konverzná služba slúži na konverziu formátov. Je to komplexný nástroj pre konverziu údajov rôznych formátov.

Vstúpiť

www.geoportal.sk

Prihlásenie

Mapa stránok

Vyhľadávanie



ZBGIS A ŠMD

ARCHÍV

APLIK

ického diela alebo jeho podstatnej časti bez súhlasu a
v zmysle zákona č. 618/2003 Z. z. (autorský zákon) z
tomto webovom portáli zakladá občianskoprávnu aj tr



Map client ZBGIS

Mapový klient ZBGIS je webová aplikácia, ktorá slúži na prácu s údajmi ZBGIS, zobrazovanie, vyhľadávanie a analýzu priestorových údajov.



Transformačná

Aplikácia Transformačná služba vykonáva autorizovanú transformáciu súradníc bodov medzi záväznými geodetickými systémami.



Transformation service



Inspire

ÚGKK SR zabezpečuje sprístupnenie referenčných údajov a informácií rezortu aj pomocou elektronických služieb, ktoré spĺňajú požiadavky smernice INSPIRE.

Vstúpiť

Searching service

Slúži na vyhľadávanie metaúdajových záznamov publikovaných pripojeným katalógovým serverom.

Vstúpiť

služba
ú
ov medzi
témami.



Transformačná služba

Formát vstupných údajov Transformácia bodu jednotlivo Pomoc

Výškový systém

Vstupný súradnicový systém S-JTSK (JTSK) Bpv

Výstupný súradnicový systém Vybrať

Transformovať

- Vybrať
- S-JTSK (JTSK03)
- ETRS89-LatLonh
- ETRS89-XYZ
- ETRS89-LAEA
- ETRS89-LCC
- ETRS89-TM33
- ETRS89-TM34
- ETRS89-LCC_SK

Validácia vstupu

Výsledok validácie

- Transformácia bodu jednotlivo
- Vybrať
- Transformácia bodu jednotlivo
- TXT/CSV
- GML
- ESRI Shapefile SHP
- ESRI súborová geodatabáza GDB
- ESRI personálna geodatabáza MDB
- AutoCAD DXF
- MicroStation DGN
- STX
- VGI
- VTX
- MapInfo TAB

Vstupné súradnice S-JTSK (JTSK)

Y m

X m

H m

Nastavenie spracovania vstupného súboru

Ukážka súboru

ID	Y	X	vyska
	Y	X	výška
1	530213.665	1329075.273	100
1	526479.939	1329420.652	100
1	522746.000	1329763.576	100
1	519011.848	1330104.046	100

Oddelovač stĺpcov

Čiarka

desatinných miest

Bodka

zahŕňa hlavičku

Y

X

vyska

spracovania výstupného súboru

Prepísať názvy v hlavičke súboru



MAPOVÝ KLIENT ZBGIS®
Úradu geodézie, kartografie a katastra Slovenskej republiky

OPIS

PORTÁL ÚGKK SR BOL VYTVORENÝ ZA FINANČNEJ PODPORY EÚ

Mapa | Kreslenie | Údaje | Konverzia

Vyhľadajte podľa geografického názvu

1 : 1 000 000

Projekt SDKN-ZBGIS bol realizovaný spoločnosťami SEVITECH, a.s. a BESS Slovensko, a.s. v rámci OPIS ©Sevitech, a.s. Verzia 2.0.0.3

KONVERZNÁ SLUŽBA ZB GIS
Úradu geodézie, kartografie a katastra Slovenskej republiky

OPIS

PORTÁL ÚGKK SR BOL VYTVORENÝ ZA FINANČNEJ PODPORY EÚ

Konverzná služba

Vstupný formát údajov: **Vyberte hodnotu...**

Vstupný súbor:

Výstupný formát údajov: **Vyberte hodnotu...**

Validácia vstupu

Výsledok validácie

KONVERZNÁ SLUŽBA
Úradu geodézie, kartografie a katastra Slovenskej republiky

OPIS

PORTÁL ÚGKK SR BOL VYTVORENÝ ZA FINANČNEJ PODPORY EÚ

Konverzná služba

Vstupný formát údajov: **ESRI Shapefile**

Vstupný súbor ESRI Shapefile:

Nahraný súbor: **SHP_SJTSK.zip**

Výstupný formát údajov: **GML verzia 3.1.1 SF-0**

Validácia vstupu

Výsledok validácie

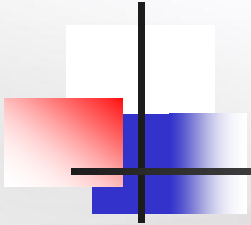
Aplikáciu vytvoril SEVITECH a.s. Verzia 0.2.0.0

Aplikáciu prevádzkuje Úrad geodézie, kartografie a katastra Slovenskej republiky | Pomoc

Geodetic basics points browser

www.geoportal.sk / Map client ZBGIS / Layer Reference geodetic points

The screenshot displays the Geoportal.sk website interface. At the top, there is a navigation bar with links for 'Príhlásenie', 'Mapa stránok', 'Textová verzia', and language options 'SK' and 'EN'. The main header features the 'Geoportál' logo and a search bar. Below the header, the 'MAPOVÝ KLIENT ZBGIS' is visible, including logos for GÚ, OPIS, and the European Union. The central part of the image shows a topographic map of Slovakia with numerous blue dots representing geodetic points. A left-hand sidebar contains a layer list under the heading 'Referenčné geodetické body', with checked items for 'Stavica_SKPOS', 'SRS', and 'ZBGIS polohy'. The bottom of the screen shows a Windows taskbar with various application icons and a system tray displaying the date '27. 3. 2014' and time '16:14'.



Thank you
for your attention