

National report of Slovakia 2017

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EUREF 2017, annual symposium

17.-19.May 2017, Wroclaw, Poland

Outline

- Slovakian activities towards to EPN
- News from:
 - SKPOS[®] (Slovak real time determination system)
 - national levelling network
 - national gravimetric network
- Research and development
 - Geodetic and Cartographic Institute activities
 - Slovak University of Technology activities
 - Slovak Academy of Sciences activities
- Other news

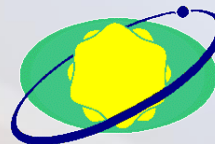
Slovakian EPN Operational and Local analysis centers



Geodetic and Cartographic Institute
Bratislava (GKÚ) – EPN OC



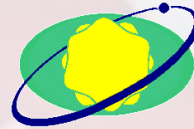
Slovak University of Technology in
Bratislava (SUT) – EPN LAC



SUT - EPN Local analysis center activity

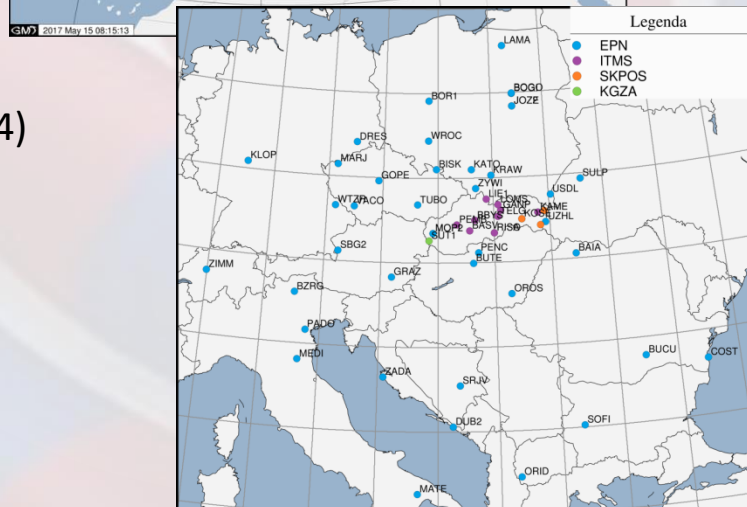
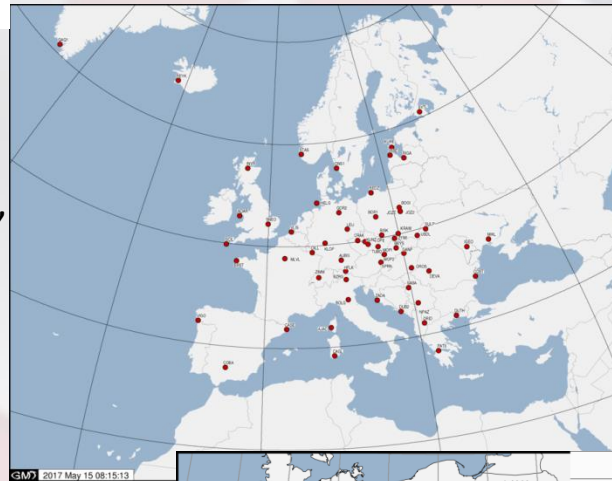


Bernese GNSS Software
Version 5.2
used since GPS week 1883



EPN subnetwork computation:

- 56 EPN permanent stations, 8 EPN permanent stations added to SUT network solution (GPS week 1908: CASE, 1910: AUBG, DILL, GOR2, LEIJ, 1936: ADAR, SCIL, SNEO).
- New reference frame (IGS14) and an updated set of antenna calibrations (igs14.atx) are used: GPS week 1934.



CEPER network computation:

- 55 permanent stations in region of Central Europe,
- GPS/GLONASS and GLONASS only solutions: GPS week 1774.

Slovakian EPN permanent stations

Slovakian EPN Real-time service permanent stations


ROYAL OBSERVATORY

EUREF Permanent GNSS Network


eurf

NETWORK & DATA PRODUCTS & SERVICES DOCUMENTATION NEWS, EVENTS & LINKS


MOPI




GANP



MOP2



BBYS



FLOW: ONLY DAILY HOURLY HOURLY & REAL-TIME

WORKS: Update map

hourly & real-time data hourly data Providing only daily data

Google Maps showing the location of Slovakian EPN permanent stations (MOPI, MOP2, GANP, BBYS) in Slovakia. The map includes labels for cities like Bratislava, Košice, and various European routes (E40, E442, E462, E50, E58, E60, E71, E75, E77, E79).

Slovakian contribution to EPN Densification (31 permanent stations)



EUREF PERMANENT NETWORK
DENSIFICATION

HOME ORGANISATION NETWORK DATA ANALYSIS PRODUCTS

Home / Network / Maps

Maps

Interactive map

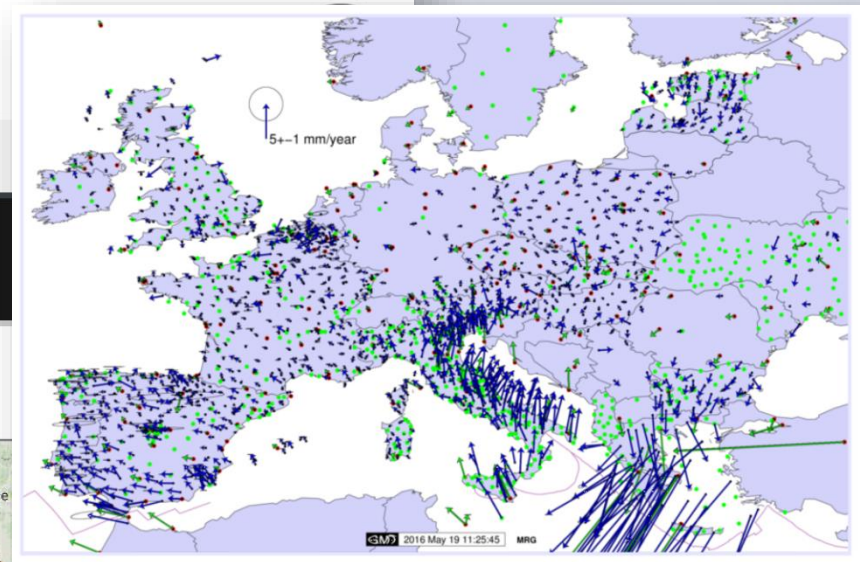
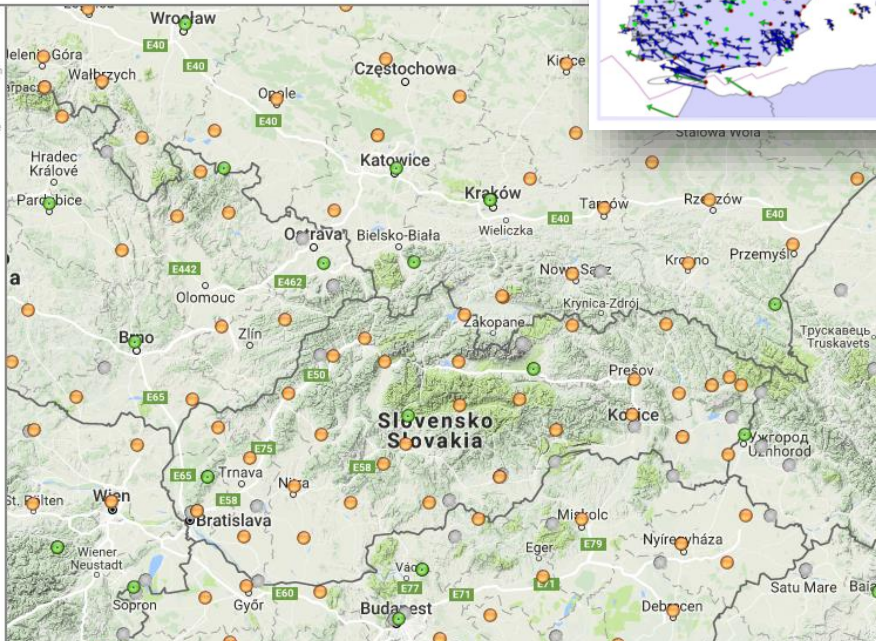
Legend

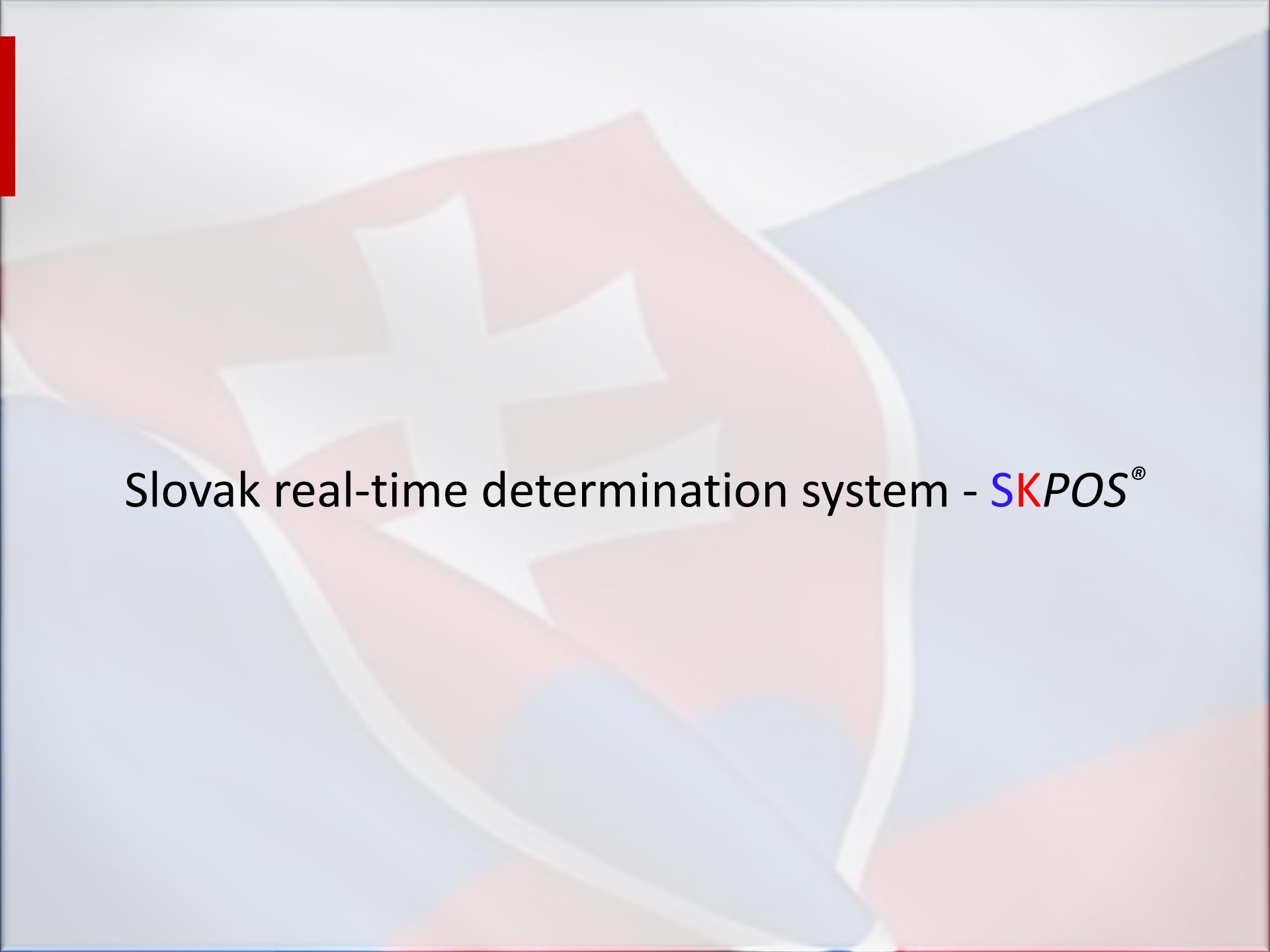
- EPN densification EPN densification
- EPN station station with station without
- station log at the station log at the
- EPN CB EPN CB

Locate station on map
- Select a station -

Station criteria selection
COUNTRIES:

- IRELAND
- ISRAEL
- ITALY
- JORDAN
- LATVIA
- LITHUANIA
- MACEDONIA
- MALTA
- MOROCCO
- NETHERLANDS
- NORWAY
- POLAND
- PORTUGAL
- REPUBLIC OF MOLDOVA
- ROMANIA
- RUSSIAN FEDERATION
- SAN MARINO
- SERBIA
- SLOVAKIA**
- SLOVENIA

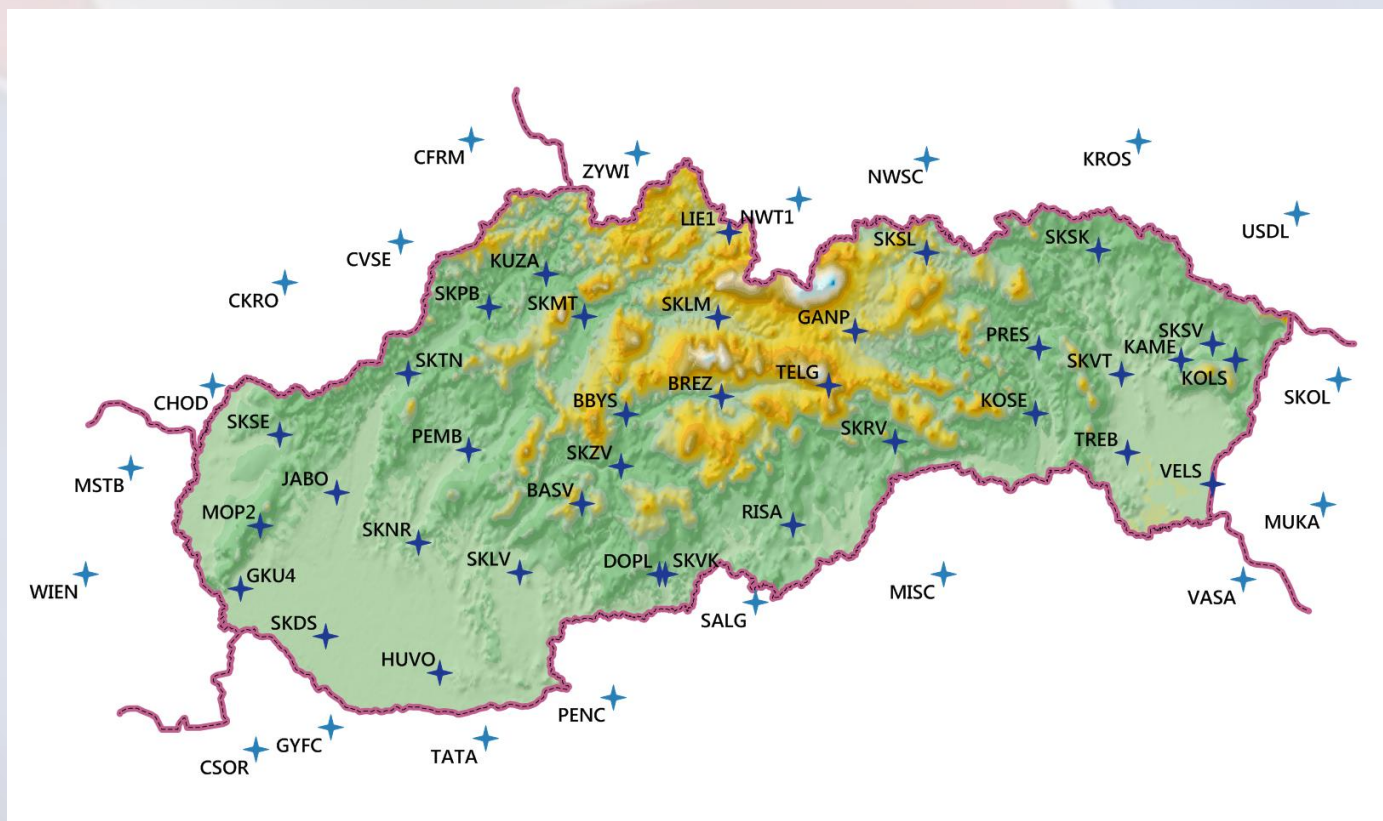


The background of the slide features a large, faded, and semi-transparent version of the Slovak coat of arms. The coat of arms is a shield with a red field and a white cross. The shield is set against a background of light blue and light red geometric shapes. A solid red vertical bar is located in the top-left corner of the slide.

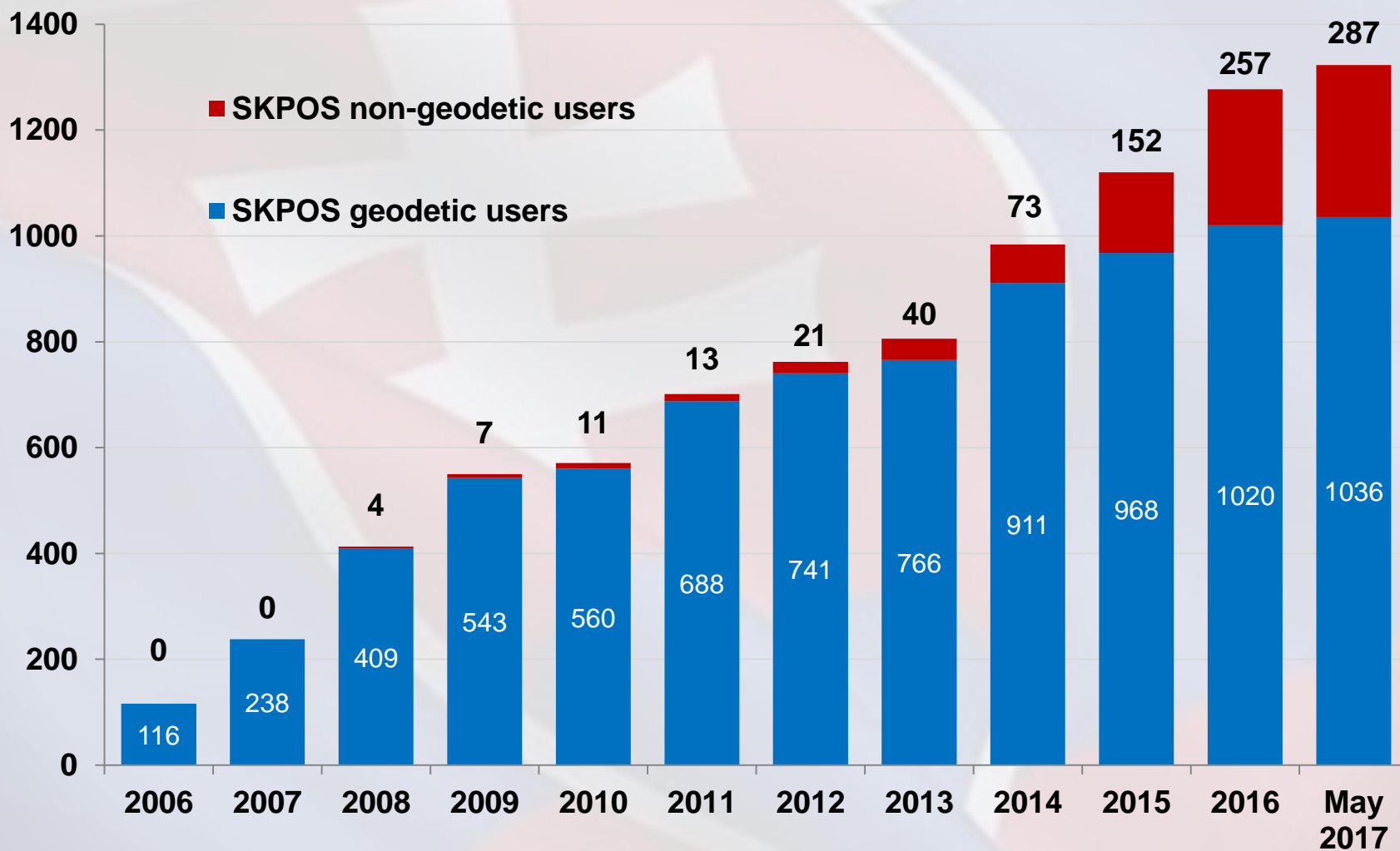
Slovak real-time determination system - **SKPOS**[®]

Reference stations infrastructure (May 2017)

- **34 Slovakian reference stations (14 individual calibrated)**
 - 29/34 stations observe GPS+GLONASS+Galileo
 - Network density: average distance is 44,6 km
- **20 foreign reference stations (APOS, gnsnet.hu, CZEPOS, ASG-EUPOS, ZAKPOS)**



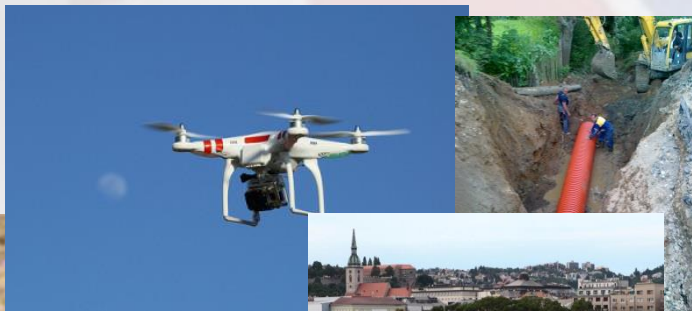
Number of users





SKPOS®

Type of users

- Surveying fields (cadastre, surveying, mapping, GIS) - **78%**
- Other fields (precise agriculture, machine guarding) - **22%**



Packages - data formats - charges

Package	Content	Duration	Format	Flat rate
SKPOS_mm	RINEX 1000 h	year	RINEX 2.x, 3.x	50 €
SKPOS_cm (year)	RTK unlimited + 50 h RINEX	year	 RTCM 2.3, 3.1, RTCM 3.2 MSM CMRx, CMR+	50 €
SKPOS_cm (month)	RTK unlimited	month	 RTCM 2.3, 3.1 RTCM 3.2 MSM CMRx, CMR+	19 €
SKPOS_dm	DGNSS unlimited	year	RTCM 2.1	20 €

SKPOS®

10 years anniversary (2006 – 2016)



■ User seminary - SKPOS 2016

- Dates: 19.10.2016 and 20.10.2016 in Bratislava
- Partners: ÚGKK SR and Geotronics Slovakia s.r.o
- Number of participants: over 150
- Feedback: well appreciate

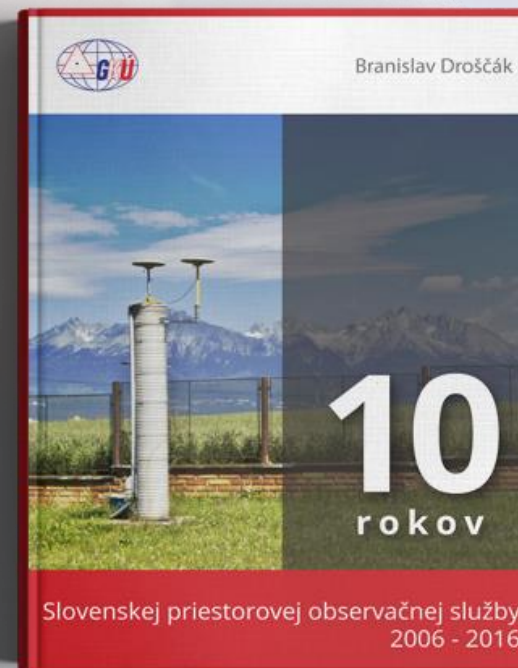
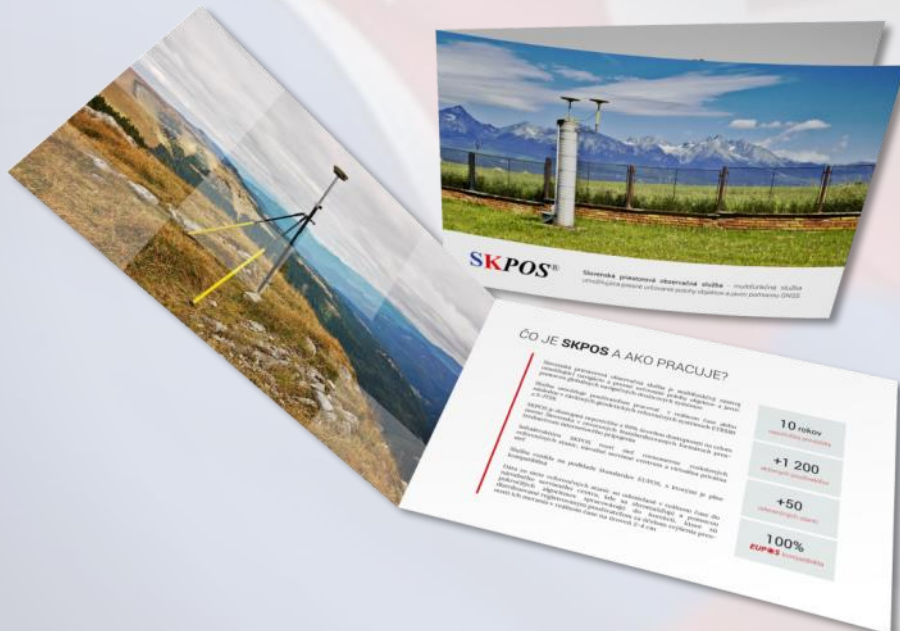


SKPOS®

10 years anniversary (2006 – 2016)



- New book: 10 years of SKPOS (in Slovak)
- New SKPOS promo brochure



New guideline for users

- Name of the guideline: Usage of Slovak real-time determination system for surveying
- Aim:
 - to define unified procedure of SKPOS usage for surveying in Slovakia
 - to improve the quality and the level of professionalism of surveying using SKPOS

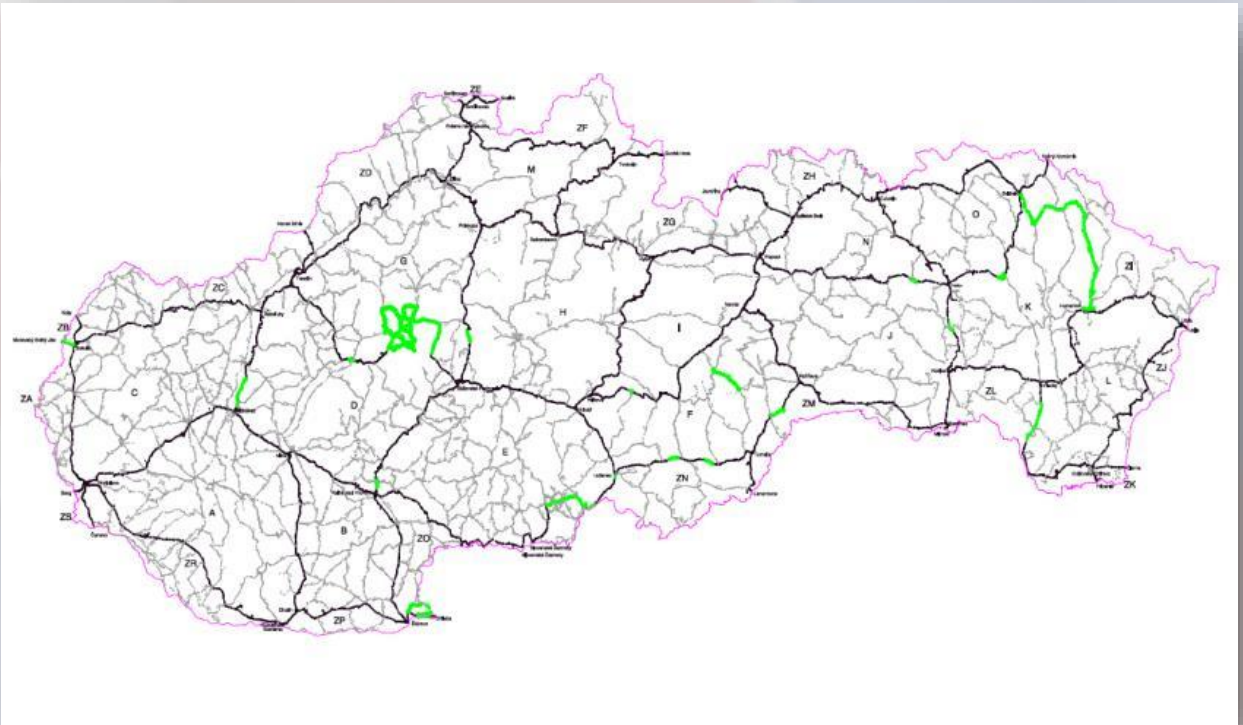





National levelling network

National levelling network

- 585 km of the new levelling lines measured in 2016
- work done by 3 levelling groups
- Target for 2020 year: The new national vertical reference system realization



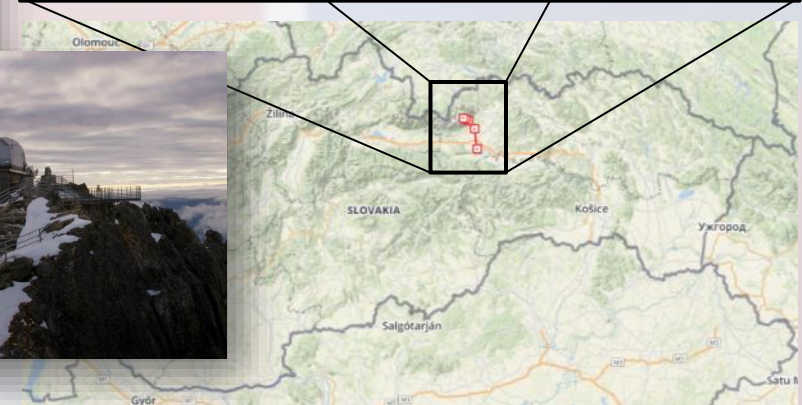
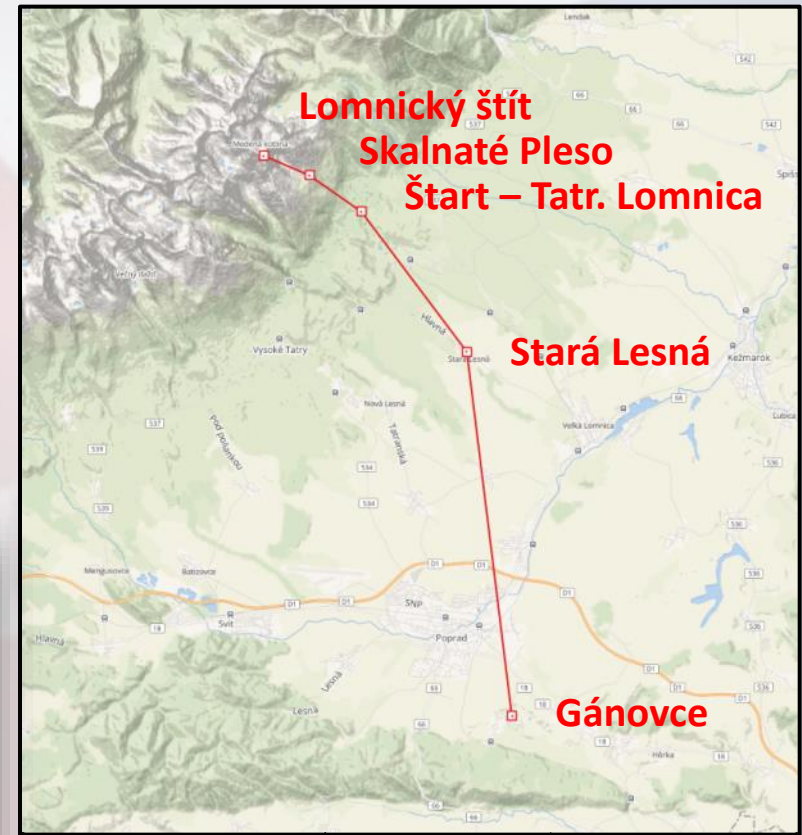


National gravimetric network

National gravimetric network

New vertical gravimetric baseline

- Locality: Tatra mountains
- 5 points
- Gravity difference: 4406,6 μGal
- Height difference: 1935 m
- Highest point: Lomnický peak 2634 m
- measurements done by FG5X-251 (GOP, CZE)



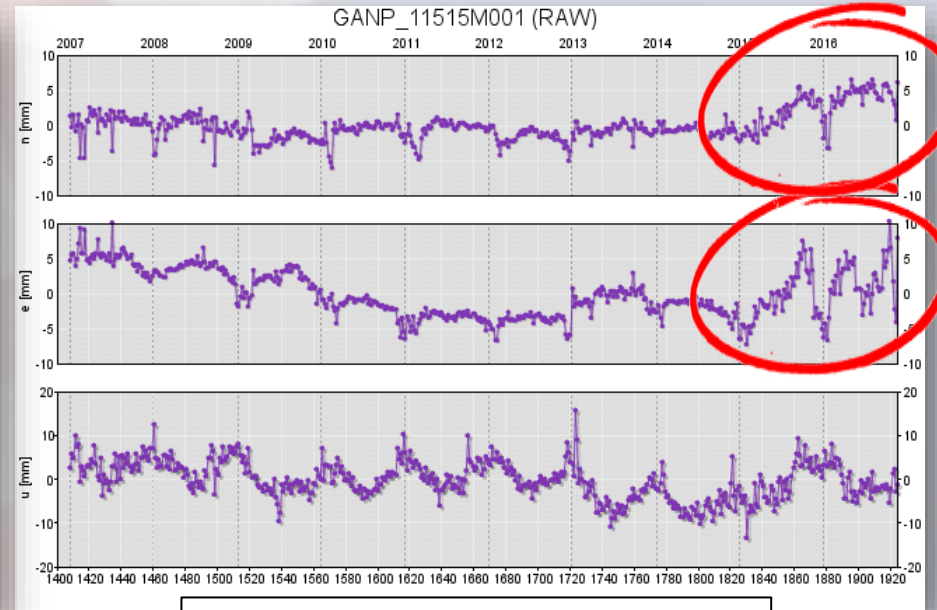


Geodetic and Cartographic Institute Bratislava
Research and development activities

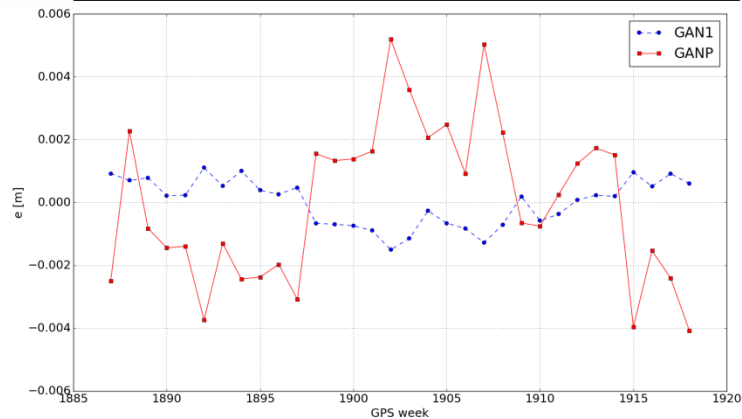
Projects supported by data from SKPOS[®]



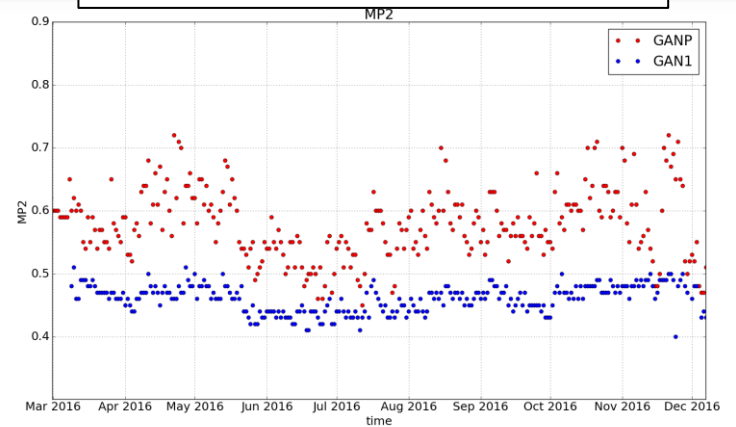
EPN, IGS and SKPOS[®] permanent station GANP (Gánovce) analysis

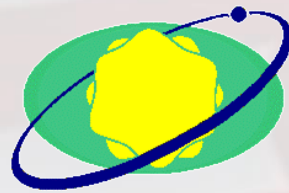


„east“ component differences



MP2 parameter differences

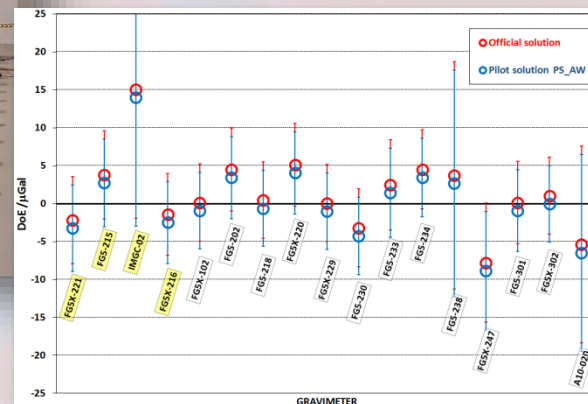
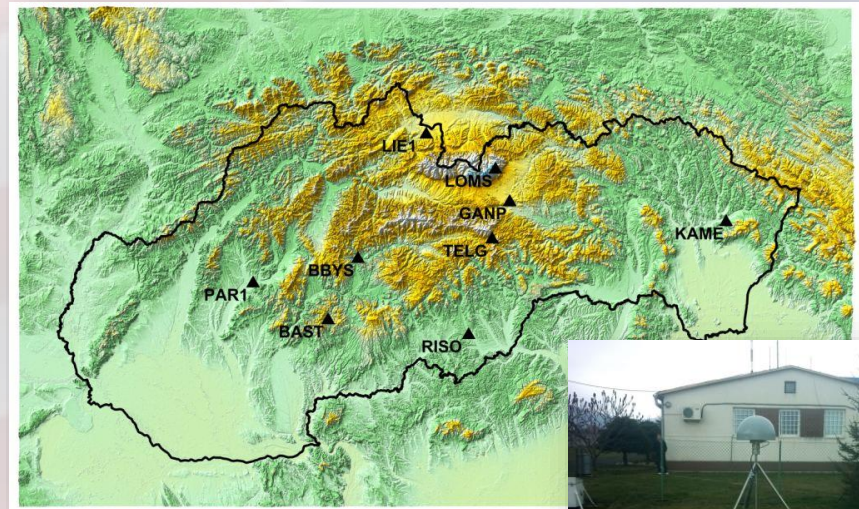




Slovak University of Technology
Research and development activities

National center for diagnosing the Earth surface deformations in Slovakia

- ITMS research project
- 9 absolute gravity / GNSS permanent stations
- Activity in 2016:
 - FG5 gravimeter comparison in Luxembourg



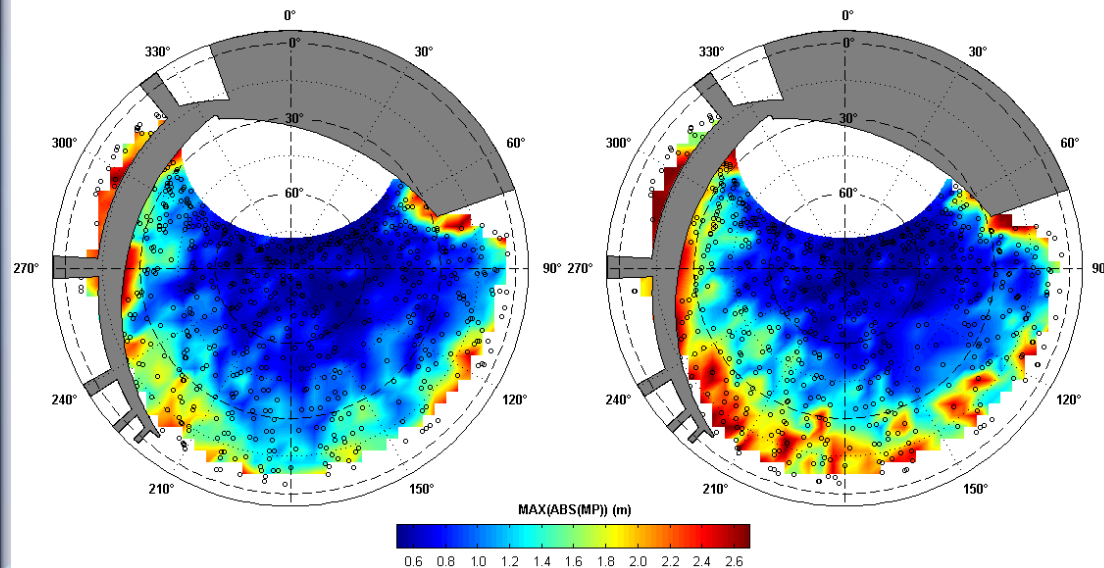
Code multipath experiment



- Two measurement epochs were performed with aim to show contribution of material reflection properties.
- Code multipath statistics MP1, MP2 for GPS signals shows increase up to 60% at point situated in 3 m distance from the wall.

Without alluminium foil

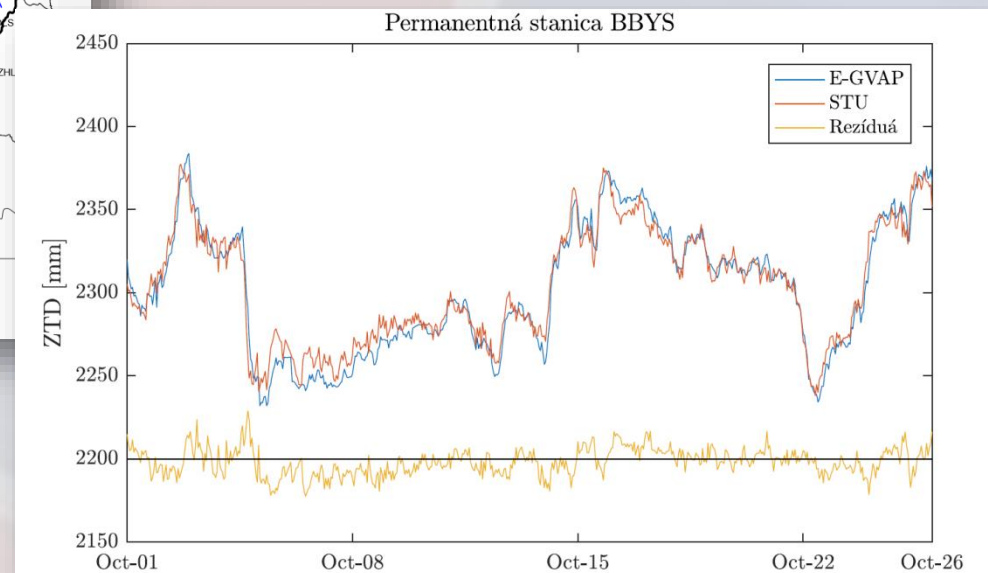
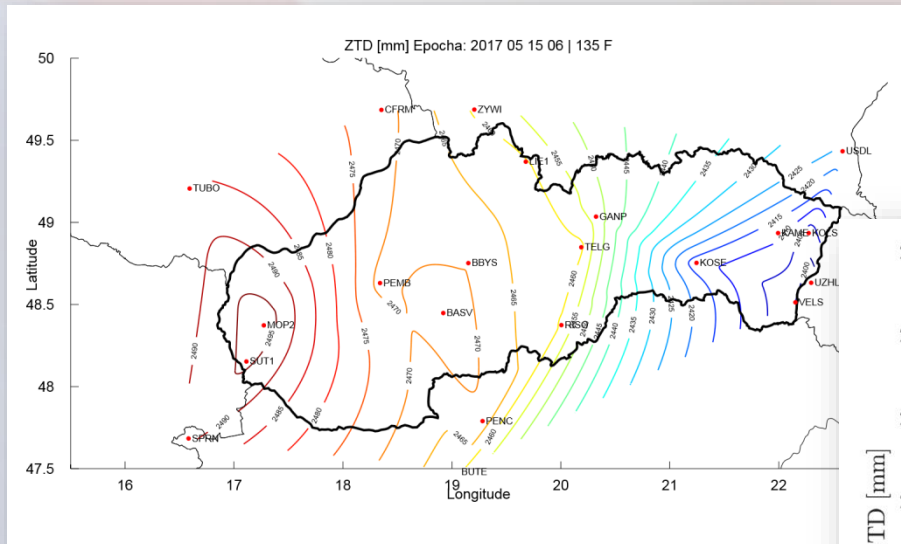
With alluminium foil



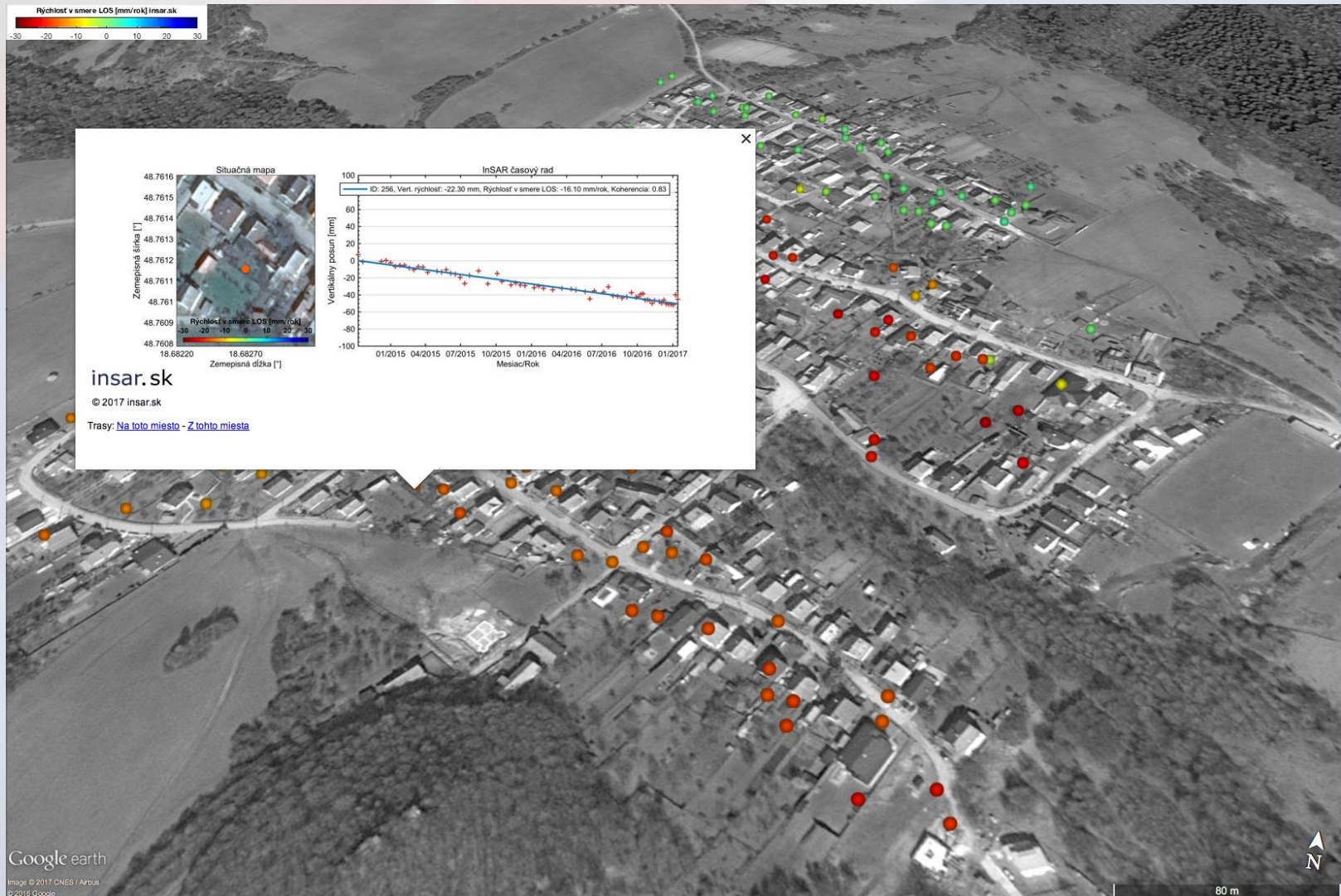
GNSS meteorology - ZTD and PWV computation

SUT own solution

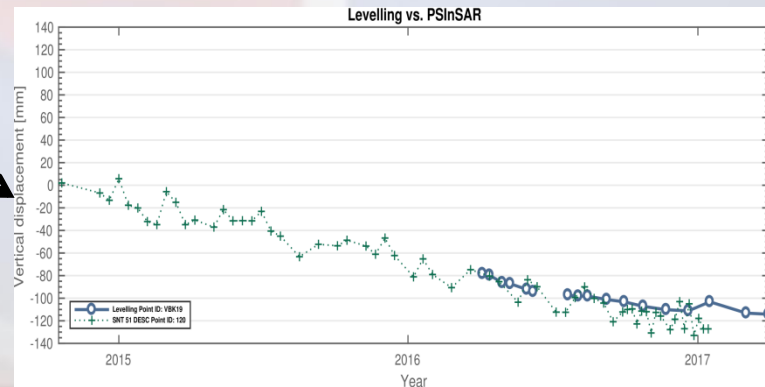
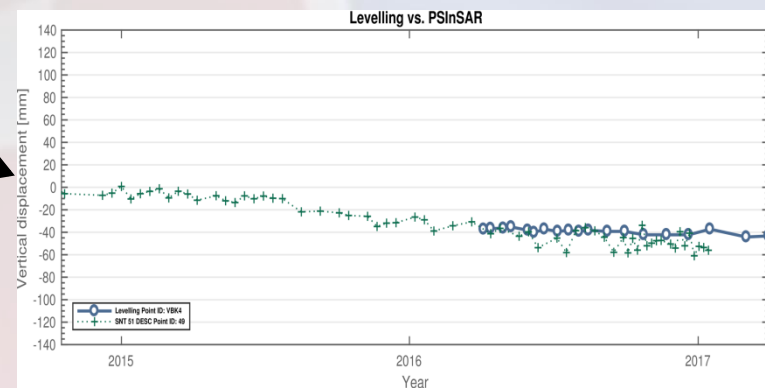
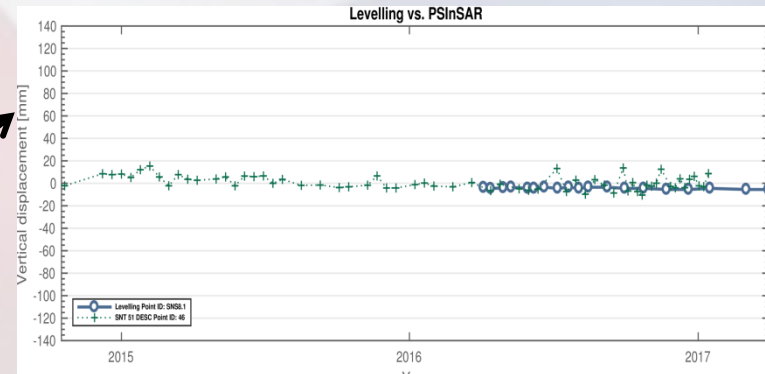
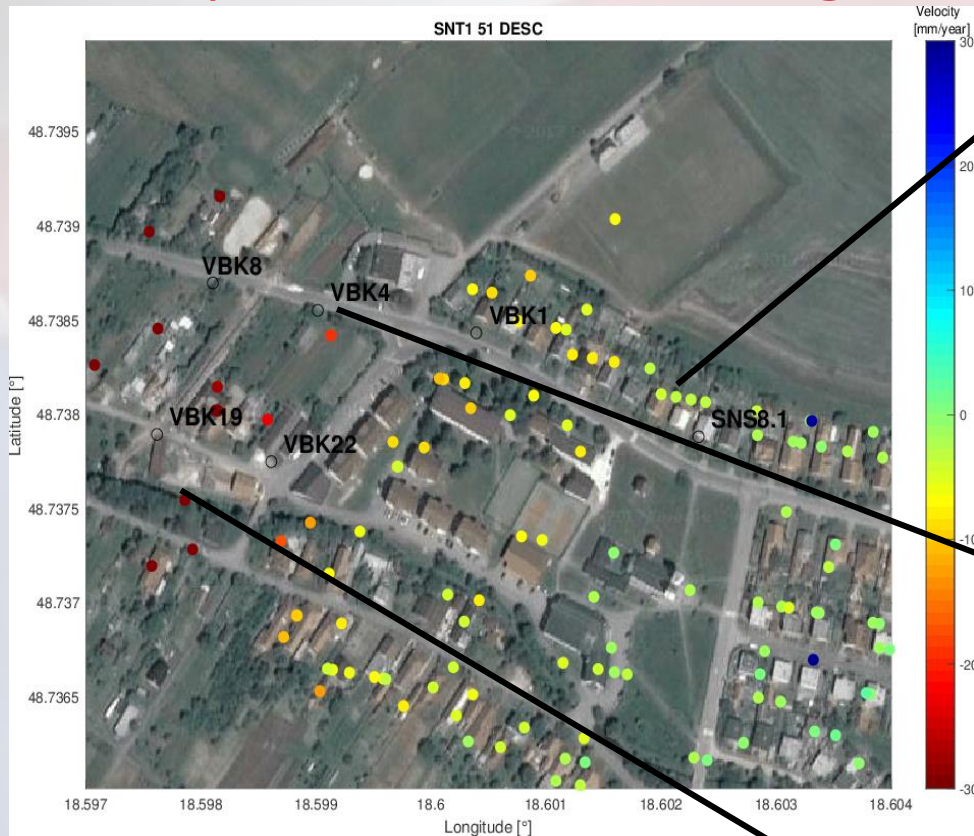
- Near real time GNSS processing in Bernese SW 5.2
- Latency 55-60 min
- Meteorological data from SHMU (Slovak meteorological service)
- 36 GNSS reference stations



Multi-sensor InSAR deformation monitoring: Geohazards - landslides, PRIEVIDZA, SENTINEL-1 (2014 -2017)



Geohazards Landslides – undermined area Koš – comparison with levelling



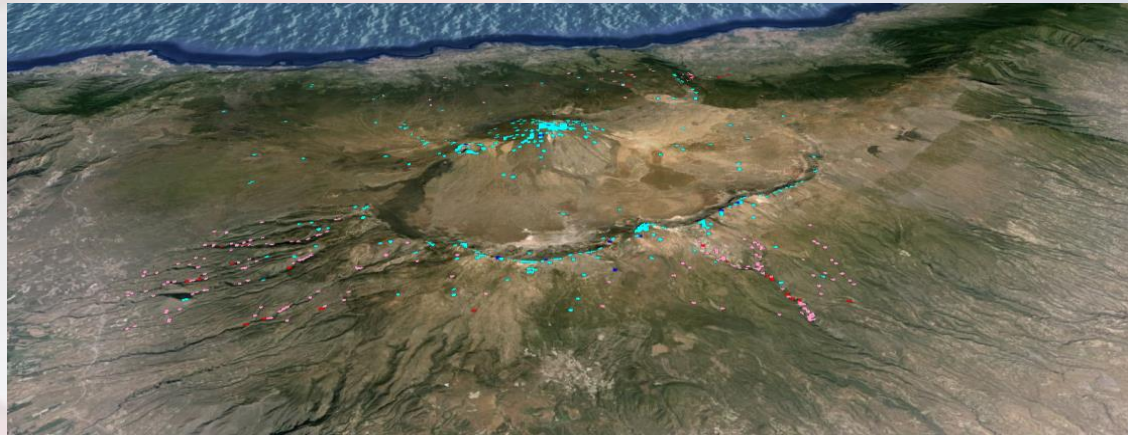
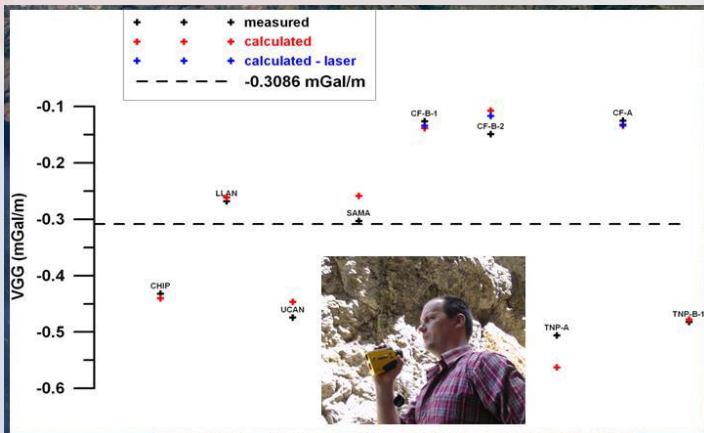
GEOHAZARDS – UNDERMINED AREA, KOŠ,
SENTINEL-1 (2014 -2017) COMPARISON WITH
LEVELLING



Slovak Academy of Science
Research and development activities

PREDICTION OF VERTICAL GRADIENTS OF GRAVITY (VGG)

- Prediction of VGGs based on modelling the topographic gradient effect with use of high resolution high accuracy DTMs (Zahorec, Papčo, Vajda)
- Verification by in situ observations (Tenerife, June 2016)
- Applications in geodesy, geophysics and geodynamics



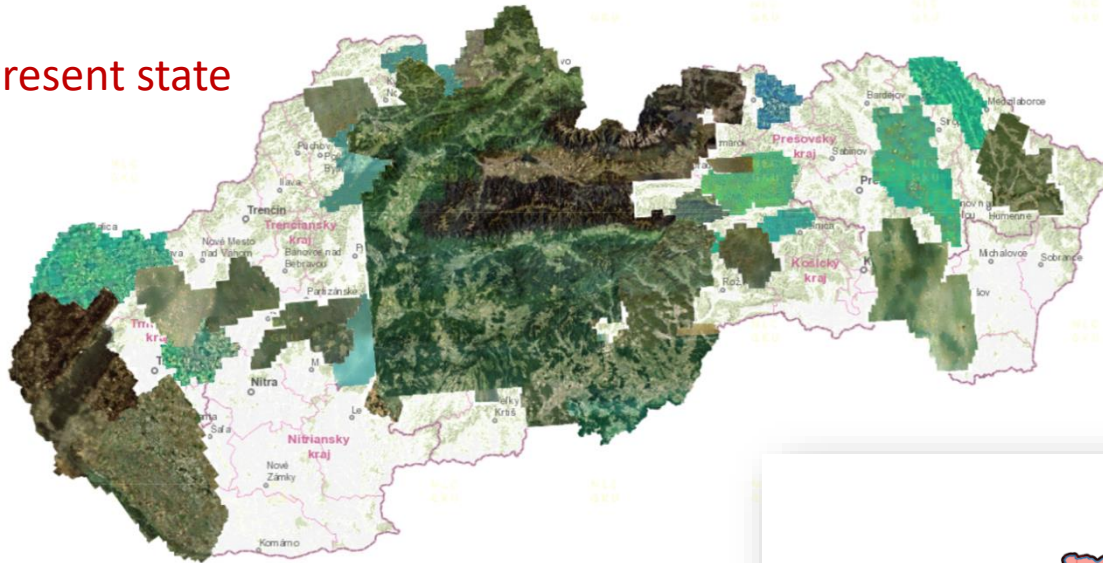


Other news

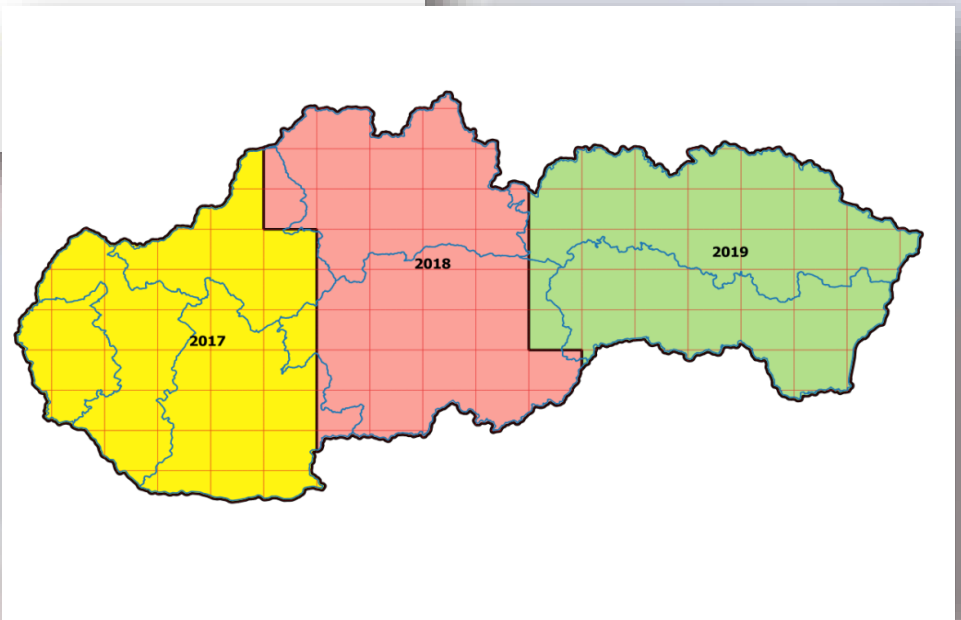
Geodesy, Cartography and Cadastre Authority of Slovak
Republic

Orthophotos of Slovakia

Present state

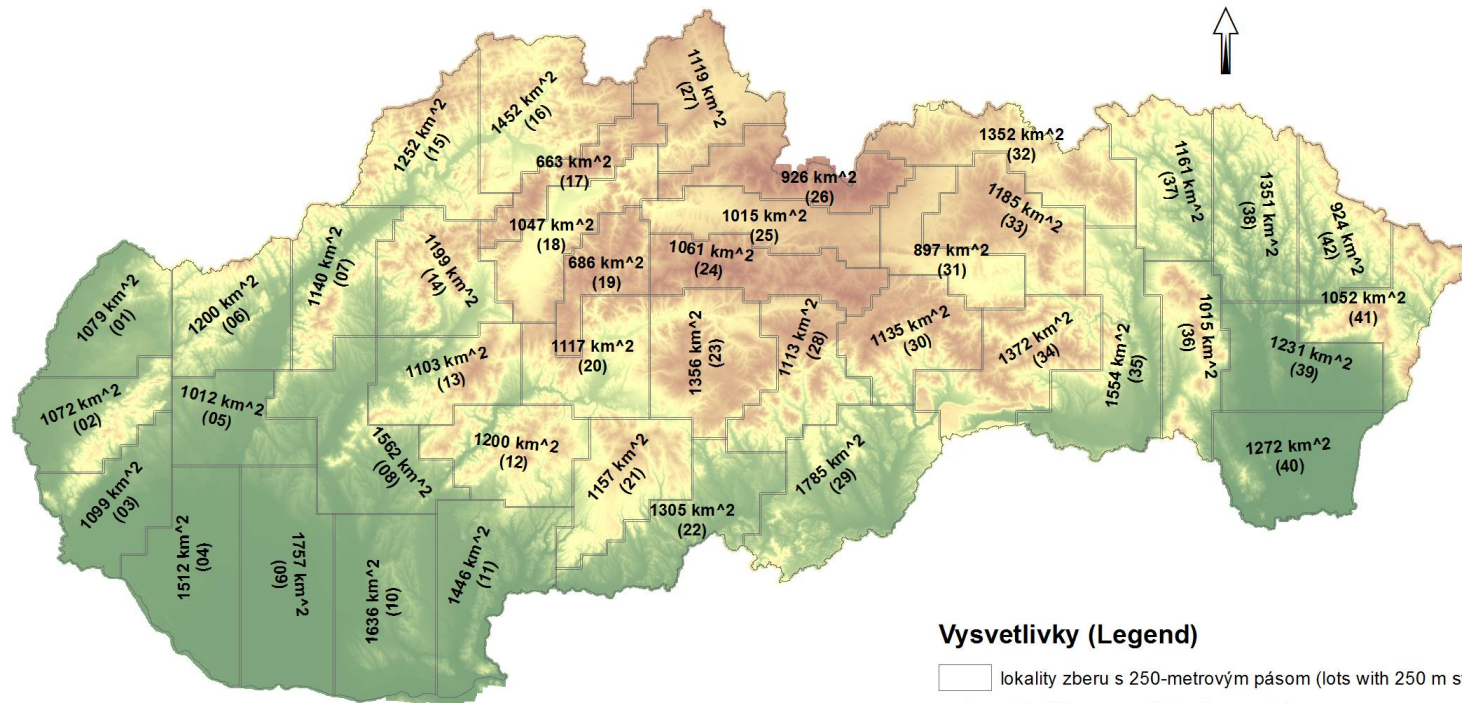


Plan – cooperation between
GCCA and Ministry of
agriculture



Digital elevation model

Lokality zberu pre LLS (Slovenská republika) Lots for ALS (Slovak republic)



Vysvetlivky (Legend)

□ lokality zberu s 250-metrovým pásom (lots with 250 m swath)

nadmorská výška m n.m. (elevation m s.l.)

max : 2655

min : 94

uvedené sú rozlohy lokalít zberu vrátane 250-metrového pásu a čísla lokalít zberu

(areas of lots with 250 m swath are listed altogether with lot numbers)

0 15 30 60 90 120 km



Thank you
for your attention