EUREF 2018 SYMPOSIUM

AMSTERDAM 30 May – 1 June 2018

EUREF Related Activities 2017 - 2018
National Report of the Czech Republic

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Czech Office of Surveying, Mapping and Cadastre: top authority (NMCA)

Cadastral Offices: Information System of Cadastre of Real Estates

Land Survey Office: Administration, realization and maintenance of geodetic control networks, state map work, fundamental database of geographical data (ZABAGED), databases of geodetic point fields, geodetic portal

Research Institute of Geodesy, Topography and Cartography: fundamental and applied research in geodesy, contribution to international scientific services (IAG), standardization and metrology (long lengths, gravity acceleration, time and frequency, 3D-position)

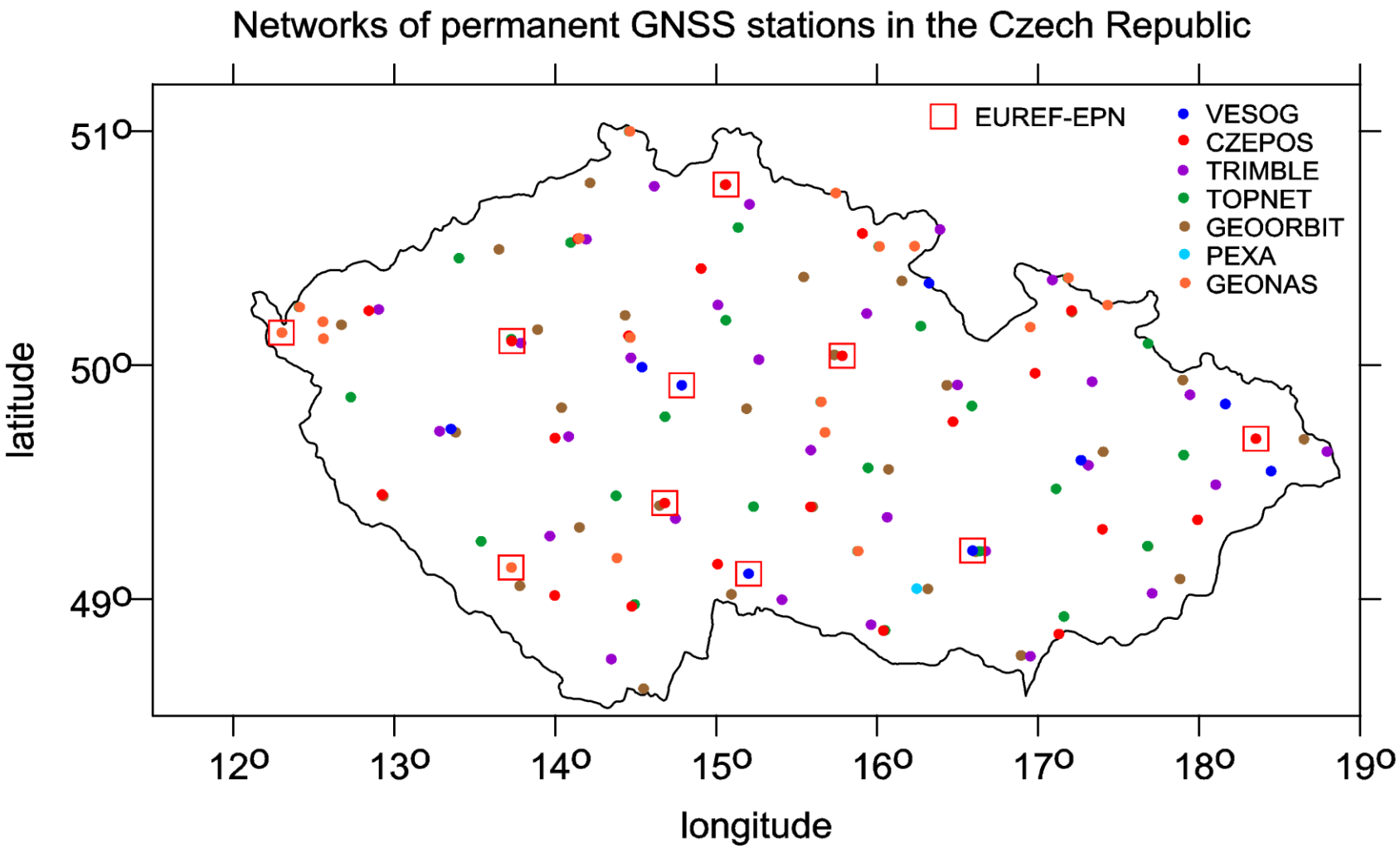
Geodetic refernce frames in the Czech Republic

- Czech Republic – area 78,864 km^2
- 74,962 triangulation points
- 35,415 associated points
- 1313 levelling lines – total 24,711 km
- 119,526 levelling benchmarks (82,722 of the Czech State Levelling Network, 12 fundamental benchmarks)
- 427 gravity control stations
- > 40,000 TP with directly measured ETRS89 coordinates

Permanent GNSS Stations in CR – Status 2018

- Fundamental Geodetic Observatory Pecný – GOPE, http://www.pecny.cz (IGS, EPN, CZEPOS, VESOG, E-GVAP II, SPMS, MGEX …)
- CZEPOS: http://czepos.cuzk.cz, Czech Positioning System, **28 PS**, operated by the Land Survey Office since 2004/2005 + **27 PS** of neighbour countries
- GEONAS: http://geonas.irsm.asc.cz, **19 PS**, experimental monitoring network operated by the Institute of Rock Structure and Mechanics, Acad. Sci. CR
- VESOG: http://pecny.asu.cas.cz/vesog/, research and experimental GNSS network operated by the RIGTC GOP and academic institutions, **8 PS**
- TopNet: http://www.geodis.cz, **27 PS**, includes also 11 GEONAS and 3 VESOG PS, operated by the private company GEODIS Brno
- Trimble VRS NOW Czech: http://www.geotronics.vrsnow, 2**9 sites** + 8 sites of Trimble VRS NOW Deutschland, operated by Geotronics Praha, s.r.o. private company
- GEOORBIT https://www.geoorbit.cz, **30 PS,** geoobchod, s.r.o.
- several smaller networks or individual stations, operated by private companies, e.g. *byS@T,* PEXA and others
- **Total: 139 permanent stations, 11 EPN**

CORS Operating in the Czech Republic in 2018

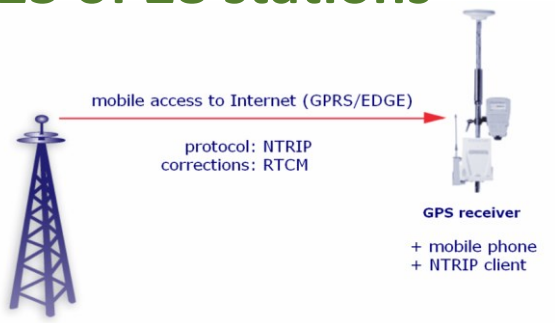


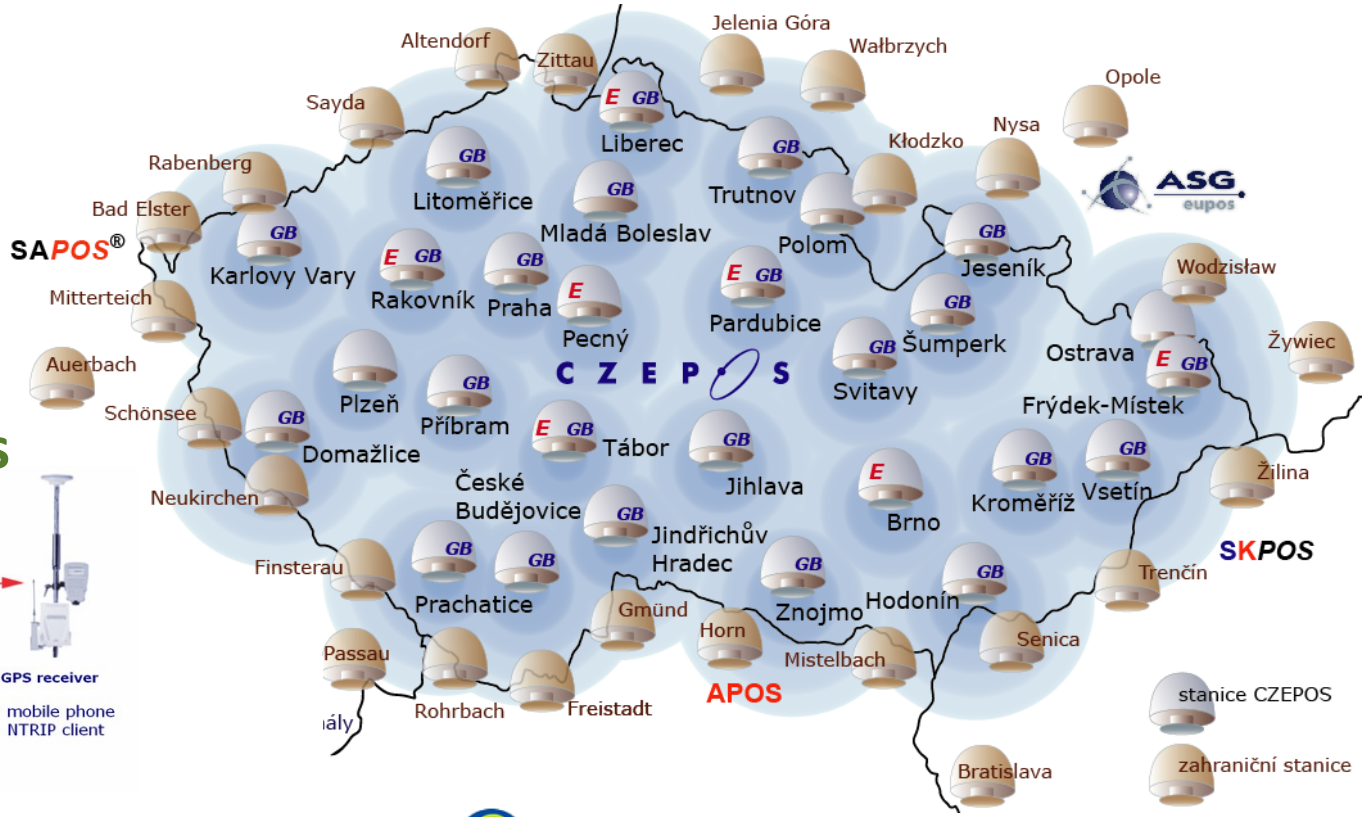
Administration of CZEPOS network

- 28 Czech stations
- 27 neighboring stations

- real-time services
- post-processing products
- GPS/GLONASS

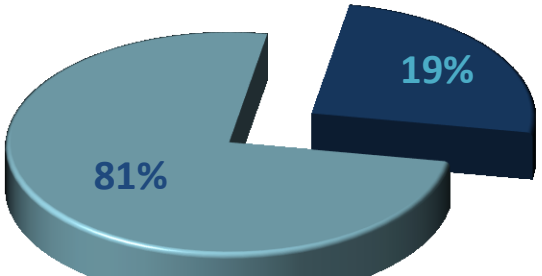
2017 Galileo + BeiDou 23 of 28 stations



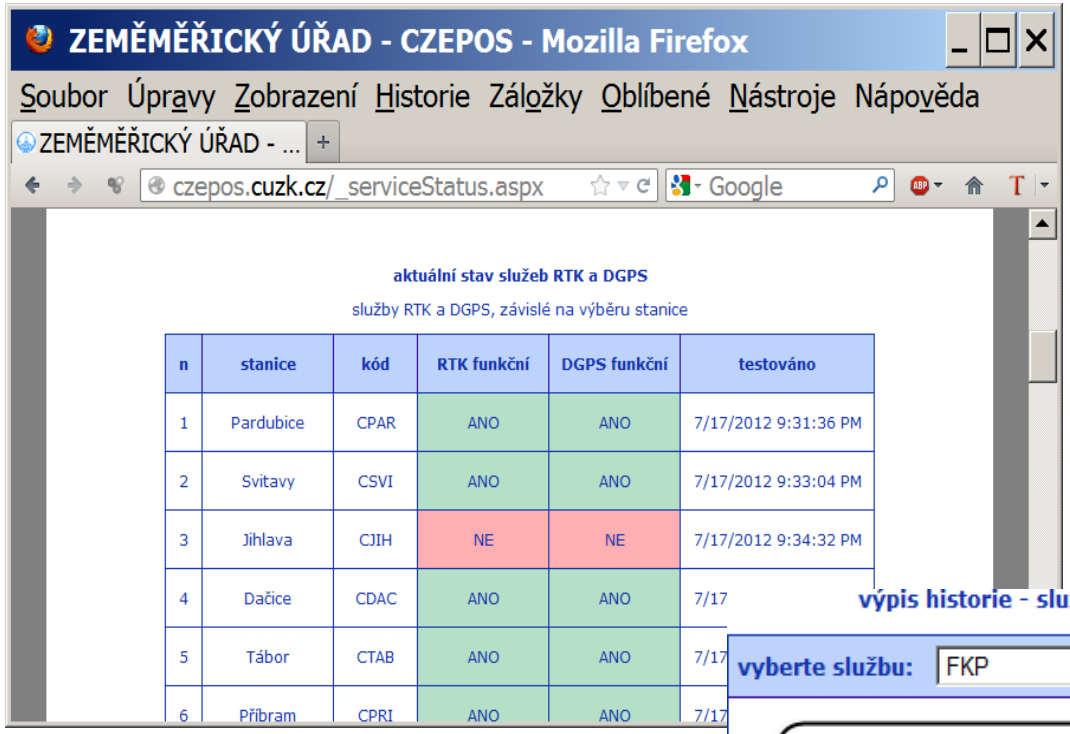


- 7 stations involved in EUREF permanent network (EPN)
- cooperation within EUPOS project

2018/04: 1610 users

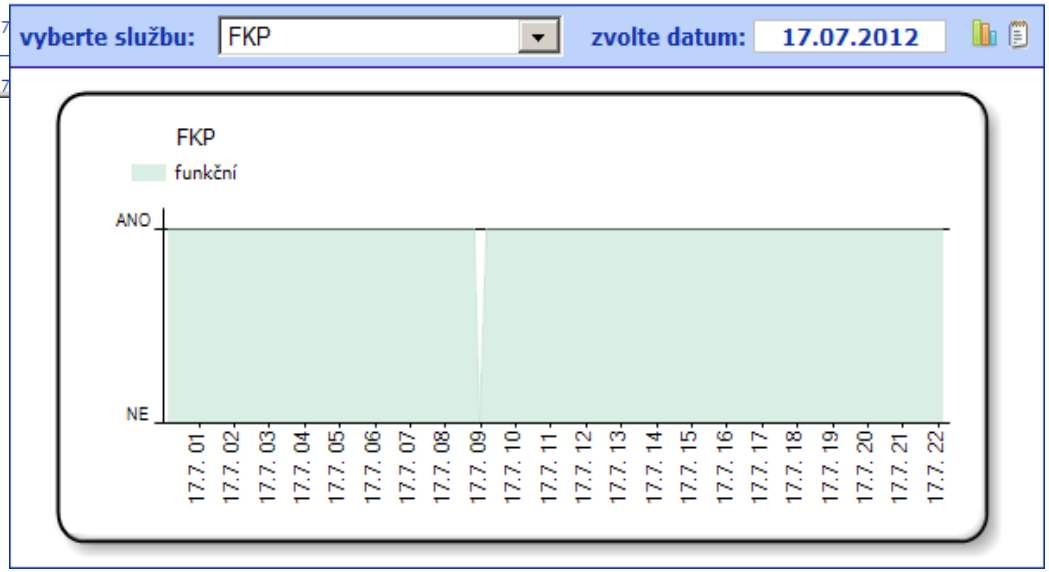


Administration of CZEPOS network

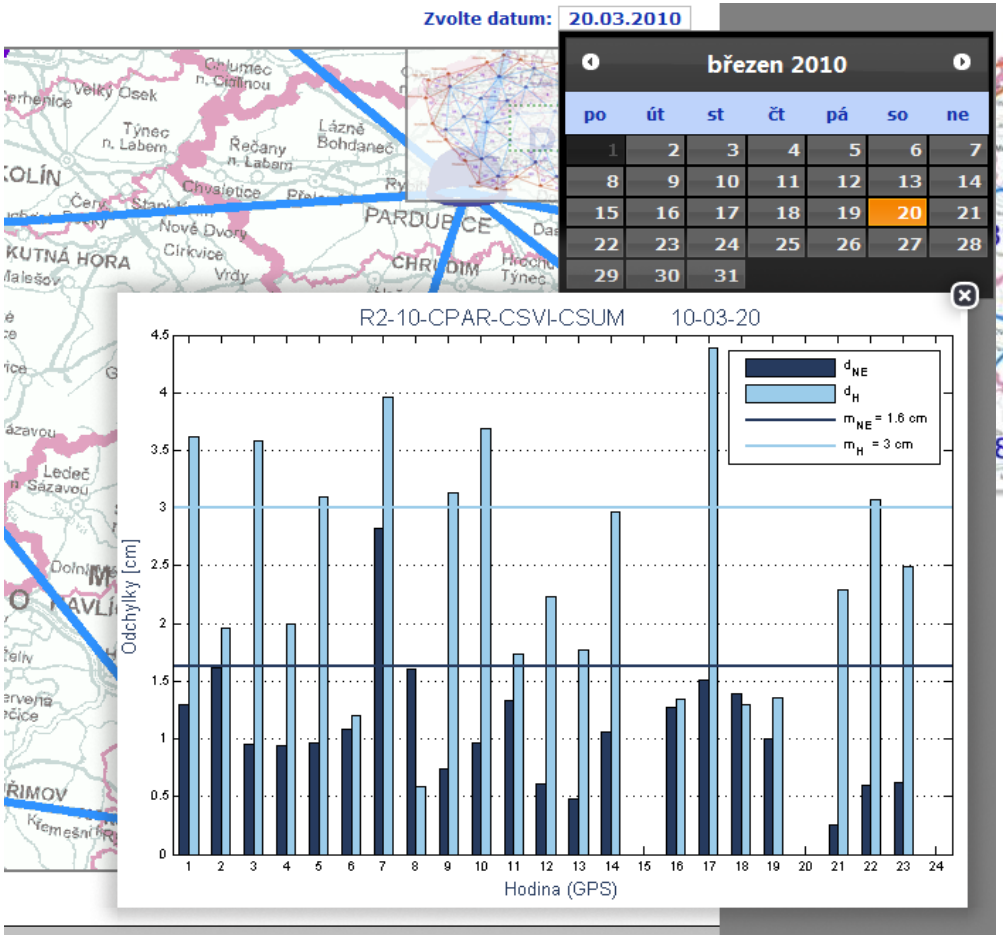


n	stanice	kód	RTK funkční	DGPS funkční	testováno
1	Pardubice	CPAR	ANO	ANO	7/17/2012 9:31:36 PM
2	Svitavy	CSVI	ANO	ANO	7/17/2012 9:33:04 PM
3	Jihlava	CJIH	NE	NE	7/17/2012 9:34:32 PM
4	Dačice	CDAC	ANO	ANO	7/17
5	Tábor	CTAB	ANO	ANO	7/17
6	Příbram	CPRI	ANO	ANO	7/17

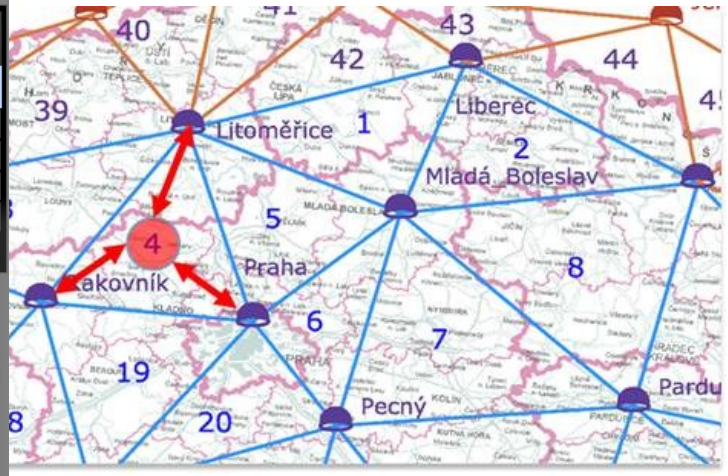
- monitoring of operation



Administration of CZEPOS network



•monitoring of accuracy



- Internet application, created in cooperation with CTU

- 75 testing areas on the territorry of CR including border areas

- there are 3 testing baselines in each area

- each baseline is tested from RTK x VRS service

Administration of CZEPOS network

•monitoring of stability

Monitoring permanentních stanic GNSS - Windows Internet Explorer

http://oko.pecny.cz/monitor/#d

Monitoring permane...

Monitoring permanentních stanic GNSS

Dočasné uživatelské rozhraní do doby, než bude služba umístěna na webu ČUZK

VUGTK

Vyvinuto ve VUGTK, GO Pecny

Statuty stanic a souřadnice pro konkrétní den | Aktuální ověřené souřadnice | Celkový přehled | Nápověda | Webová sluzba

Nahoru

1. Statuty stanic a souřadr

Stav pro den 20.1.2015 (úterý) - poslední vypočtený den

Vybrat: poslední | včera | předevčírem | -3 dny

Statuty stanic a ověřené souřadni

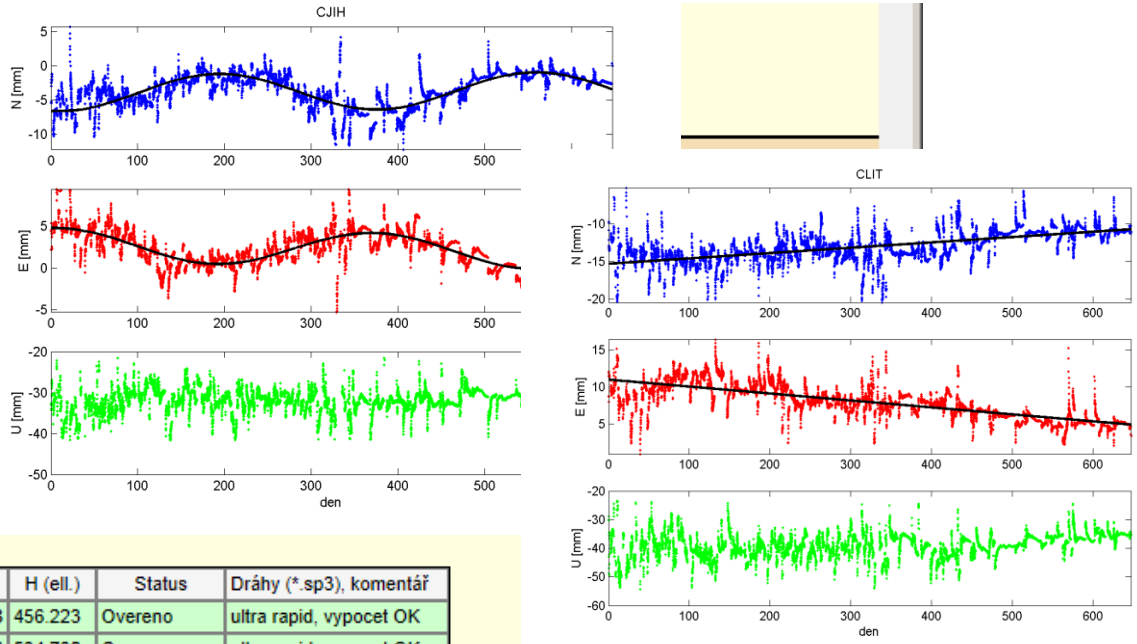
Výsledky pro síťová řešení (z ultra rapid řešen

Síť	Výsledek
CZEPOS	CZEPOS : Síťové řešení ověřeno
TRIMBLE	Trimble VRS NOW : Síťové řešení neověřeno

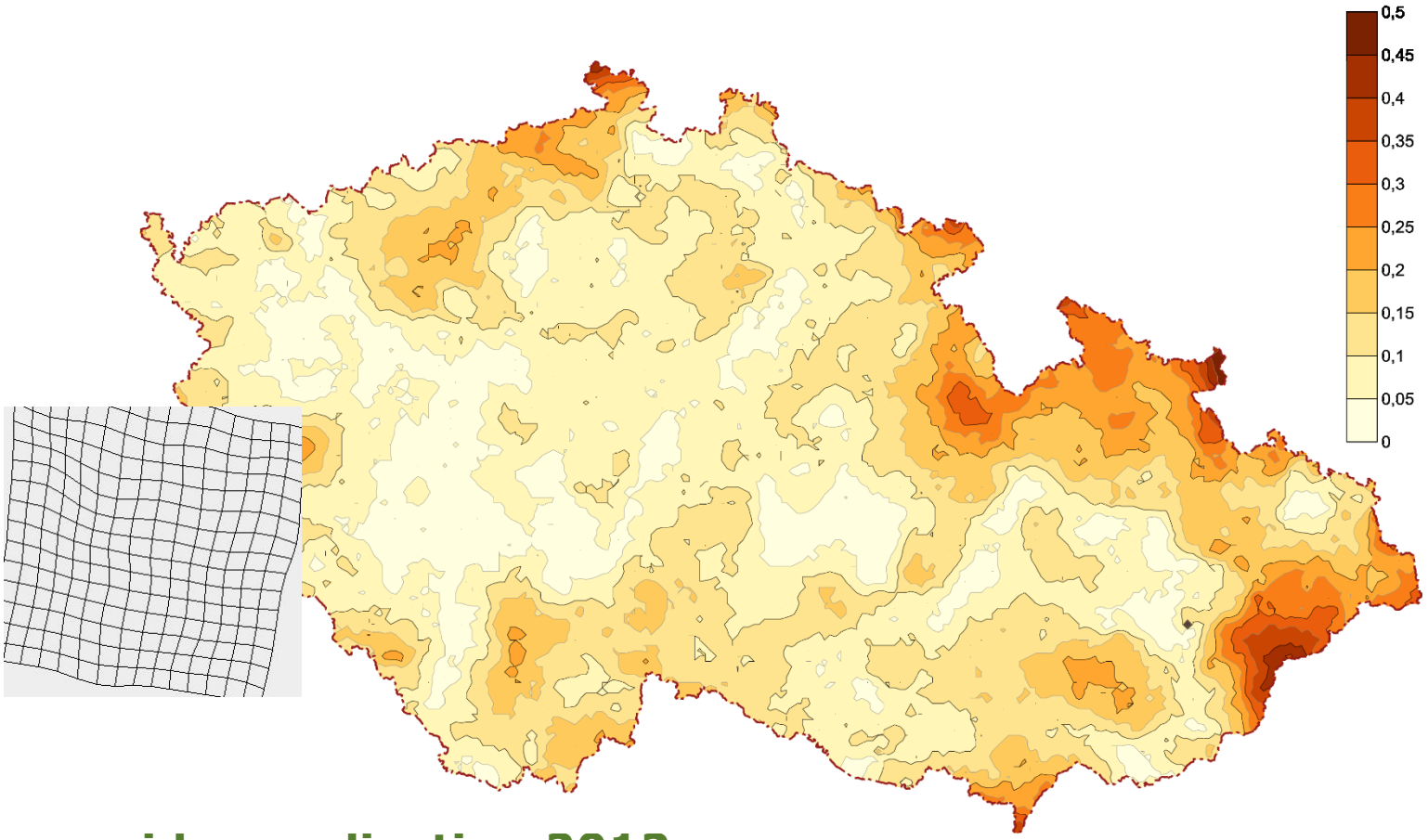
Výsledky pro jednotlivé stanice z ultra rapid ře

Stanice	Popis	B			L			H (ell.)	Status	Dráhy (*.sp3), komentář
CBUD	České Budějovice	48	58	3.47154	14	28	30.97608	456.223	Overeno	ultra rapid, vypocet OK
CDAC	Dačice	49	04	47.20485	15	26	12.45539	534.730	Overeno	ultra rapid, vypocet OK
CDOM	Domažlice	49	26	45.25334	12	55	26.77675	519.603	Overeno	ultra rapid, vypocet OK

Cooperation with Research Institute of Geodesy and Cartography



Positional Transformation – grid of local differencies

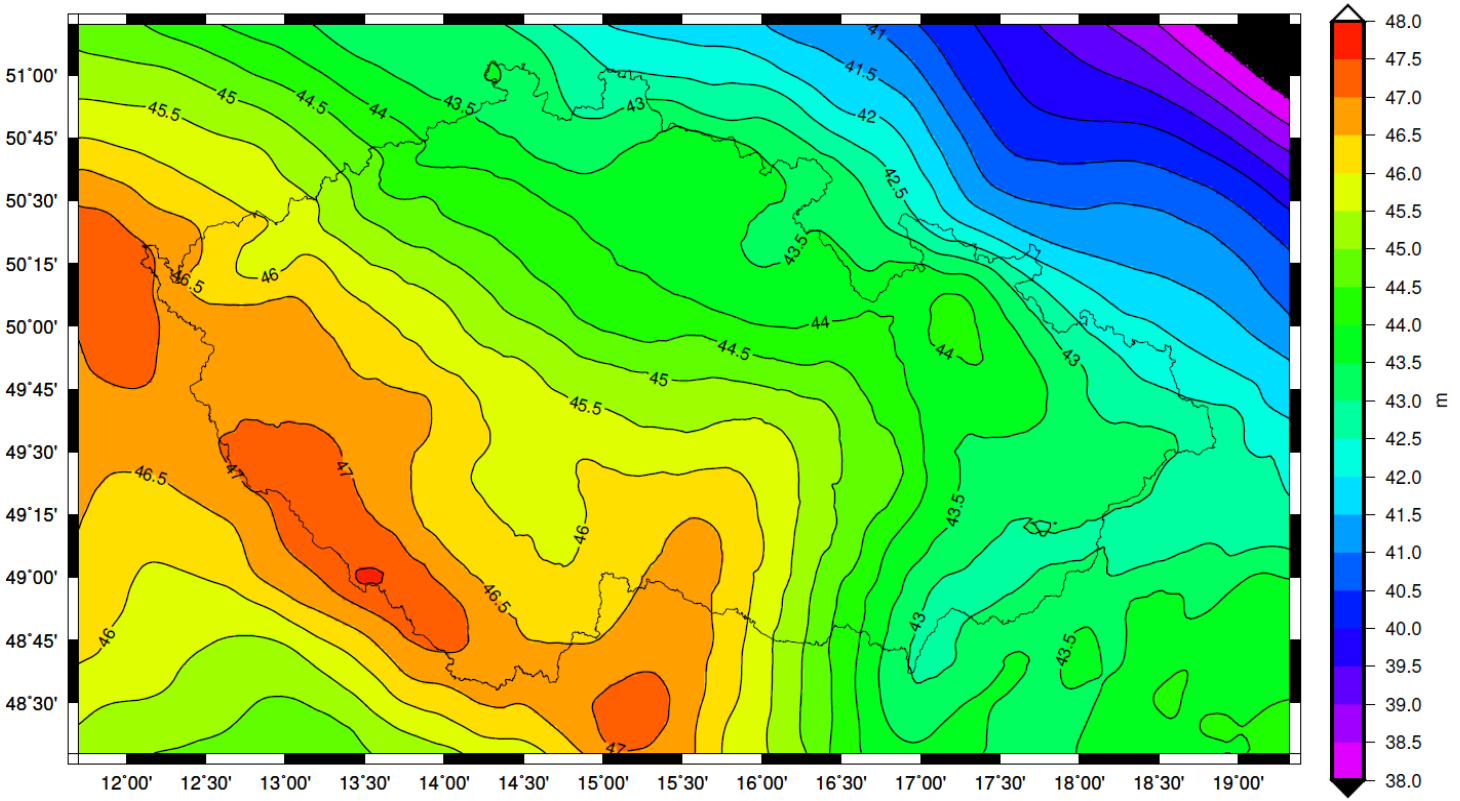


- Previous grid — realization 2012
- New realization 2017:
  - new GNSS measurements 2014-2017, smoother changes
  - higher density of points in the areas of state boundaries

Reference Frames - Height Transformation

European Terrestrial Reference System 1989 (ETRS89) ellipsoidal heights GRS80

Baltic Height System (national realization - Bpv)



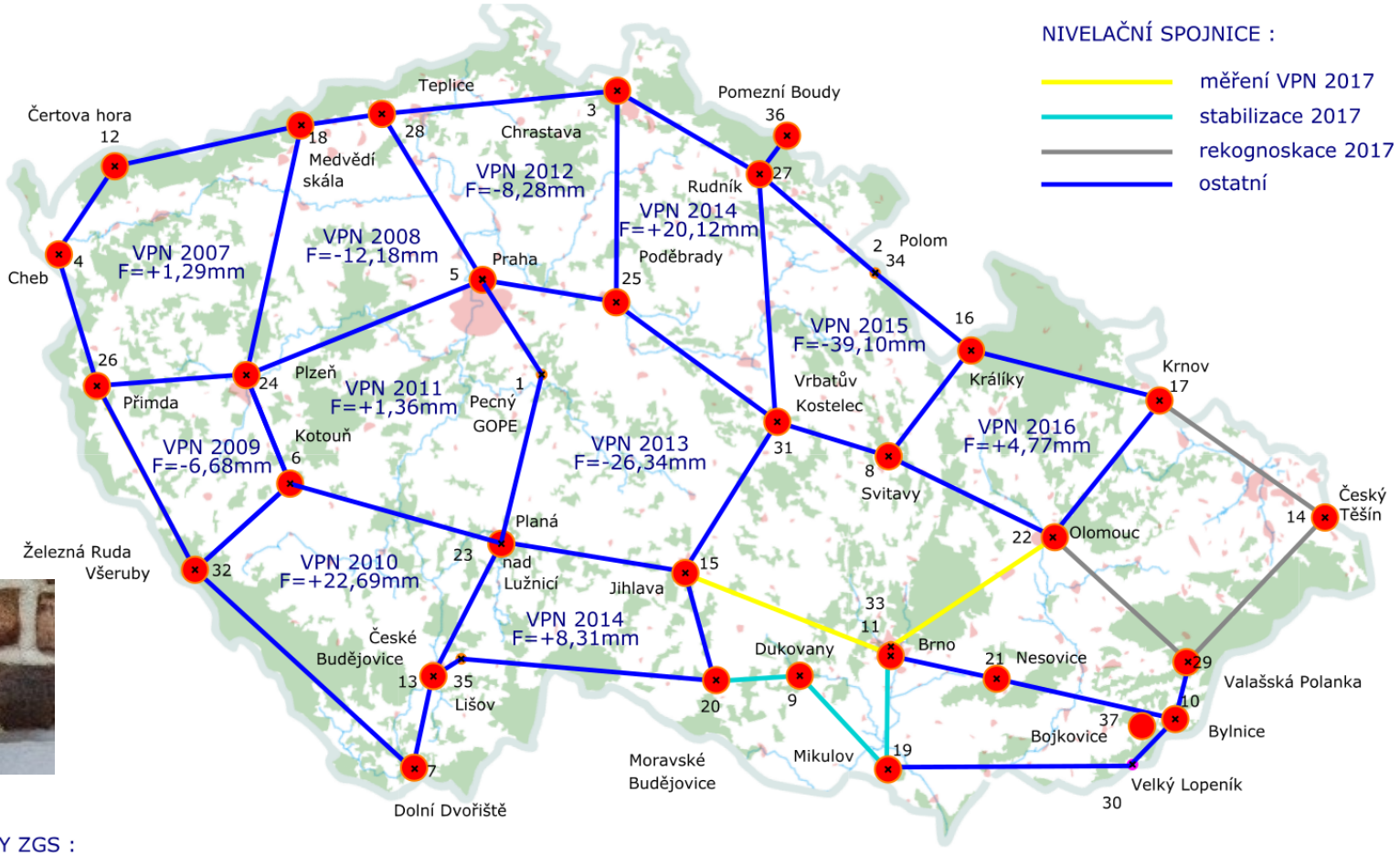
Quasigeoid QGZÚ-2014

- computed in cooperation with Research Institute of Geodesy and Cartography
- **new GNSS/gravimetric measurements**

Height Transformation

Baltic Height System (national realization - Bpv)

European Vertical Reference System (EVRS)

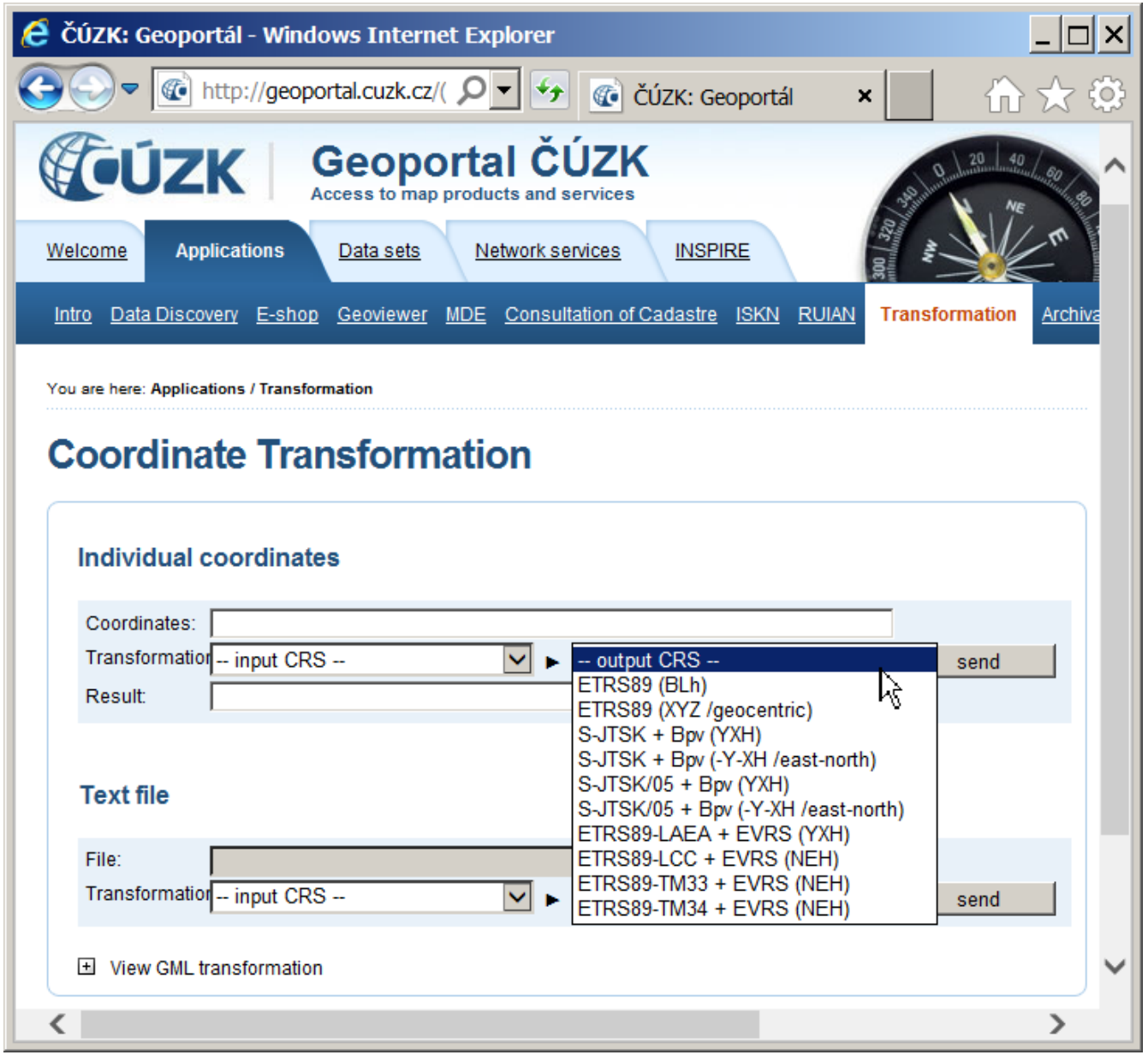


BODY ZGS :

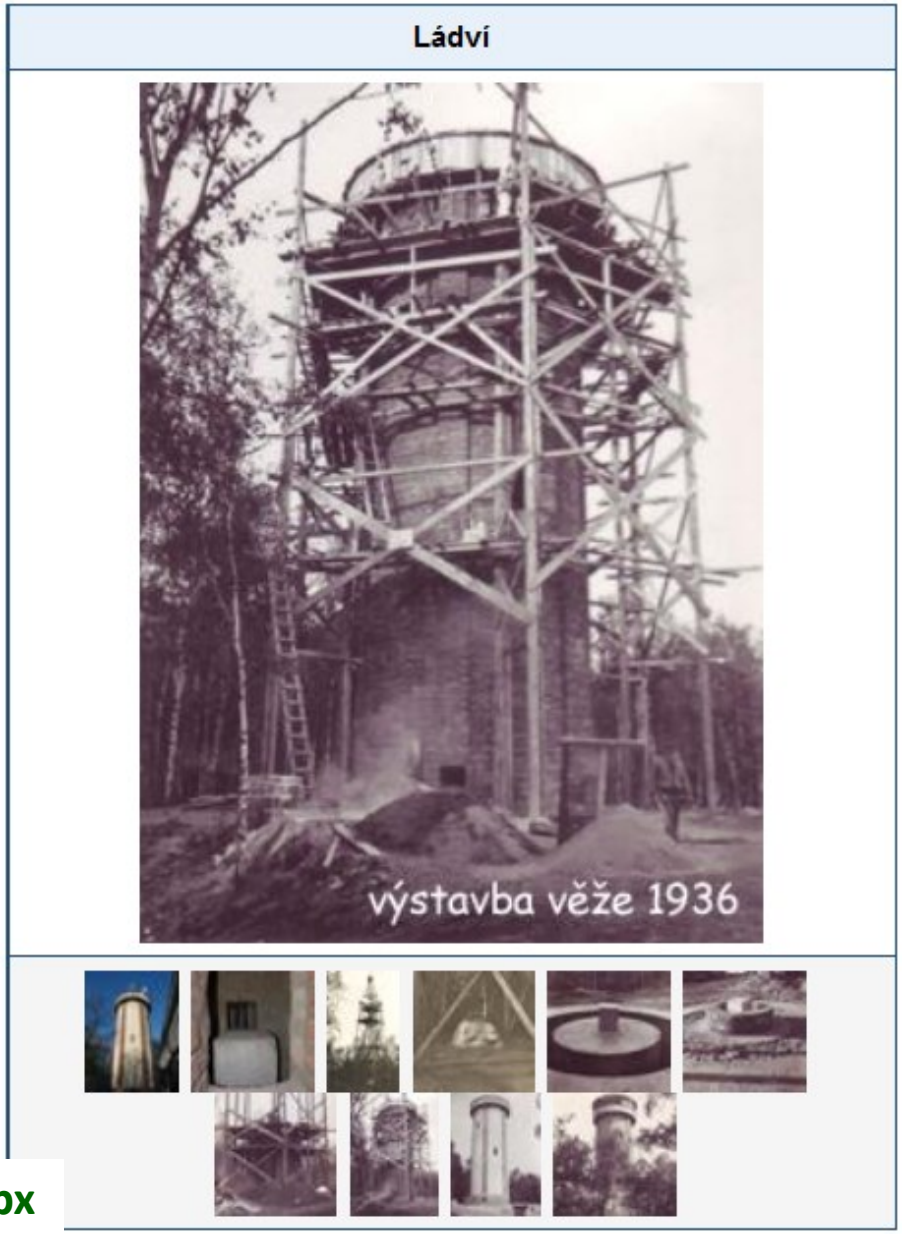
National realization of EVRS - precise leveling → grid densification

2018: results of leveling 2007 – 2016 were sent to BKG (UELN center)

Transformation Service of Geoportal ČÚZK



Popularization of historical trigonometric points



https://bodovapole.cuzk.cz/vyznamneTB.aspx

Fundamental levelling benchmarks



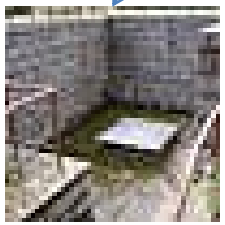



Lišov





Pecný


https://bodovapole.cuzk.cz/_znb.aspx

Geodetic Observatory Pecný (GOP) - Research Activities

- **GNSS** (Global Navigation Satellite Systems) – data collection, data quality control, data dissemination, precise analysis of regionally and globally collected data
- **DORIS** (Doppler Orbitography and Radiopositioning Integrated by Satellites) – precise analysis of globally collected data,
- **Gravity field modelling** – ground data collection and analyses, processing of data from Low-Earth Orbiter missions and satellite altimetry,
- Interdisciplinary research including **software development** – models and precise products for autonomous positioning applications, meteorology and climatology applications, geophysics and geodynamics applications,
- Applied research towards **geodetic reference frame realization** and maintenance (ETRS89, absolute gravity network)
- Applied **research in metrology** (long lengths, gravity, 3-D position, calibrations of instruments)

Major Space Projects & References

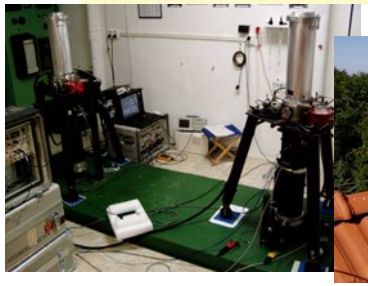
- **E-GVAP** – The EUMETNET EIG GNSS Water Vapour Programme (2005–2019, *EUMETNET service*)
- **DARTMA** – Development and Assessment of Regional Augmentation **Tropospheric Model for GNSS Positioning** (2014–2016, *ESA contract*)
- **Trop4LAS** – Assessment Techniques of Tropospheric Effects for Local Augmentation Systems (2012–2014, *ESA contract*)
- **EPOS** – **European Plate Observing System**, Implementation Phase (2015–2019, *H2020*)
- **SPMS** – **EGNOS Service Performance Monitoring** (2015–2022, *GSA*

Major Space Projects & References

- **GRC-MS – Galileo Reference Centre**, support from the member states (2017–2021, *GSA*)
- **IGMA** – International GNSS Monitoring and Assessment, task force of the International Committee on GNSS, ICG (2017–2020, UN)
- **GNSS4SWEC** – Advanced GNSS Tropospheric Products for Monitoring Severe Weather Events and Climate (2013–2017, EU)
- **SWIRLS** – Galileo Professional Receiver Development (2005–2008, EU FP 6, coordinated by Septentrio Ltd.)
- 100 global stations for determining the precise orbits and clock corrections for GPS and GLONASS satellites

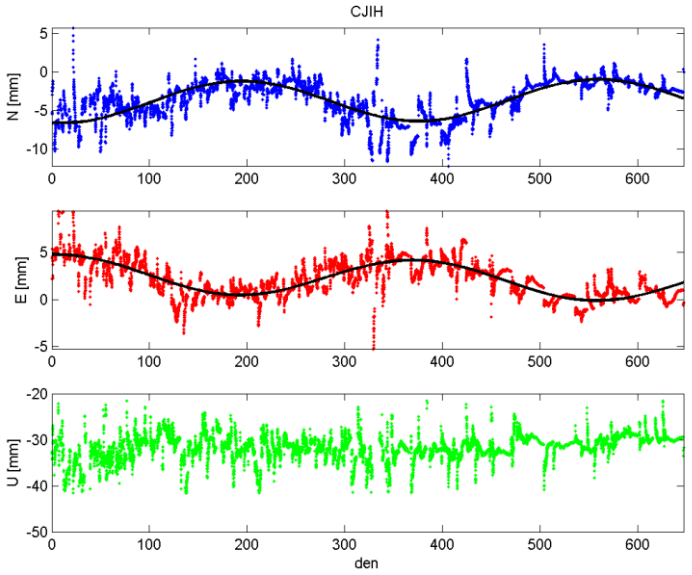
GOP – Labs and Equipment

- 12 precise (geodetic) **GNSS receivers** (6 employed in Greece),
- **atomic Cs-clock** (a part of national group standard of time and frequency)
- **passive H-maser**,
- **2 absolute** (FG5 and FG5X), **3 relative and 1 superconducting gravimeter** OSG; national gravity standard
- **water vapour radiometer**
- **3-D VBB seismometer**
- various **meteorological and environmental sensors**,
- **test and calibration baseline for 3-D positioning using GNSS** (national reference standard).



GOP: Monitoring and Reporting of all Active CORS Stations in the Czech Republic

- Check of stability and quality
- Currently **123 stations included in monitoring**
- Rapid solution used as a basis
- EPN processing standards and guidelines
- 8:00 UTC the daily solution compared with coordinates + statistical test
- Limits: 7mm, 7 mm and 15 mm for N,E,U components
- Reporting for NMCA (National Mapping and Cadastre Administration)

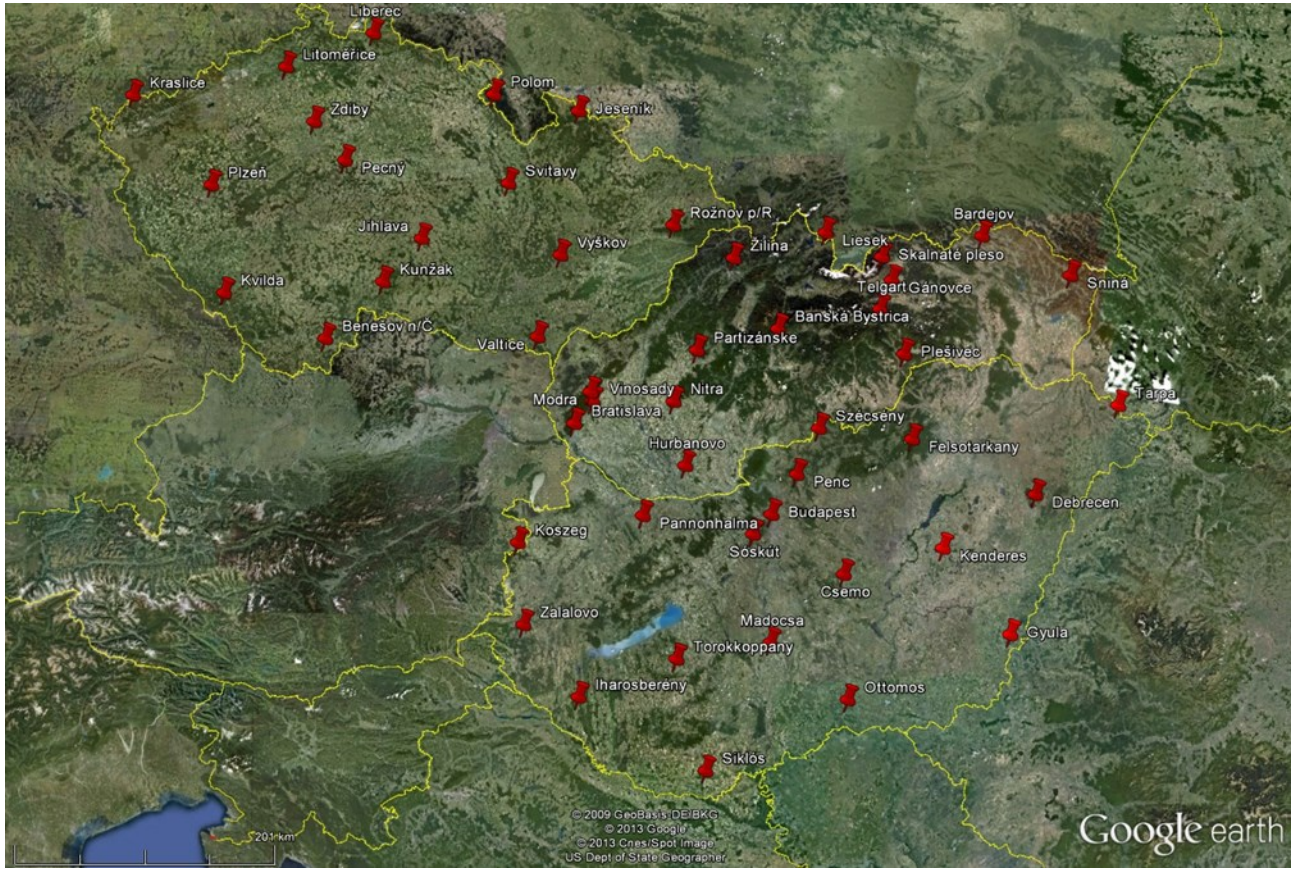


Research Institute of Geodesy, Topography and Cartography

GOP Contribution to Gravity Reference Frame Realization and Maintenance in Czechia, Slovakia and Hungary: Repeated Absolute Gravity Measurements

2017: 3 stations in Hungary, 4 stations in Beijing (China) CCM.G-K2.2017

2018: 3 stations in Hungary, 3 stations at Wettzell EURAMET.M.G-K3



thank you for your attention!

for more detailed information please visit
http://czepos.cuzk.cz
http://www.cuzk.cz
http://pecny.cz

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