Geodetic, gravimetric and geodynamic research in Slovakia 2015-2018 (Report to IAG)

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1. Reference Frames

1.1 Vertical reference systems

MAJKRÁKOVÁ, M. – PAPČO, J. – ZAHOREC, J. – DROŠČÁK, B. – MIKUŠKA, J. – MARUŠIAK, I. An analysis of methods for gravity determination and their utilization for the calculation of geopotential numbers in the Slovak national levelling network. In *Contributions to Geophysics and Geodesy*. Vol. 46, no. 3 (2016), 179-202.

1.2 Reference surfaces

HUSÁR, L. – ŠVARAL, P. – JANÁK, J. (2017): About the geometry of the Earth geodetic reference surfaces. In *Journal of Geometry and Physics* 120, 192-207. DOI: 10.1016/j.geomphys.2017.05.016.

2. Gravity Field

2.1 Determination of geoid, quasigeoid and other functionals of gravity potential in global and regional scale

BUCHA, B. – BEZDĚK, A. – SEBERA, J. – JANÁK, J. Global and regional gravity field determination from GOCE kinematic orbit by means of spherical radial basis functions. In *Surveys in Geophysics*. Vol. 36, no. 6 (2015), 773-801.

SEBERA, J. – PITOŇÁK, M. – HAMÁČKOVÁ, E. – NOVÁK, P. Comparative Study of the Spherical Downward Continuation. In *Surveys in Geophysics*. Vol. 36, no. 2 (2015), s. 253-267.

KOSTELECKÝ, J. – KLOKOČNÍK, J. – BUCHA, B. – BEZDĚK, A. – FÖRSTE, Ch. Evaluation of the gravity field model EIGEN-6C4 in comparison with EGM2008 by means of various functions of the gravity potential and by GNSS/levelling. In *Geoinformatics*. Vol. 14, no. 1 (2015), 7-27.

BUCHA, B. – JANÁK, J. – PAPČO, J. – BEZDĚK, A. High-resolution regional gravity field modelling in a mountainous area from terrestrial gravity data. In *Geophysical Journal International*. Vol. 207, no. 2 (2016), 949-966.

VANÍČEK, P. – NOVÁK, P. – SCHENG, M. – KINGDON, R. – JANÁK, J. – FOROUGHI, I. – MARTINEC, Z. – SANTOS, M. (2017): Does Poisson's downward continuation give

physically meaningful results? In *Studia Geophysica et Geodaetica*, 61, 412-428. DOI: 10.1007/s11200-016-1167-z.

JANÁK, J. – VANÍČEK, P. – FOROUGHI, I. – KINGDON, R. – SHENG, M. – SANTOS, M.C. (2017): Computation of precise geoid model using UNB Stokes-Helmert's approach: Case study in Auvergne region. In *Contributions to Geophysics and Geodesy*, 47/3, 201-229, doi: 10.1515/congeo-2017-0011.

HÁBEL, B. – JANÁK, J. (2018): Analysis of local covariance functions applied to GOCE satellite gravity gradiometry data. In *Acta Geodaetica et Geophysica* 53, 125-138, DOI: 10.1007/s40328-017-0208-6.

2.2 Gravity data processing, topographical effects, RTM, Bouguer gravity anomalies, hydrological effects

REXER, M. – HIRT, Ch. – BUCHA, B. – HOLMES, S. Solution to the spectral filter problem of residual terrain modelling (RTM). In *Journal of geodesy*. Vol. 92, no. 6 (2018), 675-690.

ĎURÍČKOVÁ, Z. – JANÁK, J. RTM-based omission error corrections for global geopotential models: Case study in Central Europe. In *Studia geophysica et geodaetica*. Vol. 60, no. 4 (2016), 622-643.

MIKOLAJ, M. – MEURERS, B. – MOJZEŠ, M. The reduction of hydrology-induced gravity variations at sites with insufficient hydrological instrumentation. In *Studia geophysica et geodaetica*. Vol. 59, no. 3 (2015), 424-437.

ZAHOREC, P. (2015) Inner zone terrain correction calculation using interpolated heights. In *Contributions to Geophysics and Geodesy* 45(3): 219–235, doi: 10.1515/congeo-2015-0021.

ZAHOREC, P. – PAŠTEKA, R. – MIKUŠKA, J. – SZALAIOVÁ, V. – PAPČO, J. – KUŠNIRÁK, D. – PÁNISOVÁ, J. – KRAJŇÁK, M. – VAJDA, P. – BIELIK, M. – MARUŠIAK, I. (2017) National Gravimetric Database of the Slovak Republic (chapter 7) pp.113–125, In book: Pašteka Roman, Ján Mikuška and Bruno Meurers (eds.): Understanding the Bouguer Anomaly: A Gravimetry Puzzle, Elsevier, ISBN 978-0-12-812913-5, doi 10.1016/B978-0-12-812913-5.00006-3.

MIKUŠKA, J. – PAŠTEKA, R. – ZAHOREC, P. – PAPČO, J. – MARUŠIAK, I. – KRAJŇÁK, M. (2017) Some Remarks on the Early History of the Bouguer Anomaly (chapter 3) pp 31–62, In book: Pašteka Roman, Ján Mikuška and Bruno Meurers (eds.): Understanding the Bouguer Anomaly: A Gravimetry Puzzle, Elsevier (2017), ISBN 978-0-12-812913-5, doi 10.1016/ B978-0-12-812913-5.00006-3.

ZAHOREC, P. – MARUŠIAK, I. – MIKUŠKA, J. – PAŠTEKA, R. – PAPČO, J. (2017) Numerical Calculation of Terrain Correction Within the Bouguer Anomaly Evaluation (Program Toposk) (chapter 5) pp. 79–92, In book: Pašteka Roman, Ján Mikuška and Bruno Meurers (eds.): Understanding the Bouguer Anomaly: A Gravimetry Puzzle, Elsevier (2017), ISBN 978-0-12-812913-5, doi 10.1016/B978-0-12-812913-5.00006-3

PAŠTEKA, R. – ZAHOREC, P. – KUŠNIRÁK, D. – BOŠANSKÝ, M. – PAPČO, J. – SZALAIOVÁ, V. – KRAJŇÁK, M. – MARUŠIAK, I. – MIKUŠKA, J. – BIELIK, M. (2017)

High resolution Slovak Bouguer gravity anomaly map and its enhanced derivative transformations: new possibilities for interpretation of anomalous gravity fields. In *Contributions to Geophysics and Geodesy* 47(2): 81–94, doi: 10.1515/congeo-2017-0006.

ZAHOREC, P. – PAPČO, J. (2018) Estimation of Bouguer correction density based on underground and surface gravity measurements and precise modelling of topographic effects – two case studies from Slovakia. In *Contributions to Geophysics and Geodesy* 48(4): 319–336. doi 10.2478/congeo-2018-0015.

2.3 Vertical gravity gradient

ZAHOREC, P. – MIKUŠKA, J. – PAPČO, J. – MARUŠIAK, I. – KARCOL, R. – PAŠTEKA, R. Towards the measurement of zero vertical gradient of gravity on the Earth's surface. In *Studia geophysica et geodaetica*. Vol. 59, no. 4 (2015), 524-537.

ZAHOREC, P. – VAJDA, P. – PAPČO, J. – SAINZ-MAZA APARICIO, S. – PEREDA DE PABLO, J. Prediction of vertical gradient of gravity and its significance for volcano monitoring – example from Teide volcano. In *Contributions to Geophysics and Geodesy*. Vol. 46, no. 3 (2016), 203-220.

Significance and application of vertical gradients of gravity and of deformation-induced topographic effects in decomposition and interpretation of time-lapse gravity changes in volcano gravimetry

We have applied a numerical approach to predicting the vertical gradient of gravity (VGG) based on modelling the contribution (effect) of topographic masses in areas of prominent and rugged topography. By in-situ observations of VGGs we have verified the accuracy of the topographically predicted VGGs. We have compared free-air effects (FAE) computed based on the theoretical (normal) free-air gradient (FAG) with those computed based on the predicted VGGs. We have discussed implications for micro-gravimetric surveys and for the evaluation of deformation-induced topographic effects in volcano gravimetry. The in-situ verification of predicted VGGs was carried out in two field campaigns: in 2016 in the central volcanic complex (surrounding the Teide volcano) on Tenerife, Canary Islands, and in 2018 on Etna, Sicily, Italy.

Slovak-Italian gravimetric field campaign Etna 2018

VGG observation at summit craters of Etna

Slovak gravimetric expedition Tenerife 2016

VGG observation at Teide summit (3718 m a.s.l.)

VAJDA, P. – ZAHOREC, P. – PAPČO, J. – KUBOVÁ, A. Deformation induced topographic effects in inversion of temporal gravity changes: First look at Free Air and Bouguer terms. In *Contributions to Geophysics and Geodesy*. Vol. 45, no. 2 (2015), 149-171.

VAJDA, P. (2016) Recent developments and trends in Volcano Gravimetry (chapter in monograph): 81–103, doi 10.5772/63420, Open Access Book: NÉMETH Károly (ed.), Updates in Volcanology – From Volcano Modelling to Volcano Geology, INTECH, eISBN 978-953-51-2623-2, ISBN 978-953-51-2622-5.

HICKEY, J. – GOTTSMANN, J. – MOTHES, P. – ODBERT, H. – PRUTKIN, I. – VAJDA, P. (2017) The Ups and Downs of Volcanic Unrest: Insights from Integrated Geodesy and Numerical Modelling (chapter in monograph). In (book): Volcanic unrest: from science to society. Book series: Advances in Volcanology, Springer, Berlin, Heidelberg, DOI: 10.1007/11157_2017_13.

ZAHOREC, P. – PAPČO, J. – VAJDA, P. – GRECO, F. – CANTARERO, M. – CARBONE, D. (2018) Refined prediction of vertical gradient of gravity at Etna volcano gravity network (Italy). Contributions to Geophysics and Geodesy 48(4), (2018), 299–317, doi 10.2478/congeo-2018-0014.

2.4 Microgravimetry

CHROMČÁK, J. – GRINČ, M. – PÁNISOVÁ, J. – VAJDA, P. – KUBOVÁ, A. (2016) Validation of sensitivity and reliability of GPR and microgravimetric detection of underground cavities in complex urban settings: Test case for a cellar. In *Contributions to Geophysics and Geodesy* 46, (1), 13–32, doi: 10.1515/congeo-2016-0002.

GRINČ, M. (2015) 3D GPR investigation of pavement using 1 GHz and 2 GHz horn type antenna – comparison of the results. In *Contributions to Geophysics and Geodesy* 45, (1), 25–39.

SLABEJ, M. – GRINČ, M. – KOVÁČ, M. – DECKÝ, M. – ŠEDIVÝ, Š. (2015) Non-invasive diagnostic methods for airport Žilina runway´s quality investigation. Contributions to Geophysics and Geodesy 45(3): 237–254, doi: 10.1515/congeo-2015-0022

Near surface geophysics for engineering-geological, geotechnical applications and archaeology

The sensitivity and reliability of microgravimetry and ground penetrating radar (GPR) was validated in complex urban settings on a test case of a known underground cellar. Road pavement quality and airport runway condition were prospected using GPR.

Near surface geophysical survey in urban settings

Deployment of GPR with various antennas

WILKEN, D. – WUNDERLICH, T. – STÜMPEL, H. – RABBEL, W. – PAŠTEKA, R. – ERKUL, E. – PAPČO, J. – PUTIŠKA, R. – KRAJŇÁK, M. – KUŠNIRÁK, D. Case history: integrated geophysical survey at Katarínka Monastery (Slovakia). In *Near surface geophysics*. Vol. 13, no. 6 (2015), 585-599.

PÁNISOVÁ, J. – MURIN, I. – PAŠTEKA, R. – HALIČKOVÁ, J. – BRUNČÁK, P. – POHÁNKA, V. – PAPČO, J. – MILO, P. Geophysical fingerprints of shallow cultural structures from microgravity and GPR measurements in the Church of St. George, Svätý Jur, Slovakia. In *Journal of Applied Geophysics*. Vol. 127, (2016), 102-111.

2.5 Development of inversion methodology

POHÁNKA, V. – VAJDA, P. – PÁNISOVÁ, J. (2015) On inverting micro-gravimetric signals with the harmonic inversion method: Application to time-lapse gravity changes. In *Contributions to Geophysics and Geodesy* 45(2): 111–134, doi: 10.1515/congeo-2015-0016.

Development of new inversion approach based on the method of harmonic inversion for interpreting spatiotemporal gravity changes in volcanic areas
A novel inversion approach based on the method of harmonic inversion, developed by Vladimír Pohánka, was test-applied to the spatiotemporal (time-lapse) gravity changes observed during the 2004/5 volcanic unrest at Teide volcano, Tenerife, Canary islands.

PRUTKIN, I. – VAJDA, P. – JAHR, T. – BLEIBINHAUS, F. – NOVÁK, P. – TENZER, R. (2017) Interpretation of gravity and magnetic data with geological constraints for 3D structure of the Thuringian Basin, Germany. In *Journal of Applied Geophysics* 136: 35–41, doi 10.1016/j.jappgeo.2016.10.039.

Application of new inversion approach based on Prutkin methodology for interpreting the geological structure of sedimentary basins
The novel inversion approach based on the Prutkin methodology was applied to invert and interpret gravity and magnetic data with constraints to determine the geological structure of the Thuringian Basin in Germany and its basement.

2.6 Absolute gravimetry and metrology

PÁLINKÁŠ V. – FRANCIS O. – VAĽKO M. – KOSTELECKÝ J. – VAN CAMP M. – CASTELEIN S. – BILKER-KOIVULA M. – NÄRÄNEN J. – LOTHHAMMER A. – FALK R. –SCHILLING M. –TIMEN L. –IACOVONE D. – BACCARO F. –GERMAK A. – BIOLCATI E. –ORIGLIA C. – GRECO F. – PISTORIO A. –DE PLAEN R. – KLEIN G. – SEIL M. – RADINOVIC R. – REUDINK R. –DYKOWSKI P. – SĘKOWSKI M. – PRÓCHNIEWICZ D. –SZPUNAR R. – MOJZEŠ M. – JANÁK J. – PAPČO J. – ENGFELDT A. –OLSSON P.A. –SMITH V. –VAN WESTRUM D. –ELLIS B. –LUCERO B. (2017): Regional comparison of absolute gravimeters, EURAMET.M.G-K2 key comparison. *Metrologia* 54, Technical supplement, available online at http://iopscience.iop.org/article/10.1088/0026-1394/54/1A/07012

3. Earth Rotation and Geodynamics

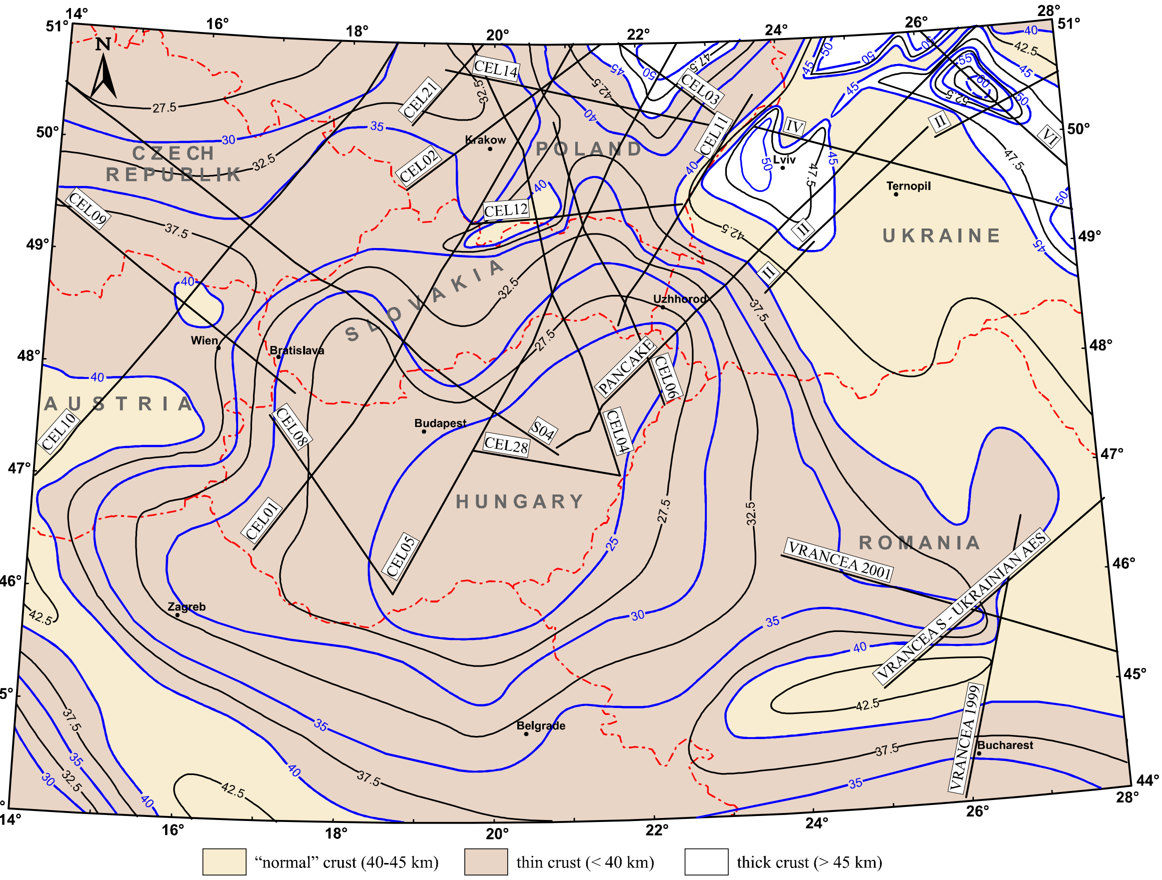
3.1 Local and regional geodynamics

MOJZEŠ, M. – KOLLÁR, P. - MIKOLAJ, M. Estimation of an effective Young´s modulus of elasticity in the locality of the Gabčíkovo hydrology power plant by geometric leveling. In *Slovak Journal of Civil Engineering*. Vol. 23, no. 1 (2015), 33-40.

BEDNÁRIK, M. – PAPČO, J. – POHÁNKA, V. – BEZÁK, V. – KOHÚT, I. – BRIMICH, L. Surface strain rate colour map of the Tatra Mountains region (Slovakia) based on GNSS data. In *Geologica Carpathica*. Vol. 67, No. 6 (2016), 509-524.

BIELIK, M. – MAKARENKO, I. – CSICSAY, K. – LEGOSTAEVA, O. – STAROSTENKO, V. – SAVCHENKO, A. – ŠIMONOVÁ, B. – DÉREROVÁ, J. – FOJTÍKOVÁ, L. – PAŠTEKA, R. – VOZÁR, J. (2018) The refined Moho depth map in the Carpathian-Pannonian region. In *Contributions to Geophysics and Geodesy* 48(2): 179–190, doi: 10.2478/congeo-2018-0007.

The refined Moho depth map in the Carpathian-Pannonian region
A new digital Moho depth map of the Carpathian-Pannonian region has been created using Moho discontinuity depth data which were obtained by interpretation of seismic measurements that were produced in last 15-20 years together with the results of 2D and 3D integrated geophysical modelling.

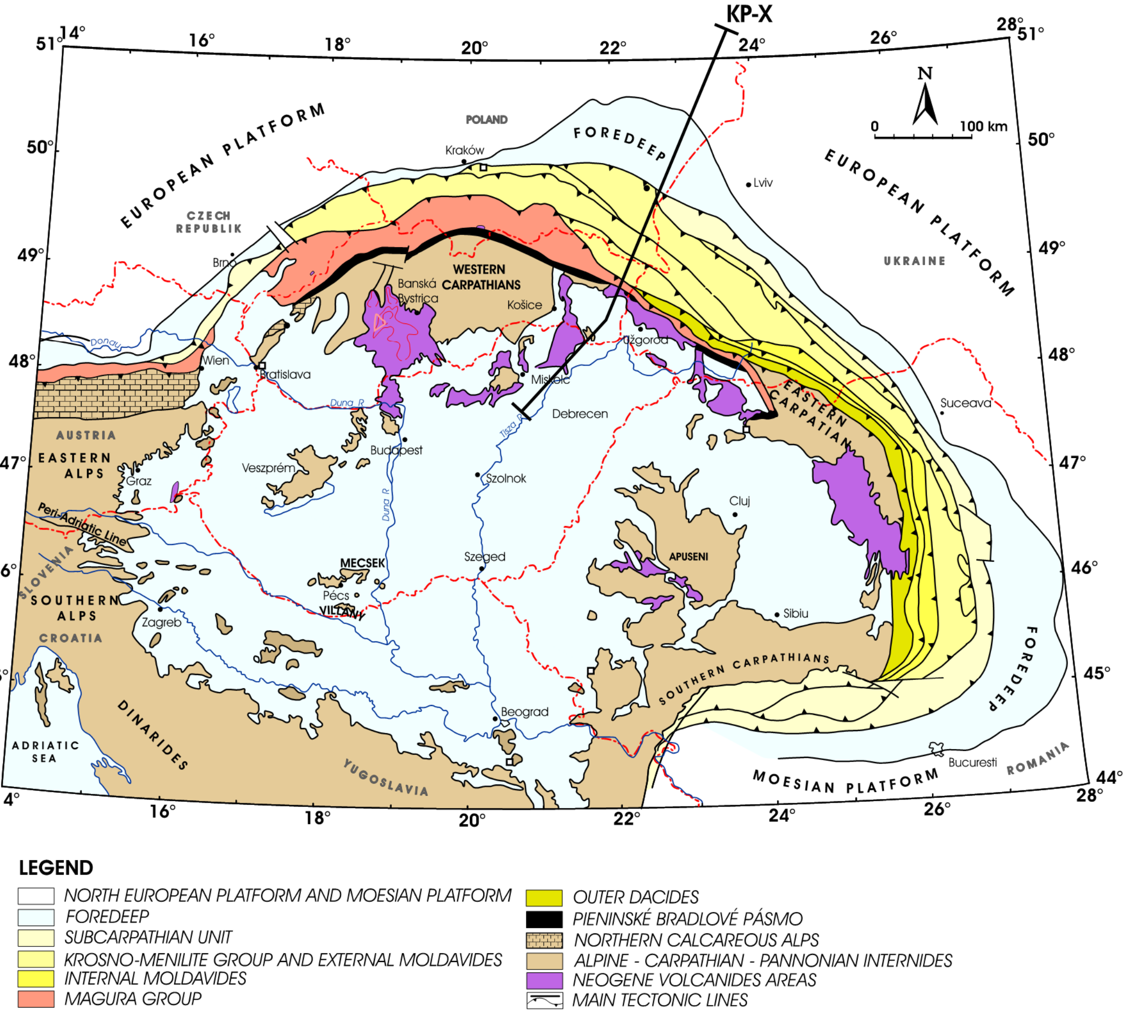


The Moho depth map in the Carpathian-Pannonian region

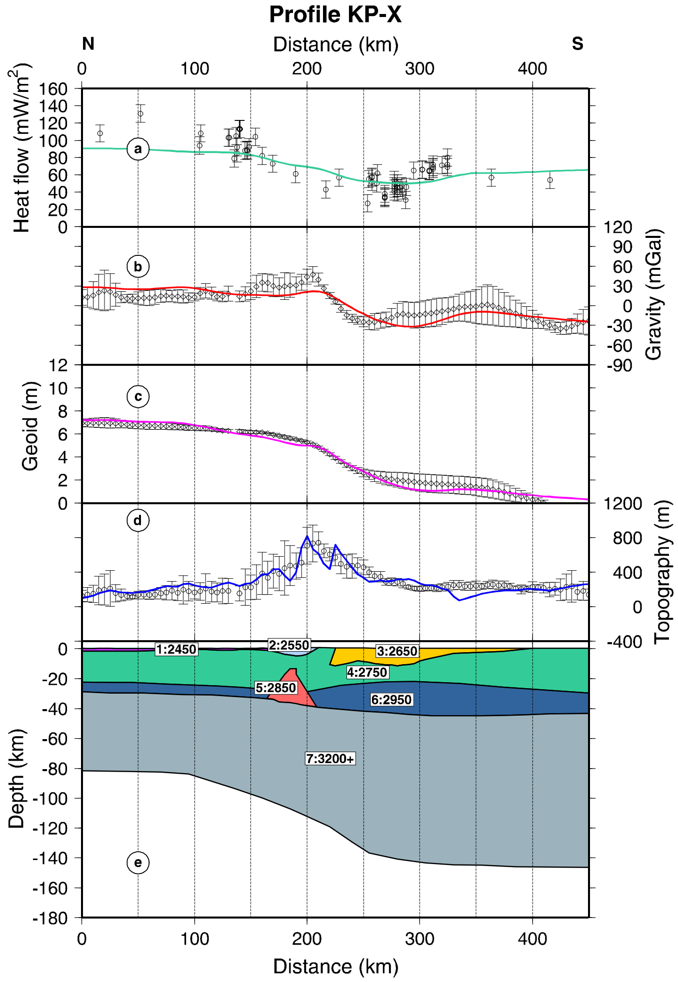
HLAVŇOVÁ, P. – BIELIK, M. – DÉREROVÁ, J. – KOHÚT, I. – PAŠIAKOVÁ, M. (2015) A new lithospheric model in the eastern part of the Western Carpatians: 2D integrated modelling. In *Contributions to Geophysics and Geodesy* 45(1): 13–23, doi: 10.1515/congeo-2015-0010.

2D integrated modelling

2D integrated geophysical modelling has been used to recalculate older lithospheric model along transect KP-X in the eastern part of the Western Carpathians. Integrated modelling takes into account the joint interpretation of the heat flow, free air anomalies, topography and geoid data. The new model has brought new valuable results about the thickness of the lithosphere and information about the deep seated structures within the lithosphere.



Location of profile KP-X on the map of the Carpathian-Pannonian basin region.

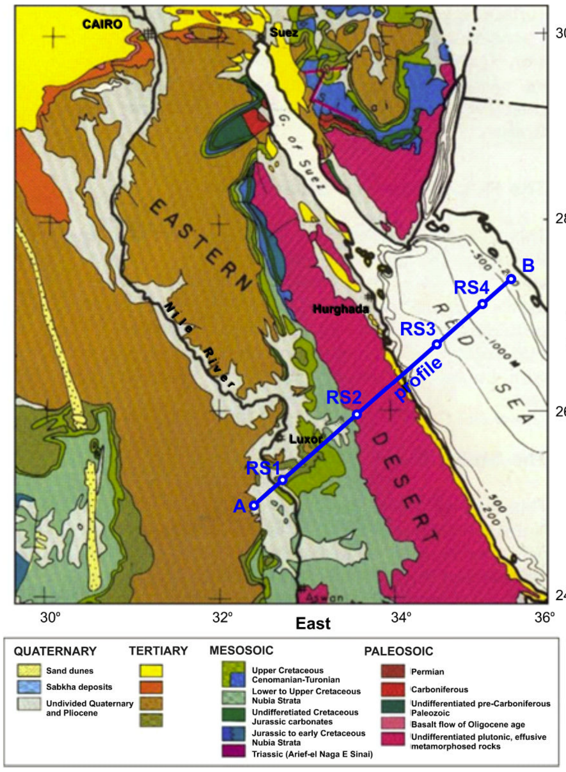


Lithospheric model along transect KP-X. (a) Surface heatflow, (b) free air gravity anomaly, (c) topography with dots corresponding to measured data with uncertainty bars and solid lines to calculated values.

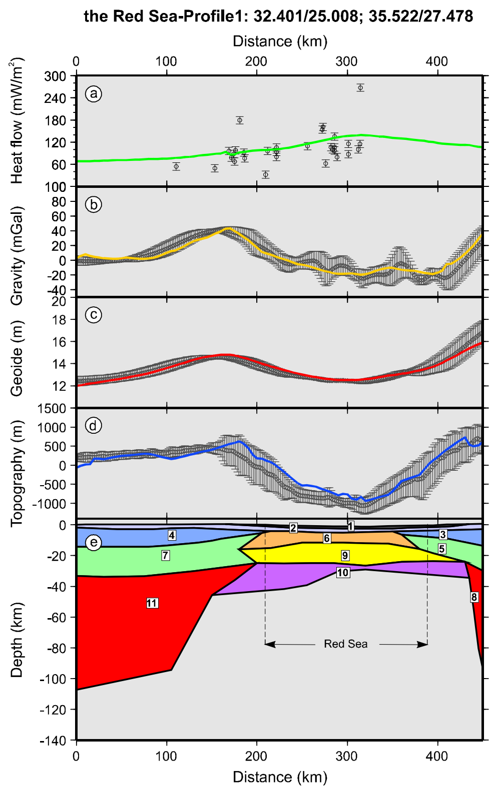
RADWAN, A.H. – DÉREROVÁ, J. – BIELIK, M. – ŠIMONOVÁ, B. – KOHÚT, I. (2017) Calculation of temperature distribution and rheological properties of the lithosphere along Profile 1 passing through Aswan. In *Contributions to Geophysics and Geodesy* 47(1): 69–80, doi: 10.1515/congeo-2017-0005.

DÉREROVÁ, J. – KOHÚT, I. – RADWAN, A.H. – BIELIK, M. (2017) Calculation of temperature distribution and rheological properties of the lithosphere along geotransect in the Red Sea region. In *Contributions to Geophysics and Geodesy* 47(4): 277–, doi: 10.1515/congeo-2017-0015.

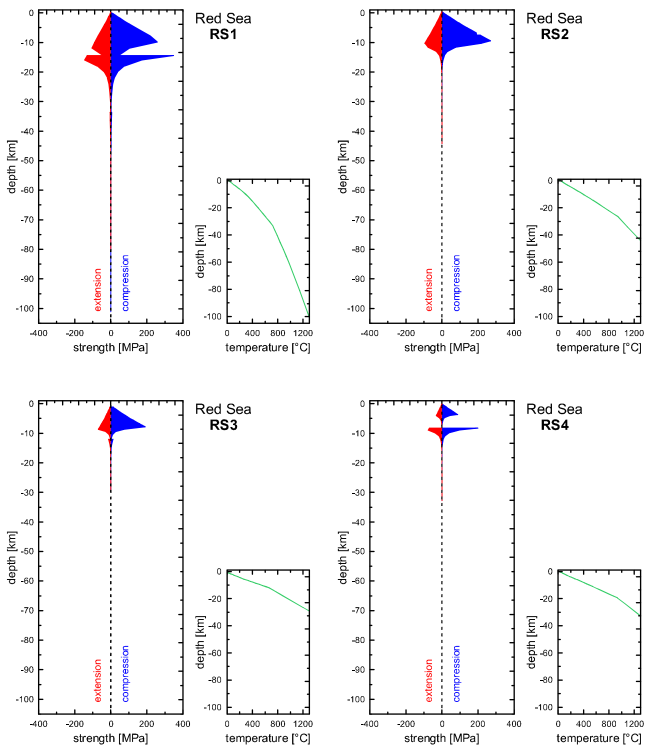
Calculation of temperature distribution and rheological properties of the lithosphere
We used 2D integrated geophysical modelling to calculate the temperature distribution in the lithosphere along 2 different profiles in Egypt. One profile was passing through the Aswan area, the other one was located in the Red Sea region. Lithospheric structure in both locations has been previously modelled using 2D integrated modelling. Based on the respective temperature models and the rheological parameters, we have calculated strength distribution in the lithosphere for both profiles. We calculated strength envelopes for both compressional and extensional regimes.



Geology of the Red Sea region (Egyptian Geological Survey, 1994) and location of studied profile in the Red Sea region.



Lithospheric model along profile in the Red Sea (with exact coordinates) (a) surface heat flow, (b) free-air gravity anomaly, (c) geoid, (d) topography with dots corresponding to measured data with uncertainty bars and solid lines to calculated values, (e) lithospheric structures.



Vertical strength distribution for different lithospheric columns RS1–RS4 along profile in the Red Sea. Negative and positive values correspond to extensional and compressional strength respectively.

MAJCIN, D. – BEZÁK, V. – KLANICA, R. – VOZÁR, J. – PEK, J. – BILČÍK, D. – TELECKÝ, J. (2018) Klippen Belt, Flysch Belt and Inner Western Carpathian Paleogene Basin Relations in the Northern Slovakia by Magnetotelluric Imaging. In. *Pure and Applied Geophysics* 175: 3555–3568.

PÁNISOVÁ, J. – BALÁZS, A. – ZALAI, Z. – BIELIK, M. – HORVÁTH, F. – HARANGI, S. – SCHMIDT, S. – GOETZE, H.J. (2018) Intraplate volcanism in the Danube Basin of NW Hungary: 3D geophysical modelling of the Late Miocene Pásztori volcano. In. *International Journal of Earth Sciences* 107(5): 1713–1730, doi 10.1007/s00531-017-1567-5.

GODOVÁ, D. – BIELIK, M. – ŠIMONOVÁ, B. (2018) The deepest Moho in the Western Carpathians and its respective crustal density model (CEL12 section). In. *Contributions to Geophysics and Geodesy*, 48(3): 255–269, doi: 10.2478/congeo-2018-0011.

BEZÁK, V. – MAJCIN, D. (2018) Lithological composition in deep geothermal source reservoirs of temperature 160°C in the territory of Slovakia. In. *Contributions to Geophysics and Geodesy* 48(4): 349–363, doi 10.2478/congeo-2018-0017.

FENDEK M., T. GRAND, S. DANIEL, V. BLANÁROVÁ, V. KULTAN AND M. BIELIK (2017) The pre-Cainozoic basement delineation by magnetotelluric methods in the western part of the Liptovská kotlina Depression (Western Carpathians, Slovakia). Geologica Carpathica 68(4): 318–328, doi: 10.1515/geoca-2017-0022.

KATONA, V. SZALAIOVÁ, A. VOZÁROVÁ, B. ŠIMONOVÁ, J. PÁNISOVÁ, S. SCHMIDT, H.J. GOETZE (2017) 3D density modelling of Gemeric granites of the Western Carpathians. Geologica Carpathica 68(3): 177–192, doi: 10.1515/geoca-2017-0014.

MARKO F., P. ANDRIESSEN, ČESTMÍR TOMEK, V. BEZÁK, L. FOJTÍKOVÁ, M. BOŠANSKÝ, M. PIOVARČI, P. REICHWALDER (2017) Carpathian Shear Corridor – A strike-slip boundary of an extruded crustal segment. Tectonophysics, 703–704: 119–134, doi.org/10.1016/j.tecto.2017.02.010.

HRUBCOVÁ P., W.H. GEISSLER, K. BRÄUER, V. VAVRYČUK, ČESTMÍR TOMEK, H. KÄMPF (2017) Active magmatic underplating in western Eger Rift, Central Europe. Tectonics 36(12): 2846–2862, doi: 10.1002/2017TC004710.

BEDNÁRIK, M., PAPČO, J., POHÁNKA, V., BEZÁK, V., KOHÚT, I., BRIMICH, L. (2016) Surface strain rate colour map of the Tatra Mountains region (Slovakia) based on GNSS data. Geologica Carpathica, 67(6): 509 – 524, doi: 10.1515/geoca-2016-0032.

SALEH S., O. PAMUKCU, L. BRIMICH (2017) The major tectonic boundaries of the Northern Red Sea rift, Egypt derived from geophysical data analysis. Contributions to Geophysics and Geodesy, Vol. 47(3): 149–199, doi: 10.1515/congeo-2017-0010.

ALASONATI TAŠÁROVÁ, Z., FULLEA, J., BIELIK, M., ŚRODA, P. (2016) Lithosphericstructure of Central Europe: Puzzle pieces from Pannonian Basin to Trans-European Suture Zone resolved by geophysical-petrological modeling. Tectonics, 35(3): 722–735, doi:10.1002/2015TC 003935.

ŠIMONOVÁ, B. – BIELIK, M. (2016) Determination of rock densities in the Carpathian-Pannonian Basin lithosphere: based on the CELEBRATION 2000 experiment. Contributions to Geophysics and Geodesy 46(4): 269–287, doi 10.1515/congeo-2016-0016

BEZÁK, V., PEK, J., MAJCIN, D., BUČOVÁ, J., ŠOLTIS, T., BILČÍK, D., KLANICA, R. (2015) Geological interpretation of magnetotelluric sounding in the southern part of seismic profile 2T (Central Slovakia). Contributions to Geophysics and Geodesy 45(1): 1–11, doi: 10.1515/congeo-2015-0009.

ŠIMONOVÁ, B. – BIELIK, M. – DÉREROVÁ, J. (2015) 2D density model of Chinese continental lithosphere along a NW-SE transect. Contributions to Geophysics and Geodesy 45(2): 135–148, doi: 10.1515/congeo-2015-0017.

MAJCIN D. – KRÁL, M. – BILČÍK, D. – ŠUJAN, M. – VRANOVSKÁ, A. (2017) Deep geothermal sources for electricity production in Slovakia: thermal conditions. Contributions to Geophysics and Geodesy 47(1): 1–22, doi 10.1515/congeo-2017-0001.

MAJCIN D., KUTAS R., BILČÍK D., BEZÁK V., KORCHAGIN I. (2016) Thermal conditions for geothermal energy exploitation in the Transcarpathian depression and surrounding units. Contributions to Geophysics and Geodesy 46(1): 33–49, doi: 10.1515/congeo-2016-0003.

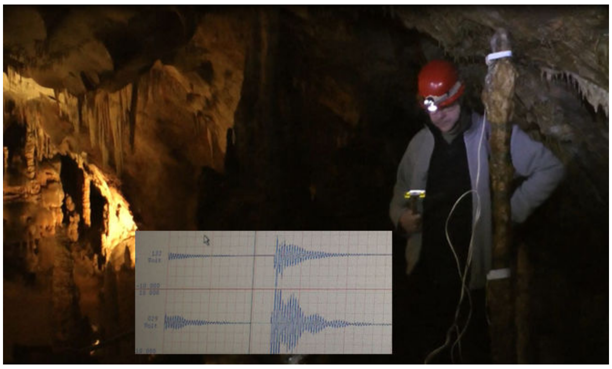
MAJCIN D., BILČÍK D., KLUČIAR T. (2015) Thermal state of the lithosphere in the Danube Basin and its relation to tectonics. Contributions to Geophysics and Geodesy 45(3): 193–218, doi: 10.1515/congeo-2015-0020.

GRIBOVSZKI K., K. KOVÁCS, P. MÓNUS, G. BOKELMANN, P. KONEČNÝ, M. LEDNICKÁ, G. MOSELEY, CH. SPÖTL, R.L. EDWARDS, M. BEDNÁRIK, L. BRIMICH, L. TÓTH (2017) Estimating the upper limit of prehistoric peak ground acceleration using an

in situ, intact and vulnerable stalagmite from Plavecká priepast cave (Detrekői-zsomboly), Little Carpathians, Slovakia – first results. Journal of Seismology 21(5): 1111–1130, doi 10.1007/s10950-017-9655-3.

Paleo-seismicity estimates based on scinter break-up in caves
Determination of constraints on seismic hazard in adjacent areas to caves based on estimates of peak horizontal acceleration breaking thin long stalagmites in caves.

Paleo-seismicity field work in the Domica cave



Measuring resonance parameters of stalagmites

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4. Positioning and Applications

4.1 GNSS applications

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Defended PhD Theses

Institution: Slovak University of Technology in Bratislava
Title: Gravity field modelling in terms of spherical radial basis functions
Student: B. Bucha
Supervisor: J. Janák
Year of defence: 2016

Institution: Slovak University of Technology in Bratislava
Title: Ground stability monitoring of selected sites in Slovakia using INSAR technology
Student: M. Bakoň
Supervisor: J. Hefty
Year of defence: 2017

Institution: Slovak University of Technology in Bratislava
Title: Solution to topographic effect problems in spherical approximation (in Slovak)
Student: Z. Ďuríčková
Supervisor: J. Janák
Year of defence: 2018

Institution: Slovak University of Technology in Bratislava
Title: Analysis of relativistic effects and their detection by space techniques (in Slovak)
Student: P. Letko
Supervisor: L. Husár
Year of defence: 2018

International Research/grant projects

COST ES1401
Time Dependent Seismology (TIDES)
since 2014
The Action aims at structuring the EU seismological community to enable development of data-intensive, time-dependent techniques for monitoring Earth active processes (e.g., earthquakes, volcanic eruptions, landslides, glacial earthquakes) as well as oil/gas reservoirs.
Project coordinator – Andrea Morelli
National coordinator for Slovak Republic – Peter Moczo, Jozef Kristek

COST ES1206
Advanced Global Navigation Satellite Systems tropospheric products for monitoring severe events and climate (GNSS4SWEC)
since 2013
Global Navigation Satellite Systems (GNSS) have revolutionised positioning, navigation, and timing, becoming a common part of our everyday life. Aside from these well-known civilian and commercial applications, GNSS is now an established atmospheric observing system which can accurately sense water vapour, the most abundant greenhouse gas, accounting for 60-70% of atmospheric warming. Severe weather forecasting is challenging, in part due to the high temporal and spatial variation of atmospheric water vapour. Water vapour is under-sampled in the current meteorological and climate observing systems, obtaining and exploiting more high-quality humidity observations is essential to weather forecasting and climate monitoring. This Action will address new and improved capabilities from concurrent developments in both the GNSS and meteorological communities. For the first time, the synergy of the three GNSS systems (GPS, GLONASS and Galileo) will be used to develop new, advanced tropospheric products, exploiting the full potential of multi-GNSS water vapour estimates on a wide range of temporal and spatial scales, from real-time monitoring and forecasting of severe weather, to climate research. In addition the action will promote the use of meteorological data in GNSS positioning, navigation, and timing services.
National coordinator for Slovak Republic – Ján Hefty

Project of Italian Space Agency ASI for satellite radar images
COSMOSkyMed Constellation Open Call For Science 00016/8/416/182
Detection of underground cavities in environmental and archaelogical applications using satellite radar interferometry. 2016. Juraj Papčo, Matúš Bakoň

Project of Italian Space Agency ASI for satellite radar images
COSMO-SkyMed Open Call for Science proposal ID 655
InSAR monitoring of landslides with the assessment of surface dynamics due to groundwater level changes, 2017.
Kopecký, Papčo J.

ESA PECS (Programme for Eurpoean Cooperating States)
4000123625/18/NL/SC: Retrieval of motions and potential deformation threats using Sentinel-1.
2018 - 2020
Matúš Bakoň, Juraj Papčo

Web pages

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http://www.nuqake.eu
http://www.fyzikazeme.sk
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https://www.svf.stuba.sk/en/departments/department-of-theoretical-geodesy/science-and-research/downloads.html?page_id=4996