

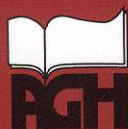


Geology, Geophysics & Environment

ISSN 2299-8004
Volume 44 • Number 1

2018

Formerly: GEOLOGIA. Kwartalnik Akademii Górniczo-Hutniczej im. Stanisława Staszica w Krakowie



WYDAWNICTWA AGH
KRAKOW 2018

POSTERS

1	László Ádám* , Enikő Mérés, Annamária Nádor and Ágnes Rotár-Szalkai, Gyula Maros	Evaluation of basement reservoirs for geothermal utilization at southern part of Pannonian Basin
2	František Bárta * , Rostislav Melichar, Mareček Lukáš	Structure of durbachitic rocks in the southern part of the Třebíč Pluton
3	Plérig Deiller* , Pavla Štípská, Marc Ulrich, Karel Schulmann, Eric Pelt, Jitka Míková	Devonian magmatic rocks of the Mariánské Lázně Complex and Čistá pluton (Bohemian Massif)
4	Piotr Hadro* , Jan Barmuta, Krzysztof Starzec, Mariusz Słyś, Krystyna Oleszkiewicz	Remarks on the structure and evolution of the Skole Unit in the eastern part of the Polish Outer Carpathians
5	Urszula Klimek* , Anna Świerczewska, Aleksander Gąsienica, Marta Waliczek	The paleothermal history of the Szaflary Beds (Podhale Basin, Poland) recorded in calcite veins and the maturity of organic matter
6	Martin Knižek* , Karolína Faktorová, Rostislav Melichar	Strength of sedimentary rocks near fault structures (Barrandian, Bohemian Massif)
7	Mateusz Kufrasa* , Łukasz Słonka, Piotr Krzywiec	Late Paleozoic fracture system in the Lublin Basin: results of seismic attribute analysis and fracture modeling
8	Mateusz Kufrasa* , Łukasz Słonka, Piotr Krzywiec	Subseismic-scale fracture system in Carboniferous strata of the Lublin Basin (Poland): results of seismic enhancement and interpretation
9	Lukáš Mareček* , Rostislav Melichar	Thick-skinned deformation in variscan fold and thrust belt: an evidence from brunovistulian terrane
10	Maria Młynarska* , Abigail Barker, Stanisław Mazur, Jarosław Majka	In search of relics of pre-Variscan oceanic crust: a geochemical signature of the Leszczyniec unit, Sudetes, revisited
11	Marcin Olkowicz* , Łukasz Jasiński	Structure from motion (SfM) for virtual 3D outcrop modelling and fracture corridors detection: case of SW Poland's granitoids
12	Éva Oravecz* , László Fodor, Szilvia Kövér	Structural mapping, well data and stress field analysis in the surroundings of the Nékézsény Thrust Fault, NE Hungary
13	Tomáš Potočný* , Dušan Plašienka, Štefan Méres	Geological structure of the Veporic–Gemic contact zone in the area between Slavošovce and Ochťiná villages (Western Carpathians, Slovakia)

14	Marián Putiš, Dušan Plašienka* , Martin Danišík, Čestmír Tomek	Infrataticum of the Inner Western Carpathians: Coupled Albian–Eocene accretionary wedge exposed in a Miocene tectonic window
15	Michał Słotwiński* , Marta Adamuszek, Stanisław Burliga	Numerical simulations of the structure evolution in three-layer evaporite systems and its application to tectonic structures from the Kłodawa Salt Structure (Poland)
16	Igor Soejono* , Matěj Machek, Jiří Sláma, Vojtěch Janoušek, Milan Kohút	Cambro–Ordovician anatexis of the Cadomian crust: geochemical and geochronological constrains from the Kouřim Unit (Kutná Hora Crystalline Complex, Bohemian Massif)
17	Aleksandra Stachowska* , Piotr Krzywiec	Late Cretaceous evolution of NE Poland – new insight based on regional seismic data
18	Ewa Szykaruk* , Andrzej Głuszyński, Zbigniew Małolepszy	Presentation of complex geological structures in the PGI-NRI 3D model viewer “Geo3D”.
19	Anne-Sophie Tabaud* , Carmen Aguilar, Pavla Štípská, Karel Schulmann and Jitka Míková	Zircon U–Pb dating of lower crustal rocks from the Góry Sowie Massif (Central Sudetes, SW Poland): New insights on the sedimentary origin and the tectono-thermal evolution
20	Maksymilian Twyrdy	Polyphase structural evolution of the supracrustal series of the Orlica-Śnieżnik Dome (Sudetes, Poland): modelling based on new data from amphibolites and mica schists
21	Maciej Kania	Thin section photomicrographs image classification methods as a tool for the microstructural analyses.

- Szałamacha J. & Szałamacha M., 1991. Ofiolit Leszczyńca w Rudawach Janowickich. *Biuletyn Państwowego Instytutu Geologicznego*, 367, 61–84.
- Winchester J.A., Floyd P.A., Chocyk M., Horbowy K. & Kozdroj W., 1995. Geochemistry and tectonic environment of Ordovician meta-igneous rocks in the Rudawy Janowickie Complex, SW Poland. *Journal of the Geological Society*, 152, 1, 105–115.

Structure from motion (SfM) for virtual 3D outcrop modelling and fracture corridors detection on case of SW Poland granitoids.

Marcin Olkiewicz, Łukasz Jasiński

Polish Geological Institute – National Research Institute, Computational Geology Laboratory (CGL); al. Jaworowa 19, 53-122 Wrocław; e-mail: molk@pgi.gov.pl

Problem of fracture network, fracture corridors and fault zone spatial distribution and internal structure was discussed by many authors e.g. (Hausegger & Kurz 2013, Barani et al. 2014, Bisdorn et al. 2014, Cilona et al. 2016) for structural analysis and fluid flow in fractured reservoirs. Our work is trying to fit into research trend presented by above authors.

The Lower Silesian granitoid massifs have potential to be fractured reservoirs of water, but moreover their fracture system can provide deep water circuit, which effects geothermal water occurrence (e.g. Cieplice Śląskie-Zdrój). For precise analysis of deep or shallow water circuit in fractured crystalline rocks detailed data about disjunctive tectonics spatial distribution and internal structure seems to be valuable input.

Structure from motion (SfM) is photogrammetric tech-

nique based on digital photography. Basis of SfM is to collect set of images of object from different points of view and reconstruct 3-dimensional colour point cloud representation of measured object. In our study SfM is used to create precise 3d data and orthorectified images, both from quarries and natural outcrops to quantitatively characterize fracture systems. Basing on 3D models and ortho-images tectonic features are detected as 2D trace lines on oriented profiles and 3D surfaces, next 2D and 3D data are combined to create fracture network model. This approach allows describing not only fractures orientation, but also their spatial density and distribution along analysed outcrops. Using such data, we can easily detect and quantitatively describe joint system, fractures corridors, fault zones and mutual relations between these structures.

REFERENCES

- Barani H.R., Lashkaripour G. & Ghafoori M., 2014. Predictive permeability model of faults in crystalline rocks; verification by joint hydraulic factor (JH) obtained from water pressure tests. *Journal of Earth System Science*, 123, 1325–1334.
- Bisdorn K., Gauthier B.D.M., Bertotti G. & Hardebol N.J., 2014. Calibrating discrete fracture-network models with a carbonate three-dimensional outcrop fracture network: Implications for naturally fractured reservoir modeling. *AAPG Bulletin*, 98, 1351–1376.
- Cilona A., Aydin A., Likerman J., Parker B. & Cherry J., 2016. Structural and statistical characterization of joints and multi-scale faults in an alternating sandstone and shale turbidite sequence at the Santa Susana Field Laboratory: Implications for their effects on groundwater flow and contaminant transport. *Journal of Structural Geology*, 85, 95–114.
- Hausegger S. & Kurz W., 2013. Cataclastic faults along the SEMP fault system (Eastern Alps, Austria) A contribution to fault zone evolution, internal structure and paleo-stresses. *Tectonophysics*, 608, 237–251.

Structural mapping, well data and stress field analysis in the surroundings of the Nekézseny Thrust Fault, NE Hungary

Éva Oravecz¹, László Fodor^{2,3}, Szilvia Kövér²

¹ Eötvös Loránd University; Pázmány Péter sétány IC, 1117 Budapest, Hungary; e-mail: orav.eva@gmail.com

² Hungarian Academy of Sciences at the Eötvös Loránd University, MTA-ELTE Geological, Geophysical and Space Science Research Group; Budapest, Hungary

³ Hungarian Academy of Sciences at the Eötvös Loránd University, MTA-ELTE Volcanological Research Group; Budapest, Hungary

The Bükk and Uppony Mts. located in NE Hungary are two adjacent structural units with different origins: while the nappes of the Bükk Mts. once formed part of the Inner Dinaric nappe system, the Uppony Mts. are correlated with the Western Carpathians (Schmid et al. 2008). The mainly S-SW-vergent Bükk and N-NW-vergent Uppony Units are separated by the Nekézseny

Thrust Fault along which the Bükk-type Permomesozoic formations are thrust upon the Uppony-type Paleozoic and Senonian formations (Schréter 1945). Despite of its obvious structural importance, the structural evolution of the Nekézseny Thrust Fault hasn't been studied in details. The possible timing of its movements is between the Senonian and the Early Miocene.

In their preliminary structural study Fodor et al. (2005) interpreted the results in the lights of the Paleogene deformation of the Darnó Deformation Zone. On the other hand, based on paleogeographic considerations Schmid et al. (2008) consider the Nekézseny Thrust Fault as the suture zone of the Meliata Ocean thus assume that the age of this structural contact is Early Cretaceous.

Consequently, the aim of our study was to understand the deformation geometry and the timing of activity along the Nekézseny Thrust Fault. As part of the study core samples from boreholes that drilled through the supposed structural contact were reviewed, sampled and interpreted. Detailed structural mapping in the surroundings of the Nekézseny Thrust Fault was followed by stress field analysis and preparation of cross-sections. According to our preliminary results, at least five tectonic phases could be separated. Field work in the gently folded Senonian Nekézseny Conglomerate revealed both pre- and post-tilt low-angle thrust faults. While the pre-tilt thrust faults are clearly the results of NW-

SE compression (D1), the post-tilt thrust faults can be separated into three groups that show slightly different N-S, NW-SE and E-W compression (D2). These deviations from the general NW-SE post-tilt compression only appear immediately at the Nekézseny Thrust Fault. The tilting itself is connected to NW-SE compression as well. The subsequent three deformation phases are connected to the later rotational events and extensional deformation history of the Pannonian Basin (D3: Early Miocene NNE-SSW extension, D4: Middle Miocene E-W extension, D5: Late Miocene-Pliocene NW-SE extension; Fodor et al. 2005, Budai & Fodor 2008). All this may contribute to understanding not only the deformation history of the Nekézseny Thrust Fault, but the role of the Darnó Deformation Zone during the Mesozoic structural evolution of the area.

The research was supported by the research found NKFIH OTKA 113013 and the ÚNKP-17-2 New National Excellence Program of the Ministry of Human Capacities.

REFERENCES

- Budai T. & Fodor L., 2008. *Geology of Vértes Hills: Explanatory Book to the Geological Map of the Vértes Hills (1:50 000)*. Geological Institute of Hungary, Budapest.
- Fodor L., Radóczy Gy., Sztanó O., Koroknai B., Csontos L. & Harangi Sz., 2005. Post-Conference Excursion: Tectonics, Sedimentation and Magmatism along the Darnó Zone. *GeoLines*, 19, 141–161.
- Schmid S.M., Bernoulli D., Fügenschuh B., Matenco L., Schefer S., Schuster R., Tischler M. & Ustaszewski K., 2008. The Alpine-Carpathian-Dinaridic orogenic system: correlation and evolution of tectonic units. *Swiss Journal of Geosciences*, 101, 139–183.
- Schróter Z., 1945. Geologische Aufnahmen im Gebiete von Uppony, Dédes und Nekézseny, Ferner im Gebiete von Putnok. *Annual Report of the Geological Institute of Hungary*, 1941, 42, 197–237.

Three models of structure of the Carpathian Klippen Belt – variable records of nappe thrusting, backthrusting and transpression

Dušan Plašienka

Comenius University, Department of Geology and Palaeontology; Ilkovičova 6, Bratislava, Slovak Republic;
e-mail: dusan.plasienka@uniba.sk

The Carpathian Pieniny Klippen Belt (PKB) is characterized as an orogen-scale, unusually narrow but continuous zone with intricate internal structure. It follows the boundary between the Cretaceous Central Western Carpathian (CWC; Austroalpine) stack of thick- and thin-skinned nappes and the Cenozoic accretionary wedge (Flysch Belt). The PKB involves its own special units (Pienidic or Oravic) that were derived from an independent palaeogeographic domain known as the Czorsztyn Ridge and its slopes. This represents an intra-Penninic continental sliver that was separated from the Austroalpine domain during the Middle–Late Jurassic and rifted off the foreland European plate in the Early Cretaceous, hence bounded by two respective branches of the Pennine oceans – the Piemont-Váh Ocean in the south and the Rhenodanubian-Magura Ocean in the north. Orogenic deformation progressed from the Late Cretaceous onward when the Oravic cover units were detached from their basement, which underthrust the CWC orogenic wedge, and were assembled in a shallow fold-and-thrust belt. As shortening embraced the North Penninic Biele

Karpaty and Magura units, the PKB Oravic units have got caught between the developing accretionary wedge of the present Flysch Belt and the CWC rigid buttress. In this backstop position, the original PKB nappe structure was variously modified up to almost destroyed by subsequent out-of-sequence thrusting, backthrusting, transpressional and transtensional movements.

Presence of the Oravic units, the Czorsztyn succession in particular, is along with frequently disorganized block-in-matrix structure the most distinctive aspect of the PKB structure that occurs all along its ca 600 km length. However, especially the western Slovakian PKB branch incorporates also cover nappe units of the CWC provenance (Peri-Klippen zone with the Klappe, Manín and Drietoma units) that were emplaced in the late Turonian and then deformed together with the Oravic units. As a result, they partially share the “klippen tectonic style” and include also the Senonian-Paleogene post-nappe strata deposited in the wedge-top Gosau-type basins (Plašienka & Soták 2015 and references therein). On the other hand, the eastern PKB branch