RESEARCH REPORTS

2013

Institute of Geology of the Czech Academy of Sciences, v. v. i.

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Praha, January 2015

Cover photo: An excavator loading “locked sand” on which the origin of sandstone arches was studied. Střeleč Quarry, Bohemian Paradise, Czech Republic. Photo by M. Filippi.

2013

Research Reports

This report is based on contributions of the individual authors; contents and scientific quality of the contributions lie within the responsibility of the respective author(s).

The report was compiled and finally edited by T. Přikryl and P. Bosák. The English version was kindly revised by J. Adamovič.

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by the Institute of Geology
of the Czech Academy of Sciences, v. v. i.

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Introduction

The life of the Institute was passing in relatively calm manner without any substantial shocks. In fact, the budget was somewhat reduced compared with previous years, but we obtained a few more grant projects and especially external orders for different kinds of services and analyses. For the first time, we opened a tender for internal projects with a total sum of about 1 million CZK. The aim of the tender was to obtain final data for successful publication of results especially for those scientists who were not successful in the tender for projects of the Czech Science Foundation. Totally 17 projects were selected by the tender committee. Evaluation and presentation of the results of the projects was held in November. Most projects were successful – i.e., researchers obtained materials for a submission of a paper to peer-reviewed journals. Some results were already submitted or even published.

During the summer, the personnel situation in the Technical-Economic Unit was settled, the accounting activities are rendered again by a private company. As a preparation for the cyclic evaluation of teams and institutes of the CAS, we modified the Institute Organization Regulation – scientific units were renamed from Laboratories to Departments: some previous Laboratories included specialized laboratories and it was clear that a confusion in terminology should be avoided.

During November, the traditional tender for positions was held as well. This year, it was very successful with many external persons attending in the tender, four applicants were from abroad. The tender resulted in the employment of several young scientists, mostly Ph.D. students and fresh post-docs (2 for Department of Paleobiology and Paleoecology, 4 for Department of Geological Processes, 1 for Department of Analytical methods). One foreign post-doc was accepted to the Department of Paleomagnetism. On the contrary, one researcher has to leave the Institute.

Our Institute was awarded the Memorial Medal at 60th Anniversary of the establishment of the Geological Institute, Slovak Academy of Sciences awarded by the Director, GI SAS. The medal was handed over by RNDr. Igor Broska, DrSc., the GI SAS director, to the GLI CAS director at the occasion of the Festive Colloquium to the Anniversary held at the Smolenice Castle on October 16, 2013. At the same occasion, a Memorial Letter of our Institute was handed over to the GI SAS director.

Pavel Bosák

2. General Information

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The Institute of Geology of the Czech Academy of Sciences, v. v. i., is a public research institute belonging to the Czech Academy of Sciences (CAS). It concentrates on the scientific study of the structure, composition and history of the Earth's lithosphere and the evolution of its biosphere. Although the Institute does not have the opportunity to cover all geological disciplines (in the widest sense) or regionally balanced geological studies, its activities span a relatively broad spectrum of problems in geology, geochemistry, paleontology, paleomagnetism and rock mechanics. The Institute takes part in the understanding of general rules governing evolutionary processes of the lithosphere and biosphere at regional as well as global scales; for this purpose, the Institute mostly employs acquisition and interpretation of relevant facts coming from the territory of the Czech Republic.

The Institute of Geology of the Czech Academy of Sciences, v. v. i., is a broad-scope scientific institute performing geological, paleontological, petrological, mineralogical and other disciplines, lately accentuating environmental geology and geochemistry. The major research areas covered by the Institute are:

- Petrology and geochemistry of igneous and metamorphic rocks
- Lithostratigraphy of crystalline complexes
- Volcanology and volcanostratigraphy
- Structural geology and tectonics
- Paleogeography
- Terrane identification
- Taxonomy and phylogeny of fossil organisms
- Paleobiogeography of Variscan Europe
- Paleoecology (incl. population dynamics, bioevents)
- Paleoclimatology as evidenced by fossil organisms and communities
- Biostratigraphy and high-resolution stratigraphy
- Basin analysis and sequence stratigraphy
- Exogenic geochemistry
- Exogenic geology, geomorphology
- Quaternary geology and landscape evolution
- Karstology and paleokarstology
- Paleomagnetism
- Magnetostratigraphy
- Petromagnetism
- Physical parameters of rocks

The Geological Institute of the Czechoslovak Academy of Sciences (ČSAV) was founded on July 1, 1960. Nevertheless its structure had developed in the period of 1957 to 1961. During this period, several independent laboratories were constituted: Laboratory of Paleontology, Laboratory of Engineering Geology, Laboratory for Pedology and Laboratory of Geochemistry; Collegium for Geology and Geography of the ČSAV represented the cover organization. On July 1, 1960, also the Institute of Geochemistry and Raw Materials of the ČSAV was established. This Institute covered technical and organization affairs of adjoined geological workplaces until their unification within the Geological Institute of the ČSAV in July 1960.

On August 1, 1964 the Institute of Geochemistry and Raw Materials of the ČSAV was integrated into the Geological Institute. On July 1, 1969 the Institute of Experimental Mineralogy and Geochemistry of the ČSAV was founded; a successor of the Institute of Geochemistry and Raw Materials was newly established. A part of the staff of the Geological Institute joined the new institute. On January 1, 1979 the Institute of Experimental Mineralogy and Geochemistry was integrated into the Geological Institute.

On March 1, 1979, the Geological Institute was united with the Mining Institute of the ČSAV under the Institute of Geology and Geotechnics of the ČSAV, and finally split from the latter on March 1, 1990 again.

On January 1, 1993 the Czech Academy of Sciences was established by a transformation from the ČSAV, and the Geological Institute became a part of the CAS. The Institute belongs to the Ist Department of Mathematics, Physics and Earth Sciences and to the 3rd Section of Earth Sciences. On January 1, 2007

the Institute became a public research institute (v. v. i.) by the change of legislation on research and development.

The economic and scientific concept of the Institute of Geology of the Czech Academy of Sciences, v. v. i., and the evaluation of its results lie within the responsibility of the Executive Board and Supervisory Board which include both the internal and external members. Plans of the Institutional Financing are evaluated by the special Committee at the CAS. Besides research, staff members of the Institute are involved in lecturing at universities and in the graduate/postgraduate education system. Special attention is also given to the spread of the most important scientific results in the public media.

3. Publication activity of the Institute of Geology

3a. Journals

The Institute of Geology CAS, v. v. i., is the publisher of **GeoLines**. GeoLines (www.geolines.gli.cas.cz) is a series of papers and monothematic volumes of conference abstracts. GeoLines publishes articles in English on primary research in many fields of geology (geochemistry, geochronology, geophysics, petrology, stratigraphy, paleontology, environmental geochemistry). Each issue of the GeoLines journal is thematically consistent, containing several papers to a common topic. The journal accepts papers within their respective sectors of science without national limitations or preferences. However, in the case of extended abstracts, the conferences and workshops organized and/or co-organized by the Institute of Geology are preferred. The papers are subject to reviews.

No volume of GeoLines was published in the year 2013.

Since 2000, the Institute of Geology of the Czech Academy of Sciences, v. v. i., has been a co-producer of the international journal **Geologica Carpathica** (www.geologicacarpathica.sk), registered by Thomson Reuters WoS database. The Institute is represented by one journal co-editor (usually Institute Director) and several members of the Executive Committee (at present P. Bosák, J. Hladil and L. Lisá). Geologica Carpathica publishes contributions to: experimental petrology, petrology and mineralogy, geochemistry and isotope geology, applied geophysics, stratigraphy and paleontology, sedimentology, tectonics and structural geology, geology of deposits, etc. Geologica Carpathica is published six times a year. The distribution of the journal is rendered by the Geological Institute, SAS. Online publishing is also possible through Versita on MetaPress platform with rich reference linking. Online ISSN 1336-8052 / Print ISSN 1335-0552.

In 2013, six issues (1 to 6) of Volume 64 were published with 35 scientific papers and short communications. Impact factor for 2013 is 0.863. For the full version see www.geologicacarpathica.sk.

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Since 2013, the Institute of Geology of the Czech Academy of Sciences, v. v. i., has become a co-publisher of the international journal **Bulletin of Geosciences** (www.geology.cz/bulletin/scope; bulletin@geology.cz), registered by the Thomson Reuters WoS database. The Institute is represented by several journal co-editors.

The Bulletin of Geosciences is an international journal publishing original research papers, review articles, and short contributions concerning paleoenvironmental geology, including paleontology, stratigraphy, sedimentology, paleogeography, paleoecology, paleoclimatology, geochemistry, mineralogy, geophysics, and related fields. All papers are subject to international peer review, and acceptance is based on quality alone.

Its impact factor for 2013 is 1.495.

The Editorial Board of the Bulletin of Geosciences has decided to reaffirm the status of the Bulletin as an open access journal. The Bulletin of Geosciences is published as a non-profit making journal and the vast majority of people (including members of the editorial board) receive no payment for their work. The budget covers costs for type-setting and printing. Online ISSN 1802-8555 / Print ISSN 1214-1119.

In 2013, four issues (1 to 4) of Volume 88 were published with 51 scientific papers and short communications. For the full version see http://www.geology.cz/bulletin.

Address of the editorial office: Bulletin of Geosciences, Czech Geological Survey, Klárov 3/131, 11821 Praha 1, Czech Republic
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Štěpán MANDA – Czech Geological Survey, Prague
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In 2013, the Institute of Geology of the Czech Academy of Sciences, v. v. i., supported the print of **Acta Carsologica** (http://ojs.zrc-sazu.si/carsologica), an international journal registered by the Thomson Reuters WoS database. The Institute is represented by one member of the Editorial (executive) Board.

Acta Carsologica publishes orginial research papers and reviews, letters, essays and reports covering topics related to specific of karst areas. These comprise, but are not limited to, karst geology, hydrology and geomorphology, speleology, hydrogeology, biospeleology and history of karst science. This journal provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

In 2013, three issues (1 and 2–3) of Volume 42 were published with 28 scientific papers and short communications. Impact factor for 2013 is 0.710). For full contents see http://ojs.zrc-sazu.si/carsologica. ISSN 0583-6050.

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3b. Monographs, proceedings, etc.

PŘIKRYL T. & BOSÁK P. (Eds., 2013): Research Reports 2012. – Institute of Geology of the Czech Academy of Sciences, v. v. i.: 1–72, ISBN 978-80-87443-08-03

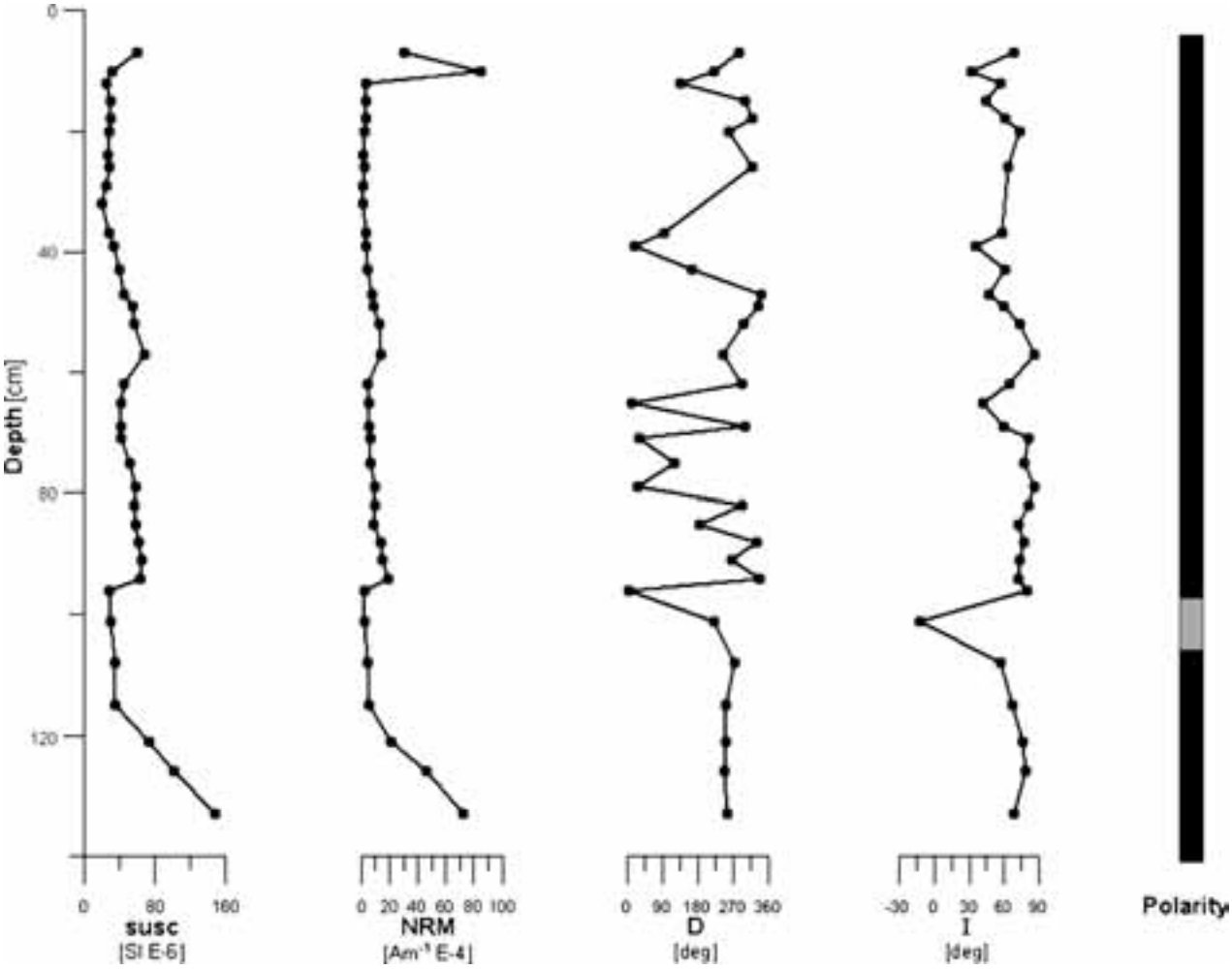
4. Research Reports

4a. Foreign Grants, Joint Projects and International Programs

Bilateral co-operation between Institute of Geology of the Czech Academy of Sciences, v. v. i., and Institute of Geological Sciences, PAS, Warszawa, Poland: **Palaeomagnetism and magnetostratigraphy of cave sediments in the Biśnik Cave, Poland** (T. Madeyska, M. Krajcarz, Institute of Geological Sciences, PAS, Warszawa, Poland, *P. Pruner, S. Šlechta & P. Bosák*; since 1997)

The Biśnik Cave is an important Palaeolithic site located in the Kraków-Częstochowa Upland. The cave fill is a complex, well-stratified sequence composed of 35 layers/sublayers interrupted by number of hiatuses and ranging from Pliocene till modern times. Fifteen Middle Paleolithic horizons, some of them among the oldest in Poland, represent the most important part of the sequence from an archaeological point of view. The recent multi-proxy study is based on the application of new methods for the site: analysis of sedimentary and post-sedimentary structures, and weathering stage of limestone rubble and fossil bones, pollen analysis, molecular biomarkers, paleomagnetic analysis and radiometric dating. Results indicated a more intensive role of reworking and redeposition in the cave. Older sediments were transported into some stratigraphic horizons from sources within the cave itself as well as from outside, including paleontological and archaeological materials. Some the detected layers therefore represent a mix derived from different sources. A record of two interglacials (Eemian Interglacial, MIS 5e and Penultimate Interglacial, MIS 7) was established. Middle/Upper Pleistocene sedimentary units were identified with MIS 3 to MIS 7/8 (Fig. 1), instead of MIS 4 to MIS 9 in the previous interpretation. The age of the basal varicolored complex, previously interpreted mostly as pre-Pleistocene, was newly correlated with MIS 7/8 and Early Pleistocene/Pliocene (Krajcarz et al. 2014).

KRAJCARZ M.T., BOSÁK P., ŠLECHTA S., PRUNER P., KOMAR M., DRESLER J. & MADEYSKA T. (2014): Sediments of the Biśnik Cave (Poland): lithology and stratigraphy of the Middle Palaeolithic site. – *Quaternary International*, 326–327: 6–19.



■ **Fig. 1.** Paleomagnetic profile of the BC section in the Biśnik Cave with the Blake reverse excursion (original). Explanations: susc – magnetic susceptibility; NRM – natural remanence magnetization; D – declination; I – inclination; column right: black – normal magnetization; grey – transient to reverse magnetization. Original.

Bilateral co-operation between Institute of Geology of the Czech Academy of Sciences, v. v. i., and Karst Research Institute, Scientific Research Centre, Slovenian Academy of Sciences and Arts: **Paleomagnetism and magnetostratigraphy of Cenozic cave sediments in Slovenia** (N. Zupan Hajna, A. Mihevc, Karst Research Institute, SRC SAZU, Postojna, Slovenia, O.T. Moldovan, the "Emil Racovita" Speleological Institute, the Romanian Academy, Bucharest, Romania, *P. Pruner, K. Žák & P. Bosák*; since 1997)

Jama pod Babjim zobom Cave (Reg. No. 129; 860 m a. s. l.) is situated in the valley of the Sava River on the western slope of the Jelovica Plateau. The valley is a karst canyon between two high karst plateaus with numerous dolines and altitudes above 1,000 m a. s. l., Pokljuka Plateau in the NW and Jelovica one in the SE. The valley was glaciated and modified by a glacier from Bohinj Valley. The cave entrance lies under the vertical walls of the upper part of the Jelovica Plateau. The cave is 360 m long and 50 m deep. It consists of a horizontal passage and younger vadose shafts which pass through it. Several types of calcite crystals cover walls and fill wall niches and ceiling pockets. There are no traces of Pleistocene glacial sediments or inflow to the cave, although the entire Sava Valley was filled with the Bohinj glacier.

The origin of the cave is complex. It was probably formed before the Sava River entrenched some 650 m and separated the Jelovica Plateau from the Pokljuka one, i.e. probably around the Miocene/Pliocene boundary. The cave could have been genetically connected with some stage in the evolution of surface on the Jelovica Plateau, probably along a zone of mixing of meteoric and hypogene (hydrothermal) waters. The hypogene waters ascended, like some of the recent thermal springs existing in the region. It is possible that the earliest stage was entirely hypogenic. This idea is supported by the large calcite crystals (scalenohedrons) on walls of some cupola-like niches, on the walls and cave roof and special features of some other speleogens. Crystallization of large scalenohedrons and deposition of some other speleothem types probably originated from degassing of ascending fluids. Stable isotopic composition nevertheless indicates the origin from cool or low-temperature waters, which corresponds to data of Otoničar (2013) obtained in other caves of the Jelovica Plateau. Smaller scalenohedrons were developed in cave pools and gours during later cave evolution, which resulted from cold water speleogenesis in epiphreatic conditions. This phase contributed to some remodelling of the cave, especially of vertical shafts. Fine-grained cave sediments were also deposited. The massive speleothems and some vadose shafts were formed in vadose conditions. Evolution of the vadose elements was connected with the entrenchment of the Sava river-bed. Deposition of the massive vadose speleothems cannot be correlated with the recent climatic conditions at their present elevations (Gams 1962). The interpretation of palaeomagnetic data can easily support ages greater than 780 ka in spite of quite high degree of speleothem recrystallization (Zupan Hajna et al. 2013).

GAMS I. (1962): Jama pod Babjim zobom. – *Proteus*, 25, 1: 6–11.

OTONIČAR B. (2013): Whole day excursion (C). Jama pod Babjim Zobom and Cok caves (Jelovica Plateau) (big low-temperature hydrothermal calcite crystals). – *21st International Karstological School – Classical Karst: Hypogene speleogenesis (between theory and reality). Guide Book & Abstracts*: 28–33. Postojna.

ZUPAN HAJNA N., MIHEVC A., PRUNER P. & BOSÁK P. (2013): Jama pod Babjim Zobom. – *21st International Karstological School – Classical Karst: Hypogene speleogenesis (between theory and reality). Guide Book & Abstracts*: 33–37. Postojna.

Bilateral co-operation between Czech Geological Survey, Praha and Geologisches Bundesanstalt Wien, Austria: **Palyno-stratigraphy of Upper Cretaceous and Paleogene sediments on maps Mondsee and St. Wolfgang** (H. Lobitzer, Geologisches Bundesanstalt, Wien, Austria, L. Švábenická, Czech Geological Survey, Praha, Czech Republic & *M. Svobodová*; 2013)

Angiosperm pollen of the Normapolles group (*Triangulipollis turonicus* and *Trudopollis* sp.) evidenced the Middle Turonian age of the exposure at Kühleiten (2013 KÜH) while the dinoflagellate cysts (*Palaeohystrichophora infusorioides*), acritarchs *Micrhystridium* sp., microforaminifers and abundant phytoclasts of terrestrial origin reflected shallow-marine depositional conditions. Some redeposited Lower Cretaceous pteridophyte spores, i.e. *Baculatisporites comaumensis*, were found. Poor preservation of palynomorphs was influenced by the presence of pyrite. Calcareous nannofossil *Lucianorhabdus quadrifidus* from ?Zone UC9a and *Lithastrinus septenarius* evidenced also upper part of the Middle Turonian age.

Project of Joint Institute for Nuclear Research, Dubna, Russia, No. 04-4-1069–2009/2015: **Investigations of nanosystems and novel materials by neutron scattering methods** (*T. Lokajíček*, T. Ivankina, Joint Institute for Nuclear Research, Frank Laboratory of Neutron Physics, Dubna, Russia; 2009–2015)

Subproject 1: **Experimental and theoretical study of elastic wave field pattern in anisotropic texturized rocks.**

Results of the study relate to the influence of temperature and stress on elastic parameters of granulites. Mechanical properties of rock are changed when subjected to heat, due to a change in their anisotropy. The study was carried out on spherical granulite specimens, which were subjected to controlled loading and heating regimes. The studied spherical specimen was subjected to confining stress loading up to 400 MPa. At different stress levels elastic anisotropy was measured in 132 independent directions. Consequently the rock specimen was gradually heated from 50 °C up to 600 °C. After individual heating regimes elastic anisotropy was determined at atmospheric pressure. After final heating of the specimen to 600 °C, its elastic anisotropy up to confining stress 400 MPa was determined again. The original rock specimen exhibited a weak anisotropy of 8 % at atmospheric pressure. At 400 MPa the granulite specimen is nearly isotropic. Heating of the specimen caused a significant decrease in P-wave velocity and a high increase in coefficient of anisotropy. Subsequent determination of elastic anisotropy of heated rock specimen under confining stress up to 400 MPa shows significant increase in P-wave velocities in all directions, which nearly reach the P-wave

velocity values of the original specimen before heating. SEM analysis was carried out for small 30mm cubic specimens treated at temperature levels of 65 °C, 100 °C, 125 °C, 160 °C and 200 °C. It revealed that the volume of cracks increased significantly from 100 °C up, causing high anisotropy.

International Geoscience Programme (IGCP) of UNESCO & IUGS, Project Code IGCP No. 575: **Pennsylvanian terrestrial habitats and biotas in southeastern Europe and northern Asia Minor and their relation to tectonics and climate** (International leader: C.J. Cleal, National Museum Wales, Cardiff, United Kingdom; International co-leaders: S. Opluštil, Charles University, Praha, Czech Republic, I. van Waveren, Naturalis Biodiversity Center, Leiden, Netherlands, M.E. Popa, University of Bucharest, Bucharest, Romania, B.A. Thomas, University of Aberystwyth, Aberystwyth, United Kingdom; Czech national coordinator: S. Opluštil, Charles University, Praha; Czech participants: J. Drábková, Czech Geological Survey, Praha, I. Hradská, West Bohemian Museum Plzeň, J. Prokop, Charles University, Praha, J. Pšenička, West Bohemian Museum, Plzeň, I. Sýkorová, Institute of Rock Structure and Mechanics, Czech Academy of Sciences, Praha, Z. Šimůnek, Czech Geological Survey, Praha, S. Štamberg, Museum of Eastern Bohemia, Hradec Králové & *J. Zajíc*; 2010–2015)

The poor fossil record of the Mšec Member (Stephanian B) was described in the linear excavation of the Gazela gas line. The local bio/ecozone Sphaerolepis-Elonichthys was proved in the southern part of the Žihle Basin.

A synthesis of the Carboniferous–Permian (Stephanian C–Autunian) boundary sediments in continental basins of the Czech part of the Bohemian Massif was compiled. Both fossil and climatic records show that, apart from a generally known long-term climatic shift to drier conditions in Early Permian, the climate oscillated on several time scales throughout the study interval. The floral record indicates the presence of dryland and wetland biomes in basinal lowlands although their proportions varied significantly as the climate changed. The response of lacustrine faunas to climatic oscillations around the Carboniferous–Permian transition is less prominent than that of plants. The origin of the transition between the local Elonichthys–Sphaerolepis and Acanthodes gracilis bio/ecozones around the Carboniferous/Permian boundary is impossible to deduce from the existing fossil record (Tab. 1).

The following papers were published this year:

OPLUŠTIL S., ŠIMŮNEK Z., ZAJÍC J. & MENCL V. (2013): Climatic and biotic changes around the Carboniferous/Permian boundary recorded in the continental basins of the Czech Republic. – *International Journal of Coal Geology*, 119: 114–151.

ZAJÍC J. (2013): První nález svrchnokarbonské fauny v jižní části žihelské pánve (Český masív). – *Zprávy o geologických výzkumech v roce 2012*: 34–35.

Lithostratigraphy		*Anthracosia stegocephalum*	*Anthraconaia* sp.	Anthracosiidae indet.	*Carbonita salteriana*	*Carbonita* sp.	*Pseudestheria* sp.	Lioestheriidae indet.	*Acanthodes fritschi*	*Acanthodes* sp.	*Sphenacanthus vicinalis*	*Lissodus lacustris*	Hybodontiformes indet.	*Plicatodus plicatus*	*Plicatodus* sp.	*Orthacanthus* sp.	Xenacanthiformes indet.	*Elonichthys krejcii*	*Sphaerolepis kounoviensis*	*Progyrolepis speciosus*	*Spinarichthys dispersus*	*Zaborichthys fragmentalis*	Actinopterygii indet.	Osteolepiformes indet.	*Sagenodus* sp.	*Branchierpeton* cf. *saalensis*	Dissorophoidea indet.	Amphibia indet.
Líně Formation		no fauna																										
	Stránka H.			x		x		x									x						x					
						x		x		x							x	x	x	x	x		x		x		x	
	Klobuky H.	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
			x			x													x		x		x		x			
	Zdětín H.		x			x		x		x	x	x				x	x	x	x	x	x		x		x	x		x
		no fauna																										

■ **Tab. 1.** Fauna of the Líně Formation from the central and western Bohemian basins. The chart shows the distribution of animal taxa in the Líně Formation (Stephanian C to supposed Lowermost Permian) close to, or around, the presumptive Carboniferous/Permian boundary.

International Geoscience Programme (IGCP) of UNESCO & IUGS, Project Code IGCP No. 580: **Application of magnetic susceptibility as a paleoclimatic proxy on Paleozoic sedimentary rocks and characterization of the magnetic signal** (International leader: A.C. da Silva, Belgium; international co-leaders: M.T. Whalen, USA, *J. Hladil*, D. Chen, China, S. Spassov, F. Boulvain, X. Devleeschouwer, Belgium; Czech group representative and organizer: *L. Chadimová*; other Czech participants: *V. Böhmová*, *P. Čejchan*, *M. Chadima*, *K. Čížková*, *J. Kadlec*, *G. Kletetschka*, *L. Lisá*, *P. Lisý*, *O. Man*, *T. Navrátil*, *P. Pruner*, *P. Schnabl*, *L. Slavík*, *S. Šlechta*, F. Hrouda, Agico, Ltd., J. Frýda, Š. Manda, P. Čáp, S. Vodrážková, L. Ferrová, P. Budil, Czech Geological Survey, F. Vacek, National Museum in Prague, I. Šafařík, Institute of Nanobiology and Structural Biology of GCRC, CAS, T. Matys-Grygar, Institute of Inorganic Chemistry CAS, v. v. i., O. Bábek, Palacký University in Olo-

mouc, J. Kalvoda & T. Kumpán, Masaryk University in Brno; 2009–2013)

The year 2013 was the last year of IGCP project No. 580 "Application of magnetic susceptibility on Paleozoic sedimentary rocks". Leader of the project Anne-Christine da Silva applied at the end of 2013 for an extension of the project, so called O.E.T. status (on extended term) for 2014. If this is approved, the last meeting of the project will be held in Mongolia in August 2014 as a joint meeting with IGCP project No. 596 (the decision is not known at the deadline of the Research Report 2013).

In 2013 three Czech participants (L. Chadimová, O. Bábek and T. Kumpan) took part and presented their results at the last IGCP 580 meeting – an international conference, joint meeting of IGCP projects No. 580 and 596: "Geophysical and Geochemical Techniques: A Window on the Palaeozoic World" which was held in Calgary, Canada (August 27 – September 1, 2013). Three lectures were given. L. Chadimová and T. Kumpan took part also in the Training core workshop (Fig. 2) at the Energy Resources Conservation Board's (ERCB) Core Research Center in Calgary studying Upper Devonian subsurface rocks and oil reservoir rocks of Alberta (Frasnian rocks of the western part of the Western Canada Sedimentary basin, e.g., Swan Hills Formation, Leduc Formation, Duvernay Formation (unconventional) and Nisku Formation; Fig. 3). The workshop was led by K. Potma (Esso) and J. Weissenberger (Husky Energy). Two days of field trips brought participants to outcrops in the area around Canmore, along the Canadina Rockies mountain front, west of Calgary to the Upper Devonian limestones at Grassi Lakes (equivalents of the subsurface reservoir rocks studied during the core workshop) and the Devonian–Carboniferous boundary at Jura Creek (Fig. 4).

Special issue of Geological Society of London dedicated to IGCP 580 was proposed in 2013 (IGCP 580 Magnetic susceptibility a window onto ancient palaeoenvironments) – three papers by Czech participants were submitted. These all three papers benefited from international cooperation during IGCP 580 conferences sampling campaigns in 2010 in China and 2011 in the Czech Republic.

Field work and high-resolution sampling for magnetic susceptibility measurements and field gamma-ray spectrometry together with the refinement of conodont biostratigraphy and lithological characterization have been launched in Central Pyrenées (Catalania) in Spain during spring 2013 (L. Chadimová, L. Slavík, J.I. Valenzuela-Ríos). Two Lower Devonian sections were studied: Compte 1 near Baro and Sort, in the Freixa Unit (Lochkovian – Emsian) and Segre II near Seu d'Urgell (Lochkovian – Pragian).

Czech IGCP National Committee celebrated its 40th Anniversary in 2013. A publication summarizing all IGCP projects with Czech and Slovak (and formerly Czechoslovak) participation in its history has been released due to common effort of Czech and Slovak IGCP National Committees: Pašava J. & Vymazalová A. (Eds.) Forty years of IGCP: from Czechoslovak to Czech and Slovak IGCP National Committees. Czech Geological Survey, 112 pp. The chapter dedicated to IGCP project No. 580 was compiled by L. Chadimová.

■ **Fig. 2**. Core workshop at the ERCB Core Research Center in Calgary for participants of a joint meeting of IGCP projects Nos. 580 and 596: "Geophysical and Geochemical Techniques: A Window on the Palaeozoic World", last meeting of the IGCP project No. 580 taking place in Calgary, Canada (August 27 – September 1, 2013). The workshop was led by K. Potma (Esso; second from the right on the photo wearing a blue shirt) and J. Weissenberger (Husky Energy; first from the right on the photo wearing an orange shirt). Photo by L. Chadimová.

■ **Fig. 3.** An example of the core from the Upper Devonian (Frasnian) Leduc Formation studied during the core workshop at the ERCB Core Research Center in Calgary during a joint meeting of IGCP projects Nos. 580 and 596 in Calgary, Canada (August 27 – September 1, 2013) – an excellently developed reservoir rock – dolostone with vuggy and moldic porosities (after stromatoporoids and evaporites). Photo by L. Chadimová.

IGCP project No. 580 was focused on application of magnetic susceptibility to sedimentary rocks (mostly of Palaeozoic age – in most studies of Devonian but also to Mesozoic and recent rocks) and the use of these techniques for paleoenvironmental reconstruction: as a proxy for impurities of different origin trapped in the rocks which are delivered into the sedimentary environment and can be interpreted in terms of sea-level fluctuations, palaeoclimatic or tectonic changes. Three main issues were solved: 1) to compile available MS data collected by researchers and project participants and continue in collecting new data in the field during meetings, workshops and sampling campaigns, 2) to identify the origin of the magnetic susceptibility signal and identify magnetic susceptibility carriers, 3) proper application of this technique as a correlation, cyclostratigraphic and palaeoclimatic tool.

To sum up the activities of all participants and results of the project in the past five years we can conclude that:

- 5 IGCP 580 meetings were organized: 2009 in Liège, Belgium, 2010 in Guilin, China, 2011 in Prague, Czech Republic (organized by L. Chadimová (Koptíková) and J. Hladil), 2012 in Graz, Austria, 2013 in Calgary, Canada), and the planned meeting in Mongolia in 2014 if O.E.T. is approved for 2014

■ **Fig. 4.** Devonian-Carboniferous Boundary Beds of the Palliser Formation (limestone beds on the right where participants of the joint meeting of IGCP projects Nos. 580 and 596: "Geophysical and Geochemical Techniques: A Window on the Palaeozoic World" are sitting) and Exshaw Formation (thick black shales on the left) during the field trip to Jura Creek, Rocky Mountains, Southwestern Alberta, Canada. Photo by L. Chadimová.

- 8 field workshops were organized: e.g., The Eifel Workshop in Germany in 2012 together with IGCP project No. 596, workshops in the Carnic Alps in 2011 and 2012
- 6 training days (3 during the first meeting of IGCP 580 in Belgium in 2009, 1 during the third meeting of IGCP 580 in the Czech Republic in 2011, 1 at the University of Manizales Caldas in Colombia in 2011, 1 during the fifth meeting of IGCP 580 in Canada in 2013)
- 4 special sessions at other international conferences (at STRATI2010 – 4th "French" Congress on Stratigraphy in France in 2010; at Opening meeting of IGCP project No. 596 in Austria in 2011and at the 34th International Geological Congress in Brisbane in Australia in 2012 in conjunction with IGCP project No. 596 and the Subcommission of the Devonian Stratigraphy and at the 4th International Geologica Belgica meeting "Moving plates and melting icecaps, Processes and forcing factors in geology" in Brussels in Belgium in 2012)
- 300 participants of all the events and meetings, 177 abstracts submitted to the abstract volumes from the meetings
- more than 14,800 samples collected in the field during the sampling campaigns
- 2 special issues dedicated to IGCP project No. 580 (Geologica Belgica special issue "Magnetic susceptibility, correlations and Paleozoic environments" and Geological Society of London Special Publication special issue proposed in 2013 – IGCP 580: Magnetic susceptibility a window onto ancient palaeoenvironments)
- approximately 70 scientific papers dealing with magnetic susceptibility techniques published
- number of researchers involved in the IGCP 580 activities increased from 118 in 2009 to 245 in 2013 (45 countries)
- all information and results can be found at project communication platform, official webpage: http://www2.ulg.ac.be/geolsed/MS/

International Geoscience Programme (IGCP) of UNESCO & IUGS, Project Code IGCP No. 591: **Early to Middle Paleozoic Revolution** (International leader: B.D. Cramer, USA, international co-leaders: T.R.A. Vanderbroucke, France, Renbin Zhan, China, M.J. Melchin, Canada, Z. Zigaite, Lithuania, K. Histon, Italy, G.L. Albanesi, Argentina, M. Calner, Sweden; Czech participants: *L. Slavík*, *P. Štorch*, J. Frýda & Š. Manda, Czech Geological Survey; 2011–2015)

Comprehensive research on faunal dynamics, biostratigraphy and taxonomy of Ludlow graptolites continued in the Prague Synform. The Gorstian-Ludfordian boundary and early Ludfordian leintwardinensis Event were analysed along with a systematic revision of 27 graptolite taxa (Štorch et al. in press). New latest Ordovician and earliest Silurian graptolite assemblages of Chinese type were studied in Ordovician–Silurian boundary strata (upper persculptus through pre-ascensus and lower ascensus biozones) near Estana in Cadí Massif of Catalonian Pyrenées (joint work with Juan Carlos Gutiérrez-Marco and Josep Roqué).

ŠTORCH P., MANDA Š. & LOYDELL D.K. (in press): The early Ludfordian *leintwardinensis* graptolite Event and the Gorstian – Ludfordian boundary in Bohemia (Silurian, Czech Republic). – *Palaeontology*.

Mobility Programme supported by the Ministry of Education, Youth and Sports of the Czech Republic, Project Code: 7AMB 12AR024: **Thermochronologic constraints on the evolution of eastern Magallanes foreland basin sediments** (*M. Svojtka*, *D. Kořínková*, D. Nývlt, Česká geologická služba, Praha, J.M. Lirio & R. Del Valle, Instituto Antártico Argentino, Buenos Aires, Argentina; 2012–2013)

The Mobility Program supports activities of international cooperation in research and development to promote the mobility of researchers. The proposed project has two principal aims. The first one is to develop international cooperation with Argentinean scientistist. The second aim, a scientific one, is to decipher potential sedimentary sources and processes of sedimentations in the Magallanes foreland basin of the southernmost Andes (Tierra del Fuego).

The Mobility program was divided into two parts. During our joint March fieldwork stay in Argentina, we focused on traditional geological and petrological field research of the Magallanes foreland basin sediments. We collected 10 samples of fine- to medium-grained sandstones to conglomerates in the stratigraphic sequence of Lower Cretaceous to Paleocene. In return, Dr. Juan Manuel Lirio from Instituto Argentino Antartica (IAA) visited the Institute of Geology of the Czech Academy of Sciences, v. v. i. in Prague and also the Czech Geological Survey in Brno. He practised analytical procedures of fission-track method at the workplace of the GLI CAS and he also presented a lecture ("NorthWest Antarctic Peninsula – changes during the last 30 years") at Masaryk University in Brno and University of South Bohemia in České Budějovice.

Slovak Research and Development Agency Project No. č. APVV-0625-11: **New synthesis of relief evolution in the Western Carpathians.**

Subproject U4-7b: **Tufa body dating on contacts with river terraces and pediments** (project principal researcher: J. Minár, Faculty of Science, Komenský University, Bratislava, Slovakia; task co-ordinators: J. Soták, Institute of Gelology SAS, Bratislava, Slovakia, P. Bella, State Nature Conservation – Slovak Caves Administration, Liptovský Mikuláš and Catholic Universtity in Ružomberok, Slovakia, H. Hercman, M. Gasiorowski, Institute of Geological Sciences, PAS, Warszawa, Poland, *P. Bosák*, *P. Pruner*, *K. Čížková* & *S. Šlechta*; 2012–2015)

Pilot samples from tufas in different location within the Liptovská kotlina Basin (northern Slovakia) were taken by drilling (Fig. 5) in following bodies: Bešeňová–Drienok, Bešeňová–Záskalie, Čerená (abandoned quarry), and Liptovské Sliače–Skalie. The sites were carefully selected with respect to geological and geomorphological setting of each tufa body. All samples from Bešeňová–Drienok and Bešeňová–Záskalie sites showed normal magnetic polarity. Individual samples from Čerená indicated also reverse or transient/reverse magnetization, probably an effect of short excursions of the magnetic pole. The Th/U dating was performed on Čerená samples. It is influenced by relatively high detrital thorium admixture due to the admixture of fine-grained siliciclastics taken from dissolution of underlying

■ **Fig. 5.** Drilling at the top of the Čerená tufa body. Photo by P. Bella.

Central Carpathian Paleogene rocks by ascending warm waters. Nevertheless, basal horizons of the tufa body can be dated to 419 a 283 ka. Paleomagnetic sampling continued also in 2013 at the Čerená and Liptovské Sliače–Skalie sites to obtain more material from transient and reverse polarity segments (Bosák et al. 2013).

BOSÁK P., PRUNER P., ŠLECHTA S., ČÍŽKOVÁ K. & BELLA P. (2013): Paleomagnetizmus travertínov při Bešeňovej, Liptovských Sliačov a Ludrovej (Liptovská kotlina) – predbežné výsledky. – *Aragonit*, 18: 45–47.

Ministry of Education, Youth and Sports of the Czech Republic, "KONTAKT II", Project No. LH13102: **Kinematic and dynamic anisotropy of sedimentary and crystalline rocks: Ultrasonic, synchrotron and neutron diffraction study** (*T. Lokajíček*, *T. Svitek*, *M. Petružálek*, H.R. Wenk, University of California, Berkeley, Earth&Planetary Science; 2013–2015)

A measuring head for high pressure system was constructed. The head will enable elastic anisotropy measurement of rocks by means of longitudinal and transversal ultrasonic sounding under hydrostatic pressure up to 100 MPa. An approach was also developed on how to measure spherical sample deformation under hydrostatic pressure up to 400 MPa.

Grant-in-aid internal program of international cooperation projects of the Czech Academy of Sciences, Project Code: M100131201: **Hi-res correlation and dating of Mid-Paleozoic sedimentary sequences of Peri-Gondwana using integrated biostratigraphy and chemo-physical methods** (*L. Slavík*, *L. Koptíková*, *A. Hušková*, J.I. Valenzuela-Ríos, J.-Ch. Liao & H. Sanchíz-Calvo, University of Valéncia, Spain; 2012–2015)

The basis of the international Czech–Spanish project is a detailed correlation of selected sedimentary successions of the late Silurian and early Devonian in peri-Gondwana (Prague Synform, Spanish Central Pyrenees and Carnic Alps). The correlation is based on application of several methods in the sections: the detailed biostratigraphic framework is supplemented by multiple chemo-physical measurements (i.e., gamma-ray spectrometry and magnetic susceptibility) in order to avoid discrepancies in correlation of the peri-Gondwanan successions. A substantial part of the project is focused on conodont biostratigraphy which is fundamental for time correlation.

The highest precision has been attained in the Lochkovian where numerous cosmopolitan conodont time-marks occur. These are mostly represented by taxa belonging to the genera *Ancyrodelloides* and *Lanea* with minor widespread of other relevant taxa as *Flajsella*, *Masaraella*, *Pedavis* and *Kimognathus*. In three key areas of European peri-Gondwanan sections (Spanish Central Pyrenees; Prague Synform and Carnic Alps) the *Icriodus* and *Pelekysgnathus* record is also remarkable and can help in increasing the detail of correlations. In 2013 the basic correlation of the major Lochkovian conodont time-marks was finished and a draft of a refined biostratigraphical subdivision for the key areas was made. This preliminary subdivision became a basis for correlation with even more distant regions, e.g., Southern Urals and Northeast Asia. The biozonation established for the Pyrenees and Prague Synform has been successfully tested in the Southern Urals (Mavrinskaya & Slavík 2013).

According to the plan, the project leaders organized two field campaigns in 2013. First field work in the Prague Synform was focussed on the examination of classical Lower Devonian sections and conodont sampling. The following field campaign in the Pyrenees concentrated on hi-res biostratigraphic correlation between th Czech and Spanish sections. Two Lower Devonian sections (Segre II near Seu d'Urgell and Compte 1 near Baro and Sort) were sampled for magnetic susceptibility, and gamma-ray spetrometric data were obtained. All the samples for MS were already meassured. Evaluation of the results and further fieldwork is planned for 2014.

MAVRINSKAYA T. & SLAVÍK L. (2013): Correlation of Early Devonian (Lochkovian–early Pragian) conodont faunas of the South Urals (Russia). – *Bulletin of Geosciences*, 88, 2: 283–296.

Grant-in-aid internal program of international cooperation projects of the Czech Academy of Sciences, Project Code: M100131203: **Origin and characterization of mantle and crustal rocks: answer for deformation, thermal and geochemical evolution of orogenic zones** (*M. Svojtka*, *J. Sláma*, *L. Ackerman*, T. Hirajima, D. Naemura, K. Yoshida & T. Kobayashi, Kyoto University, Japan; 2012–2015)

In 2013, Ackerman et al. (2013) published results from isotopic study focused on pyroxenites and peridotites from Horní Bory, Bohemian Massif. We documented highly siderophile element (HSE – Re, Os, Ir, Ru, Rh, Pd, Pt, and Au) and S abundances, sulphide petrography and $^{187}Os/^{188}Os$ compositions of two distinct suites – Mg-lherzolites and Fe-dunites/wehrlites. The Mg-lherzolite suite is enriched in IPGE (Os, Ir, and Ru), moderately depleted in Pd, Pt and S, and has osmium isotopic compositions similar to that of the Phanerozoic convecting mantle. Such a composition can be best explained by a reaction between previously depleted peridotite and sulphur-under-saturated melt at low melt-rock ratios. The Re–Os data for the Fe-wehrlite/dunite and pyroxenite rocks yield an errorchon age of 334±19 Ma, which is similar to the age of other high-temperature/pressure rocks from the Gföhl Unit (Moldanubian Zone, Bohemian Massif); this age likely corresponds to the time of melt-rock reactions and subduction.

■ **Fig. 6.** During our joint Czech–Japan project supported by "Grant-in-aid internal program of international cooperation projects of the Czech Academy of Sciences" we carried out fieldwork in the Horoman peridotite massif (Hokkaido, Japan). We collected a unique collection of samples from a sequence of MORB-related oceanic mantle rocks in cooperation with Japanese colleagues. Photo by M. Svojtka.

We also studied mantle-derived garnet-bearing pyroxenites form layers or patches within garnet peridotite bodies at seven localities from the Gföhl Unit (Moldanubian Zone, Bohemian Massif) both in the Czech Republic and Austria. We measured Re-Os concentrations in spinel and garnet pyroxenites. The pyroxenite composition of the studied samples ranges from clinopyroxenite to websterite and they likely represent crystal cumulates (± trapped liquid) from melts migrating along conduits, and reacting with peridotite in a mantle wedge above a Variscan subduction zone. The studied samples have relatively variable Re and Os concentrations of 0.103–1.45 ppb and 0.18–1.84 ppb, respectively. Radiogenic $^{187}Os/^{188}Os$ ratios range from 0.1425 to 0.3247. This points to superchondritic γOs values from +3 to +132. In contrast, most of the pyroxenites display radiogenic γOs suggesting a variable but significant contribution of recycled crustal material (subducted oceanic crust) in the migrating upper mantle melts from which they were crystallized. This enrichment was most likely associated with Variscan subduction processes. Melt-rock reactions between previously depleted peridotite and invading melts with highly radiogenic $^{187}Os/^{188}Os$ composition (γOs up to +132) would lead to mantle refertilization with significant addition of Re.

In 2013, joint Czech–Japan fieldwork was carried out in the Horoman peridotite massif (Fig. 6, Hokkaido, Japan). This massif is a MORB-related oceanic mantle subsided to deeper mantle depth, before crustal ascension and emplacement. The structure of the peridotite body is layered, two main zones have been distinguished: (A) Upper zone – core of an ascending mantle diapir with plagioclase lherzolites and harzburgites and mafic layers, and (B) Lower zone – margin of an ascending mantle diapir with cyclic layers of lherzolites, harzburgites, dunites and mafic layers.

The research activities were also focused on further stuides with P-T reconstruction and geochemistry of high-pressure/ultrahigh-pressure rocks from the Bohemian Massif (Czech Republic). Individual results were presented at the 10th International Eclogite Conference.

ACKERMAN L., PITCHER L., STRNAD L., PUCHTEL I.S., JELÍNEK E., WALKER RJ. & ROHOVEC J. (2013): Highly siderophile element geochemistry of peridotites and pyroxenites from Horní Bory, Bohemian Massif: implications for HSE behaviour in subduction-related upper mantle. – *Geochimica et Cosmochimica Acta,* 100: 158–175.

Participation on a research project of the Institute of Nature Conservation, Polish Academy of Sciences, Krakow, No. NN 306 522 738, Granted by the Polish Ministry of Science and Higher Education, No. 0062: **Phases of initiation and development of mass movements in Polish Flysch Carpathians in the Late Glacial and the Holocene, on the basis of speleothems and**

sediments in the non-karst caves (W. Margiełewski, J. Urban, Institute of Nature Conservation PAS, Krakow, Poland, M. Schejbal-Chwastek, AGH University of Science and Technology, Krakow, Poland & *K. Žák*; 2010–2013)

The phases of movement of landslides in the Polish Flysch Carpathians were studied using a set of research methods applied on speleothems in non-karst caves. These caves are formed by mass movements in sandstone lithologies. Flysch sandstones locally contain abundant carbonate cement, which results in the formation of usual types of speleothems in the caves. Speleothems of these caves are commonly destroyed or inclined as a result of later phases of the landslide movement. Speleothems were studied by a set of geochronological and geochemical methods, which enabled to determine the chronology of landslide movements from the late Glacial to the present. The landslide movement phases are well correlated with periods of increased precipitation during the late Glacial and Holocene. An important methodical aspect of the study was the comparison of radiocarbon and U-series disequilibrium dating methods applied on speleothems with increased content of impurities. The results of the study were presented at several conferences, and a paper is under review in the Zeitschrift für Geomorphologie journal.

4b. Czech Science Foundation

Finished projects

No. GA205/09/0703: **Integrated late Silurian (Ludlow–Přídolí) stratigraphy of the Prague Synform** (*L. Slavík*, *P. Štorch*, Š. Manda, J. Kříž, J. Frýda & Z. Tasáryová, Czech Geological Survey, Praha; 2009–2013)

The global correlation of the Silurian is based principally on graptolites (mostly in shale-dominated facies) and conodonts (in carbonate-dominated facies). In many regions the graptolite and/or conodont biostratigraphy has been complemented by isotope geochemistry utilized as an event-stratigraphic proxy, and also by parallel evaluation of benthic and nektic faunas which serve as appropriate palaeoecological indicators. There still exist, however, pending problems concerning the stratigraphic distribution of key graptolite and conodont taxa, and in their global correlation. In general, the difficulties in correlation are caused by natural constraints (e.g., dearth of biostratigraphic information due to incomplete sedimentary and/or fossil record), further complicated by diverse scientific approaches to taxonomy and nomenclature.

Since the work by Bouček (1936) the Barrandian area has been considered a territory of high-resolution upper Silurian biostratigraphy based on planktic graptoloids. However, the most detailed and most elaborated graptolite biozonations of the upper Silurian world-wide arose from study of core sections on the periphery of the East European Platform (Teller 1997; Urbanek & Teller 1997). Similar to other regions world-wide, the upper Silurian graptolite stratigraphy of the Prague Synform remained less studied than that of the lower Silurian. Local reasons involved less abundant and less diversified graptolites and the rather discontinuous graptolite occurrences in limestone-dominated, relatively shallow-water parts of the upper Silurian succession (Ludfordian and Přídolí). Perner & Kodym (1919) subdivided the entire Silurian succession into only nine graptolite biozones. Ludlow graptolite biostratigraphy was developed by Bouček (1934, 1936). Prantl & Přibyl (1948) recognized five graptolite biozones within the Ludlow Series. Jaeger (1959) replaced the *M. leintwardinensis primus* Zone with the *S. linearis* Zone (= *leintwardinensis* Biozone). Přibyl (1983) further proposed a considerable refinement of the Ludlow graptolite biozonation; some of his new biozones, however, met difficulties both in intra- and inter-regional correlations. For example, the biozonal index species *Saetograptus insignitus* Přibyl, 1983 is now considered to be a junior synonym of *Pseudomonoclimacis latilobus* (Tsegelnyuk, 1976), a biozonal species used in Poland and Podolia (Ukraine). Přibyl (1983) listed many localities but did not refer to measured and/or figured sections. Štorch (1995a, b) described Ludfordian graptolites of the *N. inexpectatus* and *N. kozlowskii* biozones from a measured section in Kosov quarry near Beroun. The most complete upper Ludfordian graptolite succession was recently described from the relatively off-shore, shale-dominated Všeradice section (Manda et al. 2012). Frýda & Manda (2013) supplemented the existing biozonal chart with the *P. dubius postfrequens* Interval Biozone.

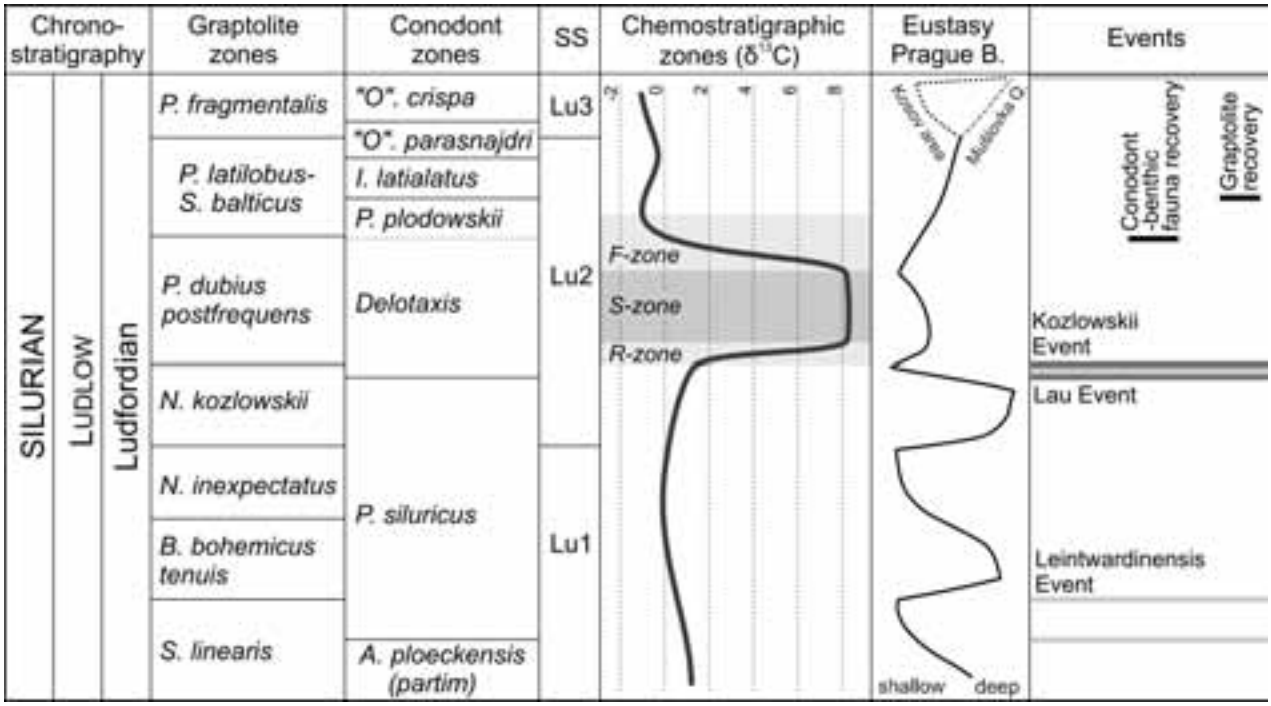
Conodont studies in the upper Silurian in the Prague Synform date back to the pioneer work of Walliser (1964), who included the conodont data from the area into his first biozonal framework for the Silurian. He erected a stratigraphically important taxon "*Spathognathodus snajdri*" (types come from Mušlovka Quarry) that has an excellent correlation potential as shown for example by Viira & Aldridge (1998). With regard to the Ludfordian, Walliser's original sequence of biozones – *ploeckensis*, *siluricus*, *latialatus* and *crispa* – has been changed only moderately through time by adding the *snajdri* Interval Biozone (for summary see Corradini & Serpagli 1999 and Corradini 2009). The *snajdri* Interval Biozone represents an elevation of Walliser's former "*snajdri*-Horizon" to a formal biozone for global correlation purposes. Various conodont data including occurrences of index taxa from the Ludfordian have been reported from numerous localities around the Prague Synform, e.g., by Bultynck & Pelhate (1971), Walmsley et al. (1974) and Mehrtens & Barnett (1976). A comprehensive work on upper Silurian conodonts is that by Schönlaub (in Chlupáč et al. 1980 and in Kříž et al. 1986). He made a large summary of conodont faunas obtained from samples from several sections and localities that were sampled and studied by him or by previous authors. Based on this summarized data he recognized the Walliser's biozones: *ploeckensis*, *siluricus*, *latialata*, *snajdri* and *crispa* in the Ludfordian and *eosteinhornensis* in the Přídolí. Later, Carls et al. (2005) established in the middle Ludfordian a new spathognathodontid taxon *Parazieglerodina plodowskii* that is characterized by incipient alternating denticulation in some ramiform elements of the conodont apparatus. The stratigraphic potential of the innovative morphology in *P. plodowskii* apparatus has been evaluated in recent papers (Slavík et al. 2010; Slavík & Carls 2012) in which the Ludfordian conodont biozonation has been refined.

Upper Silurian sedimentary succession of the Prague Synform (Barrandian area) has been a subject of detailed study within the finished project. Appropriate sections were selected to enable a complex study of biotic changes in marine environment reflecting global events. Long-term detailed study of marine faunas resulted in a substantial progress in relative dating of sedimentary succession at this stratigraphic level. The newly revised biozonation based on conodont faunas largely applicable in carbonates was proposed for the Ludlow and Přídolí Series.

Biozonation of the Upper Silurian of the Prague Synform is essential for global correlation within the Series but has long been delayed because comprehensive studies of neither the type section of the Přídolí nor the stratotype of the Silurian/Devonian boundary are available. Extant attempts at biozonation have originated in areas distant from the Barrandian and have all been found inapplicable (Carls et al. 2007). Within the project a tentative regional zonal scheme for the Přídolí has been suggested, including six biozonal units.

The conodont zonal scale for Ludlow has then been correlated with an updated graptolite biozonation that is applicable mostly in shaly offshore successions. A unique juxtaposition of both independent biozonations, that are normally applicable in different facies types, was facilitated by detailed study of stratigraphic sections with transitional facies development. The newly refined biozonations are then integrated with the generalized eustatic and carbon isotope curves into a composite correlation chart. The stratigraphic level of major biotic crisis (mass extinction – i.e., the Lau/Kozlowskii Event) in marine environment is now precisely defined within the newly established correlation chart for the Ludfordian Stage which represents a basis for high-resolution correlation of that region within global reconstruction of the Silurian World (Slavík et al. 2013). The major biotic crisis in the late Silurian is also connected with geochemical composition of the Silurian Ocean. The integration of the biozonations in the late Silurian resulted in the high-resolution stratigraphy that enables very fine stratigraphic time-subdivision. The biostratigraphic refinements are then a basis for detailed reconstructions of the biodiversity evolution and global changes of ecosystems with precision that extends far beyond the correlation achieved in other stratigraphic levels intervals. The project also contributes to understanding of progress of global crises (events) in the late Silurian and points to their polyphase character. The evident linkage between biotic changes and global carbon isotope cycle was proved and the upgraded biozones of the Ludfordian Stage were directly correlated with the newly established chemostratigraphic zones (see Fig. 7).

Stratigraphic positions of major crises in marine biota (e.g., Lau/Kozlowskii Event, Leintwardinensis Event) were precisely defined. The effects of the conodont Lau Event in shallow water environments of the Prague Synform was rather moderate in comparison with Gotland. The post-Lau Event restoration of conodont faunas following the characteristic post-*siluricus* faunas with diminished elements and dominated by *Delotaxis* was also gradual. This points to the absence of large gaps in sedimentation that were characteristic below and caused disappearance of a large upper part of the *siluricus* Zone. Accordingly, the conodont record of recovering conodont faunas starting with the entry of "slender spathognathodontids" is probably complete. Increased diversity and abundance of new-coming conodont taxa enabled a refinement of regional zonal subdivision. This includes a succession of *plodowskii*, *latialatus*, *parasnajdri* and *crispa* conodont Biozones for the interval following the Lau Event in the late



■ **Fig. 7.** A correlation chart for the Ludfordian in the Prague Synform. The chart includes integrated correlation of regional graptolite and conodont biozones and global $d^{13}C$ chemostratigraphic zonation, generalized carbon isotope curve, eustatic curve and plotted positions of major faunal events. Original.

Ludfordian. This subdivision may have potential for global correlation, when more data are available. The conodont data from Bohemia showed that the use of the *snajdri* Interval Zone for global correlation should be avoided, because taxa *Pedavis latialatus* and "*Ozarkodina*" *crispa* largely overlap. Similarly, the use of this problematic stratigraphical unit as a base for definition of the "Stage Slice" for the middle Ludfordian is misleading. Conspicuous morphological changes in the *snadri-crispa* and *Ozarkodina typica* lineages allow refined inter-regional correlations.

The number of published studies on the composition and evolution of major macrofaunal groups (e.g., bivalves, cephalopods, graptolites or bryozoans) and its significance for the reconstruction of paleocomunities evolution and global paleoenvironmental correlations represent important scientific results that arose from the project. Apart from the main and/or previously planned outputs several "by-products" can be listed. These include, e.g., an independent correlation of the Silurian/Devonian boundary based on conodont faunas in shallow-water environment. A novel petrophysical study (made extra plan) has been carried out in three carbonate sections using modern computer data processing. The most important results have been published or accepted for print in prestigious international journals.

The aims of the project have been accomplished; however, the number of results is so large that all outputs could not be published yet. Some specific problems, especially in the latest Silurian, will require further study.

BOUČEK B. (1934): Bemerkungen zur Stratigraphie des böhmischen Gothlandien und seinen Faziesverhältnissen. – *Zentralblatt fur Mineralogie Geologie und Paläontologie*, 5, Abteilung B 114: 477–494.

BOUČEK B. (1936): Die Planktonfauna der böhmischen Graptolitenschiefer. – *Zentralblatt fur Mineralogie Geologie und Paläontologie,* 7: 291–296.

BULTYNCK P. & PELHATE A. (1971): Découverte de la Zone a eosteinhornensis (Conodontes) dans le Synclinorium Médian du Massif Armoricain. – *Mémoire du B.R.G.M., Colloque ordovicien-silurien*, 73: 189–197.

CARLS P., SLAVÍK L. & VALENZUELA-RÍOS J.I. (2005): A new Ludlow (Late Silurian) Spathognathodontidae (Conodonta) from Bohemia with incipient alternating denticulation. – *Neues Jahrbuch für Geologie und Paläontologie Monatshefte*, 9: 547–565.

CARLS P., SLAVÍK L. & VALENZUELA-RÍOS J.I. (2007): Revisions of conodont biostratigraphy across the Silurian-Devonian boundary. – *Bulletin of Geosciences*, 82, 2: 145–164.

CHLUPÁČ I., KŘÍŽ J. & SCHÖNLAUB, H.P. (1980): Silurian and Devonian conodont localities of the Barrandian. – *In*: Guidebook and Abstracts, Second European Conodont Symposium /ECOS II/. *Abhandlungen der Geologischen Bundesanstalt*, 35: 147–180.

CORRADINI C. (2009): Looking for a late Silurian Standard Conodont Zonation: still a long way to go. – *In*: CORRIGA M.G. & PIRAS S. (Eds.): *Time and Life in the Silurian: a multidisciplinary approach. Abstracts. Rendiconti della Società Paleontologica Italiana*, 3, 3: 273–274.

CORRADINI C. & SERPAGLI E. (1999): A Silurian conodont biozonation from late Llandovery to end Pridoli in Sardinia (Italy). – *In*: SERPAGLI E. (Ed.): *Studies on Conodonts. Proceedings of the Seventh European Conodont Symposium. Bolletino della Società Paleontologica Italiana,* 37, 2–3: 255–273.

FRÝDA J. & MANDA Š. (2013): A long-lasting steady period of isotopically heavy carbon in the late Silurian ocean: evolution of the δ13C record and its significance for an integrated δ13C, graptolite and conodont stratigraphy. – *Bulletin of Geosciences,* 88, 2: 463–482.

JAEGER H. (1959): Graptolithen und Stratigraphie des jüngsten Thüringer Silurs. – *Abhandlungen der Deutschen Akademie der Wissenschaften, Klasse für Chemie, Geologie und Biologie*, 2: 1–197.

KŘÍŽ J., JAEGER H., PARIS F. & SCHÖNLAUB H.P. (1986): Přídolí – the fourth subdivision of the Silurian. – *Jahrbuch der Geologischen Bundesanstalt*, 129, 2: 291–360.

MANDA Š., ŠTORCH P., SLAVÍK L., FRÝDA J., KŘÍŽ J. & TASÁRYOVÁ Z. (2012): The graptolite, conodont and sedimentary record through the late Ludlow kozlowskii Event (Silurian) in the shale-dominated succession of Bohemia. – *Geological Magazine*, 149, 3: 507–531.

MEHRTENS C.J. & BARNETT S.G. (1976): Conodont subspecies from the Upper Silurian-Lower Devonian of Czechoslovakia. – *Micropaleontology*, 22, 4: 491–500.

PERNER J. & KODYM O. (1919): O rozčlenění svrchního siluru v Čechách. – *Časopis Musea Království českého*, 93: 1–19.

PRANTL F. & PŘIBYL A. (1948): Revise různorepých (Eurypterida) z českého siluru [Revison of the Bohemian Silurian Eurypterida]. – *Rozpravy Státního geologického ústavu*, 10: 1–116.

PŘIBYL A. (1983): Graptolite biozones of the Kopanina and Přídolí Formations in the Upper Silurian of central Bohemia. – *Časopis pro Mineralogii a geologii*, 28, 2: 149–167.

SLAVÍK L., ŠTORCH P., MANDA Š. & FRÝDA J. (2013): Integrated stratigraphy of the Ludfordian in the Prague Synform. – *GFF Geologiska Föreningen*, 136, 1: 1–5.

SLAVÍK L. & CARLS P. (2012): Post-Lau Event (late Ludfordian, Silurian) recovery of conodont faunas of Bohemia. – *Bulletin of Geosciences*, 87, 4: 815–832.

SLAVÍK L., KŘÍŽ J. & CARLS P. (2010): Reflection of the mid-Ludfordian Lau Event in conodont faunas of Bohemia. – *Bulletin of Geosciences*, 85, 3: 395–414.

ŠTORCH P. (1995a): Upper Silurian (upper Ludlow) graptolites of the *N. inexpectatus* and *N. kozlowskii* biozones from Kosov Quarry near Beroun (Barrandian area, Bohemia). – *Bulletin of the Czech Geological Survey*, 70, 4: 65–89.

ŠTORCH P. (1995b): Biotic crises and post-crisis recoveries recorded by Silurian planktonic graptolite faunas of the Barrandian area (Czech Republic). – *In*: ČEJCHAN P., HLADIL, J. & ŠTORCH P. (Eds.): *Evolution and extinctions. Geolines*, 3: 59–70.

TELLER L. (1997): Graptolites and stratigraphy of the Přídolí Series in the east European Platform. – *Palaeontologia Polonica*, 56: 59–70.

URBANEK A. & TELLER L. (1997): Graptolites and stratigraphy of the Wenlock and Ludlow series in the East European Platform. – *Palaeontologia Polonica*, 56: 23–57.

VIIRA V. & ALDRIDGE R.J. (1998): Upper Wenlock to Lower Pridoli (Silurian) conodont biostratigraphy of Saaremaa,

Estonia, and a correlation with Britain. – *Journal of Micropalaeontology*, 17, 1: 33–50.
WALLISER O.H. (1964): Conodonten des Silurs. – *Abhandlungen des Hessischen Landesamtes für Bodenforschung*, 41: 1–106.
WALMSLEY V.G., ALDRIDGE R.J. & AUSTIN R.L. (1974): Brachiopod and conodont faunas from the Silurian and Lower Devonian of Bohemia. – *Geologica et Palaeontologica*, 8: 39–47.

Major publications/outputs:

SLAVÍK L. & CARLS P. (2012): Post-Lau Event (late Ludfordian, Silurian) recovery of conodont faunas of Bohemia. – *Bulletin of Geosciences*, 87, 4: 815–832.
SLAVÍK L., KŘÍŽ J. & CARLS P. (2010): Reflection of the mid-Ludfordian Lau Event in conodont faunas of Bohemia. – *Bulletin of Geosciences*, 85, 3: 395–414.
ŠTORCH P., MANDA Š., LOYDELL D. (in press). The early Ludfordian Leintwardinensis graptolite event and the Gorstian–Ludfordian boundary in Bohemia (Silurian, Czech Republic). – *Palaeontology*.
SLAVÍK L., CARLS P*., HLADIL J. & KOPTÍKOVÁ L.* (2012): Subdivision of the Lochkovian Stage based on conodont faunas from the stratotype area (Prague Synform, Czech Republic). – *Geological Journal*, 47, 6: 616–631.
SLAVÍK L., ŠTORCH P., MANDA Š. & FRÝDA J. (2013): Integrated stratigraphy of the Ludfordian in the Prague Synform. – *GFF Geologiska Föreningen*, 136, 1: 238–242.
MANDA Š., *ŠTORCH P., SLAVÍK L.*, FRÝDA J., KŘÍŽ J. & TASÁRYOVÁ Z. (2012): The graptolite, conodont and sedimentary record through the late Ludlow kozlowskii Event (Silurian) in the shale-dominated succession of Bohemia. – *Geological Magazine*, 149, 3: 507–531.

No. GA205/09/1918: **Soluble and insoluble fraction of inorganic pollutants in various types of precipitation, their quantification and input into the ecosystems** (J. Fišák, Institute of Atmospheric Physics CAS, Prague, M. Tesař, Institute of Hydrodynamics CAS, Prague & *J. Rohovec*; 2009–2013)

During this year of project solution, the main focus was on collecting the precipitation samples. A number of 396 liquid samples were collected together at four sites. Insoluble particles were separated from fog water samples and these particles were rigorously analyzed. Quantification of the deposited precipitation amount was also one of the major parts of the project. As a result of this objective, four gauges for the measurement of the precipitation amount were developed. The main attention of the first joint applicant (Institute of Hydrodynamics of the Czech Academy of Sciences) during the project solution was centred on two research lines: the experimental and the analytical ones. The monthly samples of the bulk precipitation in the open air area, throughfall under the forest canopy and surface water, were collected in the selected small experimental catchments in the Šumava Mts., in the Jizerské hory Mts. and in the Krkonoše (Giant) Mts. In the Šumava Mts. the samples of throughfall water were collected at two localities (i.e., under the spruce and under the beech forest canopies). In order to estimate the influence of the occult precipitation on the matter balance, the samples of water from the wind-driven low clouds and fogs were collected and analyzed in the chemical laboratory. In each of the mountainous regions, both active and passive cloud and fog water samplers were installed and operated. From 2009 to 2013 the total amount of 421 samples of water of the occult precipitation were collected.

The attention was paid to the estimation of both the amount of water and of the matter input to the headwater region via wind-driven low clouds and fogs. Unique data sets on the assessment of water balance in the forest canopy ware obtained. These data make possible to evaluate the water balance of both the spruce and the beech forest canopy by taking into account the interception and occult precipitation deposition. The wind-driven low clouds and fogs represent important delivery mechanism for water in many mountainous region in the Czech Republic. The results obtained in the framework of this project were used as input data to models simulating the water regime of the water balance of small catchments and the runoff formation from these regions. The occult precipitation can also increase the water amount incoming to the soil surface and thus influence the soil water regime. The greatest significance of the occult precipitation, including the water droplets deposition from wind-driven low clouds and fog, is represented on the concentration of pollutants in this kind of water. As a result, the substantial findings of this project can be formulated as the improvement of our knowledge of chemical composition of the occult deposition and of the matter balance of a small mountainous watershed in headwater regions. The findings also obtained in the framework of this project were used for the description of the relationship between precipitation, runoff, and loss of potassium and sodium ions in the closing profile of a small mountain basin predominantly covered by spruce forest. It was found that extremely high sodium losses from the watershed are closely related to precipitation extremes. In contrast, the annual loss of potassium is not as strongly linked to the annual rainfall. Moreover, in the framework of this project the automatic system for the monitoring of deposited precipitation and fog water sampling was applied at four sites – two meteorological observatories (Milešovka and Kopisty) and two field sites (Žloukovice and Praha–Suchdol) at the Institute of Atmospheric Physics CAS. In the framework of this project the automatic system for the monitoring of the forest canopy was created at the selected localities that belong to the Institute of Hydrodynamics CAS in the Šumava Mts. (two localities), in the Jizerské hory Mts, and in the Krkonoše (Giant) Mts. This system is in a continuously operation regime in order to estimate the amount of the water input to the headwater region via wind-driven low clouds and fogs by using the balance of the forest canopy. Additional well equipped meteorological stations situated on the slope of Smědavská Mt. (Jizerské hory Mts.) and on the top of Poledník Mt. (the Šumava Mts.) were supplemented by both active and passive cloud and fog water collectors and by the equipment for a continuous registration of the dew in cooperation with the applicant institute.

During the course of work, it was possible to improve sensitivity of trace element analyses due to the application of ICP MS technique, as the instrument was acquired by the Institute of Geology CAS. At the same time, ultra trace elements like U, Th,

and RE elements can be easily quantified and studied. As a result, it was recognised that Th is a typical ultra-trace element transported exclusively in silicate-based solid particles, while its content in the liquid fraction of atmospheric deposition is negligible. Uranium is distributed in a different manner, being present in the solid fraction and in the liquid fraction as well.

No. GAP405/11/1590: **Neolithic rondels from the perspective of micromorphologic and formative analysis** (Petr Květina, Institute of Archaeology in Prague CAS, v. v. i., Prague, Czech Republic and *L. Lisá*; 2011–2013)

The project presents qualitatively new methods and results for analyzing and interpreting the Late Neolithic rondels (Kreisgrabenanlage). Using detailed spatial analyses of artefacts deposition, AMS ^{14}C dating of multiple samples and geological microstratigraphy (micromorphology), the formation processes were studied together with depositional events of rondel ditches.

Also the comparison study of formation processes which took place in the infilling of spitzgraben ditches of different ages was pronounced. On the basis of sedimentological and consequently micromophological study, processes of the formation of the studied infillings were recognized. In the case of Neolithic rondels, two parts of infilling were distinguished. Lower one is characterized by straight laminae, originated by processes connected with vegetation ingrowth and rampart erosion. The upper part of the infilling is usually homogenous, originated during the human-induced grading of the surrounding area. During this phase the remains of rampart constructions are most probably destroyed. The basic type of deposition – particularly well visible in the case of rondels – is the lateral plane wash with phases of bioturbation, running pedogenesis on the edges of the ditch or stagnant water within the infilling. The second main featuring process is mass movement, so-called slumping, particularly on upper faces of sloped sides. This process often happens naturally, mainly due to erosion, presence of water and vegetation. The most distinctive post-sedimentary processes determined within the rondel infilling was the bioturbation, accumulation of carbonates and movement of clay minerals caused by soil leaching. In the case of the V-shaped ditches of the Roman temporary camps it was possible to microscopically identify a similar record documenting coarse particle sedimentation at the base of the ditch, whilst this layer is not continuous across the whole width of the ditch. It indicates the direction from which it was deposited. These are remains of an intentionally redeposited rampart. The upper part it typical for its increasing humification and bioturbation as a result of the emergence of the ditch infilling. However, similar formation processes can be identified in both groups of studied V-shaped ditches and basic classification can be outlined. Prevailing textural and structural features are distinctly different between the groups. This is primarily caused by geological subsoil conditions, hydrological regime and depth of the ditches.

Results from the study of Neolithic rondels are in agreement with the theoretical predictions stated in the initial stage of the project: archaeological material from the ditches is not related with the period of rondel function (whatever it was). This result is in direct opposition with most published thematic studies. Also the way of the extinction of the ditches was probably much more complicated than previously assumed. The results of the project have profound implications for future studies of Neolithic rondels and may help to solve the fundamental question of original function of these monumental structures in the future.

Continued projects

No. GA13-13967S: **Experimental study of crack initiation and crack damage stress thresholds as critical parameters influencing the durability of natural porous stone** (R. Přikryl, A. Šťastná, Faculty of Science, Charles University, Praha, Z. Weishauptová, I. Sýkorová, M. Švábová, Institute of Rock Structuree and Mechanics, Praha, *T. Lokajíček* & L. Zamrazilová, Academy of Fine Arts, Praha; 2013–2017)

The proposed project assumes that the durability prediction of porous natural stones cannot be fully resolved without a detailed understanding of their physical properties, specifically of their mechanical behavior in the brittle field. Aims of the project include laboratory rock mechanical experiments, microscopic examination and instrumental study, artificial laboratory weathering procedures, experimental uniaxial compressive and/or indirect tensile strength tests, computation of the traditional energetic parameters, microscopic examination and image analysis quantification of microcracks, experimental data analysis and proposal of an expert system for the prediction of the durability of porous natural stones.

No. GA13-15390S: **Re-Os geochronology of ore mineralizations from the Bohemian Massif with possible metallogenic implications** (*L. Ackerman*, *K. Žák*, *M. Svojtka*, *J. Ďurišová*, J. Pašava, F. Veselovský & V. Erban Czech Geological Survey, Praha; 2013–2016)

This new project is focused on the geochronology of ore mineralizations and related magmatic systems from the Bohemian Massif. In the first year, preparation of a collection of molybdenite, pyrite, and arsenopyrite samples covering various mineralization types (e.g., Sn-W, Au-W, Mo) from different sources (donations from museum collections, purchase from private collectors, individual sampling etc.) was accomplished. More than 100 samples (e.g., Fig. 8) were acquired for this

■ **Fig. 8.** Molybdenite from the Krupka Mo-mineralization. Photo by K. Žák.

study and the work of suitable sample selection. The results for the first year of this project can be summarized as follows:

1. Preparation and application of analytical protocol for Re-Os isotopic analyses of molybdenites was established in a close co-operation with Prof. Robert A. Creaser (University of Alberta, Canada). The method was successfully tested on several samples including reference material (NIST Henderson Mine). The method was also applied to determine the age of U-Mo mineralization from Kurišková, Western Carpathians, Slovakia, the results of which are summarized in Kohút et al. (2013).
2. The Re-Os method was successfully applied for age determination of Ni-Cu-(PGE) mineralization of the Ransko gabbro-peridotite massif, Bohemian Massif. Seven barren and mineralized samples from the Jezírka deposit yielded a Re–Os regression of 341.5±7.9 Ma (MSWD=69). This age suggests close association of the Ransko massif emplacement with the late-stage evolution of the near Kutná Hora crystalline complex. The results were published in Ackerman et al. (2013).
3. Within the framework of this project, the method for accurate trace element analyses of molybdenites was developed using LA-ICP-MS system. We studied three molybdenite samples from Krupka (Sn-W greisen) and Mokrsko (Au-bearing quartz veins) with different morphologies (needle-like grains, large aggregates) from the Bohemian Massif. Molybdenite trace element heterogeneity at both localities was found in different contents of Au, Re, Te and also in Sb. The highest contents of Au, Re, Te and Sb were detected at the Mokrsko deposit, whereas mean contents at the Krupka deposit were significantly lower. Also Bi and Pb display greater variance at both localities. The contents of Se, Zr, Nb, Ag and W show similar trace element distribution at both localities, and also in different morphological types of molybdenite grains from a single locality (needle aggregates vs. oval or elongated grains).
4. During the continuous sampling of ore mineralizations throughout the Bohemian Massif, the Obří Důl Fe-Cu skarn deposit (a unique and fortunately well accessible mine heritage site) was visited. Large amount of samples (e.g., Fig. 9) including mineralized but also barren lithologies were collected to carry out a detailed genetic study including mineralogy, geochemistry, isotopic and possibly fluid inclusions studied in the forthcoming years.

■ **Fig. 9.** Fe-Cu disseminated mineralization at Obří důl. Photo by M. Filippi.

ACKERMAN L., PAŠAVA J. & ERBAN V. (2013): Re-Os geochemistry and geochronology of the Ransko gabbro-peridotite massif, Bohemian Massif. – *Mineralium Deposita*, 48, 7: 799–804.

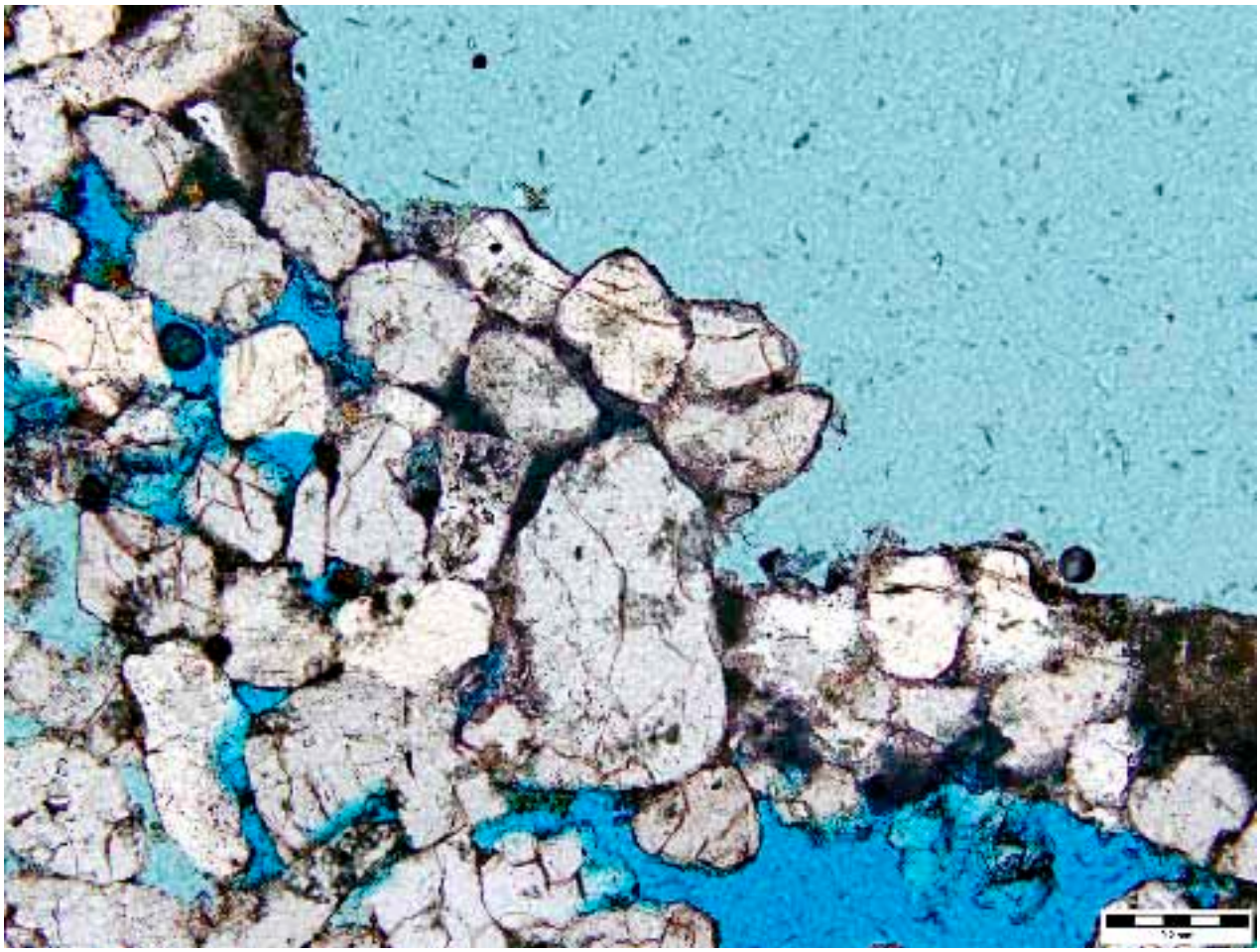
KOHÚT M., TRUBAČ J., NOVOTNÝ L., ACKERMAN L., DEMKO R., BARTALSKÝ B. & ERBAN V. (2013): Geology and Re-Os molybdenite geochronology of the Kurišková U-Mo deposit (Western Carpathians, Slovakia). – *Journal of Geosciences*, 58, 3: 275–286.

No. GA13-22351S: **Combined use of novel and traditional stable isotope systems in identifying source components and processes of moldavite formation** (T. Magna, J. Farkaš, V. Chrastný, Czech Geological Survey, *K. Žák*, *R. Skála*, *L. Ackerman*, Z. Řanda, J. Mizera & J. Kučera, Institute of Nuclear Physics CAS, v.v.i.; 2013–2016)

Moldavites are central European tektites genetically related to the Ries Impact Structure in Germany. However, source materials of moldavites and processes of their chemical fractionation are not properly constrained. Investigation of moldavites indicates that, in parallel to sedimentary rocks, plant biomass could have supplied significant portion of source matter as indicated by enrichments in contents of plant-essential elements, depletion in plant-non-essential elements and C and O isotope composition in moldavite glass. The project aims at exploring this hypothesis by C and O isotope analysis in glass and fluid inclusions in moldavites, as well as Si, Ca, Mg and Li in moldavites and sedimentary units of the Ries area by means of isotope mass spectrometry. Selection of samples for detailed isotope analyses will be based on prior geochemical characterization. Further, Re–Os systematics, Cr and platinum group element contents will be studied in order to reveal any extraterrestrial signature in moldavites. These findings should constrain the processes of tektite formation, with possible application in astrobiology.

No. GA13-28040S: **Multi-approach study of processes in sandstone exposures: new view on study and interpretation of selected sandstone landforms** (J. Bruthans, Faculty of Science, Charles University Prague, *M. Filippi* & J. Schweigstillová, Institute of Rock Structure and Mechanics of the CAS, v. v. i.; 2013–2015)

Four localities were selected for field study (active Střeleč Quarry, natural sites of Mladějov I and II and natural and historical quarries of Malobratřice). All of them are formed in the Hruba Skala Sandstone in Bohemian Paradise. At each locality, the air humidity and temperature dataloggers were installed. Sandstone cores 6 cm in diameter were taken from each studied exposure. Hydraulic conductivity and vapor diffusion coefficient (wet cups) were measured at cores. Access holes were drilled at localities to measure the rock moisture content by TDR method. Rock moisture is measured on monthly intervals. In the Střeleč Quarry, 60 sandstone cores were obtained from two sandstone exposures with a relatively homogeneous surface. These cores were sealed by epoxy resin from all sides except the original rock surface. Cores were saturated and placed to



■ **Fig. 10.** A thin-section photomicrograph of a surface part (crosscut) of the sandstone sample where epoxy resin is colored by blue dye to highlight pore spaces. Photo by M. Filippi.

drill holes at the localities to measure the potential evaporation rate under microclimate of the locality.

Large effort was spent to quantify the differences between sandstone crusts vs. sandstone in subsurface. Crusts are generally expected to strongly affect moisture flux due to assumed reduced hydraulic conductivity. They may react differently to salt weathering than the underlying sandstone. The tensile strength and drilling resistance were measured at crust surface and below. Drilling resistance, hydraulic conductivity, vapor diffusion coefficients and apparent moisture diffusivity were measured at drilled cores. Preliminary results indicate that hydraulic conductivity differences mostly do not exceed one order of magnitude. Wider differences exist in apparent moisture diffusivity.

Experiments using hydrogen peroxide and enzymatic dissolution by zymolyase revealed that the rock crusts are supported mainly by the hyphae of lichens in the Střeleč Quarry. Lichen hyphae are critical in protecting the surface from decay by weathering agents.

Various mineralogical and geochemical methods were used for the identification of the cement mineralogical composition and thus its significance in the fabric cohesion of the sandstones. First, the samples of weakly cemented quartzose sandstones from different sites were studied using the binocular microscopy (BM) to document (select) and later identify possible mineral phases composing the cement of the sandstone. Binocular microscopy indicated that cement is quite rare in the studied samples and its contents seem to be variable. Based on the results of the binocular study, selected fragments of the sandstones were analyzed by a powder X-ray diffraction method (XRD) and more than 10 polished sections were prepared for the study using a polarizing microscope (PM) and scanning electron microscopy (SEM). The addition of blue dye into the epoxide resin was used within the preparation of the polished sections to simply distinguish the quartz grains and pore spaces and thus effectively study the grain to grain and cement to grain contacts (Fig. 10). Leaching of selected samples with apparently contrasting amounts and colors of the cements was performed to estimate the significance of these cements in particular samples. We used various concentrations of a citrid, hydrochloric and hydrogen fluorid acids.

No. GAP104/12/0915: **Quantitative analysis of quartz deformation affecting ASR in concrete** (A. Šťastná, Š. Šachlová, R. Přikryl, Z. Pertold, Z. Seidlová,Faculty of Science, Charles University, Praha & *T. Lokajíček*; 2012–2015)

The project is aimed to: (1) aggregate sampling; (2) laboratory preparation and analysis of ASR (alkali silicate reaction) of aggregates employing accelerated mortar bar test; (3) modification of seismoacoustic emission monitoring under special experiment conditions; and (4) development of high temperature AE transducers and complete monitoring system.

In the first quarter of 2013, different approaches were tested to protect the ultrasonic/AE sensors against the influence of NaOH solution. No method was found effective to protect the sensors. Even epoxy resin layer resists to 80 °C solution for only one week. Due to this fact, a decision was made to leave the sensors outside the measuring chamber and to use special steel 316L as waveguides. First solution of outside sensor positioning was made by institute workshop. Four measuring cycles were applied (each about 30 days' duration) to different concrete blocks. The first cycle was used for a complete measuring system tuning to find the way for next measurements. Three remaining measuring cycles were based on measuring a setup where each concrete block was monitored by 3 ultrasonic sensors. There was used 316L steel waveguide between the block and the sensor. Measurements showed several important dependencies based on regular ultrasonic sounding of block during the experiment. Ultrasonic sounding revealed that during first 3–7 days of the test run, an increase in P-wave velocity, increase in energy and amplitude transfer are observed. After this period, this maximum value remains stable for several days. After this time, a continued decay of P-wave velocity, energy and amplitude transfer is observed. An ultrasonic wave high-frequency filtration was also observed before and after the test run. The tests revealed that such an arrangement of ultrasonic sensors placement going through the upper cover gives a lot of acoustic emission noise, as well as changes in contact conditions between the sensors, waveguides and the sample. Due to this fact a decision was made to reconfigure the sensors position, when only two sensors were used for block sounding/monitoring. The sensors were tightly connected with the measuring chamber body. After this modification, one measuring cycle started just at the end of year 2013. Some of the results of the project were presented at two local scientific meetings and at one international – DRT 2013, Leuven Belgium.

No. GAP210/10/2351: **Palaeomegnetism & geochemistry of volcanic rocks: Implications to palaeosetting and development of the Prague Basin (Late Ordovician - Early Devonian)** (*P. Pruner, P. Schnabl*, *P. Štorch*, *L. Koptíková*, *G. Kletetschka*, Z. Tasáryová, T. Hroch, Š. Manda, J. Frýda, V. Janoušek & P. Kraft, Faculty of Science, Charles University, Prague; 2010–2014)

We applied, evaluated and integrated geochemical, palaeomagnetic, rockmagnetic and stratigraphic methods on selected Ordovician and Silurian volcanic–sedimentary successions in the Prague Basin. Paleomagnetic research was centred on Vinařice locality in the Suchomasty Volcanic Centre. Further detailed investigation was carried out also in the Kosov section (Kosov Volcanic Centre). Vinařice and Kosov basalts, their contact aureoles and adjacent country rocks were sampled for palaeomagnetic analyses. Laboratory experiments included: (a) progressive thermal demagnetisation using the MAVACS (Magnetic Vacuum Control System) equipment with a step interval of 40 °C, (b) alternating field (AF) demagnetisation using a Superconducting Cryogenic Magnetometer (type 755 4 K) with steps at 5 mT to 20 mT, and (c) separation of the remanent magnetisation (RM) directions using principle component analysis. Palaeomagnetic analyses of the Vinařice lava samples (Vin-1, Vin-2), dated into the late Gorstian *S. chimaera* Biozone, yielded low magnetic remanent magnetisation (Jn = 0.03–0.17 mA/m) *c*. 60 % and low magnetic susceptibility (MS = 86–333×10^{-6} Sl) *c*. 50 %, respectively, of the values in other Silurian volcanic rocks (Jn ca 1.10 mA/m; MS ca 7,000×10^{-6} Sl). Such values may result from a higher Ti content within the titanomagnetite phases in the Vinařice lava samples. As for the Vinařice locality, principal component analysis identified that 15 samples were remagnetised during the Variscan orogeny. The characteristic primary component C was determined in the temperature range of 280–480 °C (540 °C) and by alternating field (AF) in the range of 40–50 (60) mT. On the basis of mean palaeomagnetic directions calculated from samples of Vin-1 and Vin-2, palaeolatitudes of 22.5° and 25.2° on the southern hemisphere were computed. Secondary remanent magnetisation component B, reflecting altered titanomagnetite or magnetite presence, was determined in the temperature range of 80–280 °C (320 °C) and by alternating field (AF) in the range of 5–25 (30) mT. Major paleomagnetic characteristics inferred from component B achieved values of: D = 217°, I = 25° for Vin-1 and D = 235°, I = 23° for Vin-2. Computed palaeolatitudes without tilt correction yielded 13° (Vin-1) and 12° (Vin-2) that plot to the southern hemisphere.

Remanent magnetisation component C was determined by a higher temperature range than component B, which indicates that C is the primary magnetisation. This is in agreement with published data. The interpretation of a secondary remanent magnetisation component B involves either 170° counter-clockwise or 190° clockwise rotation of the Prague Basin during the Variscan orogeny. On the basis of the mean palaeomagnetic direction calculated from all samples, a palaeolatitude of 24.4° located on the southern hemisphere is estimated for the Vinařice locality, which concurs with the model published by Cocks & Torsvik (2006). Palaeomagnetic data from Vinařice locality allowed the computation of mean palaeolatitude of 24.4° on the southern hemisphere for the Suchomasty Volcanic Centre and hence for the western segment of Prague Basin in the Gorstian (lower–middle *S. chimaera* Biozone).

Magnetic scanning: Without magnetic maps produced by magnetic scanner the demagnetization of the remanence would be quite complicated. There are several pole directions and it is difficult to figure out which is the primary and which is the secondary component of magnetization. Even harder is to assign a specific time to individual components. However magnetic maps helped to localize the magnetic minerals by detecting their saturation isothermal remanence imparted by 3 T pulse magnetic field parallel to the rocks' thin sections. In general, saturation remanence is about two orders of magnitude larger than natural remanence (NRM) that carries the paleomagnetic information. This method was used for a detailed study of samples from the Kosov site.

Geochemical characterization of magmatic episodes (or individual volcanic phases) was correlated with palaeomagnetic

data for volcanic activity in: 1) Wenlock and 2) Ludlow. A multidisciplinary palaeomagnetic, geochemical and volcanological study of the latest phase of Silurian volcanism in the Prague Basin was presented at IGCP 591 international meeting in June 2013. Moreover, correlation of palaeolatitude, geotectonic setting and eruption character of the Suchomasty Volcanic Centre in the western tectonic segment was evaluated for the Gorstian stage, i.e., for the latest phase of Silurian volcanism in the Prague Basin, and published in a peer-reviewed journal (Tasáryová et al. 2014).

Petrophysical data from the late Silurian (Ludlow) Lau event interval in the Požáry and Mušlovka sections representing shallow-water facies in the Prague Synform were extended and additional measurements and methods were applied. Frequency-dependent magnetic susceptibility (MS) measurents and dynamic time-warping algorithm (DTW) for comparison of magnetic susceptibility logs were applied. The results were summarized in the paper by Chadimová et al. and submitted to the Geological Society of London Special Publication dedicated to IGCP580 (Magnetic susceptibility a window onto ancient palaeoenvironments). The paper is under review now.

Dynamic time warrping (DTW) alignment shows that the Mušlovka represents a less complete succession when compared to the Požáry section. DTW alignment of the MS logs shows perfect match of the logs and detected several prominent and minor gaps. MS logs show elevated values at both sections across the Lau Event interval and coincide with the uppermost part of the *siluricus* Biozone. Magnetite was identified as the main carrier of the magnetic susceptibility signal at both sections. Hematite and minerals with paramagnetic characteristics contribute in the lowermost and uppermost part of the Mušlovka section. Gamma-ray spectrometric logs across the Lau Event interval at both sections seem to be driven by fine-grained detrital siliciclastic grains. The Požáry section shows a higher influx of these impurities. Frequency-dependent MS measurements revealed occurrence of superparamagnetic (SP) particles at both sections in all selected samples. A contribution of SP particles to the MS signal is the highest in the Lau Event interval in the Požáry section.

Petrophysical data including magnetic susceptibility measurements and gamma-ray spectrometry in the Kosov section – a deeper-water equivalent of the Požáry and Mušlovka sections – across the late Silurian Lau Event interval were acquired in 2013.

Besides the volcanic rocks, also the sedimentary rocks interlayered with volcanic bodies were subject of the planned studies which were focused on different structural and diagenetic features having the potential to explain the variability in measured magnetic signal and/or provide more details on the origin of rockmagnetic signatures.

Close attention was paid to the successive analyses of argillaceous carbonate concretions in the Kosov Quarry near Beroun (Homerian Stage, Wenlock Series, late mid Silurian ages of about 426 Ma; Liteň Formation, Motol Member). The "concretion" objects K6, K7 and K8 were characterized by means of microscopic optical methods in thin sections and X-ray diffraction analyses of powdered samples. The first results suggest that these objects represent one of the earliest "mineralogically" closed and blocked rock fabrics, where the sedimentary material was spared of damage which came from overall dissolution and compaction up to 10:1 that was accompanied by subsequent alterations which was coming with eo-Variscan, Variscan and younger deformation events. These concretions, however, do not show absolutely undisturbed structures, although the fine primary sedimentary fabrics are relatively well preserved. It is because of the fact that these concretions are typically built of hypidiotopic to xenotopic (inequigranular to equigranular), 5–20 μm-sized, carbonate (Mg-calcite and calcite) mosaics spreading through these concretions from their uppermost central parts toward their margins (like a fan, and mostly downwards). Major part of the mineral phases with significant magnetic properties was moved toward the edges of the penetrative, microcrystalline carbonate aggregates and/or located along tiny interstitial spaces (sutures between crystals). Nonetheless, this is not a negative message because this concretion-forming crystallization process drastically reduced the rock porosity and practically blocked the subsequent re-crystallization very soon, as estimated, within tens of thousands of years after the material deposition. An interesting finding is that these concretions can widely vary in composition and proportions of non-carbonate minerals. Iron-rich chlorites, indicated by XRD, are currently studied in concentrates obtained from these materials.

In the overlying rocks of Devonian age, the attention was paid to iron-rich, argillaceous limestones with rock-forming content of tiny dacryoconarid shells. An enormous amount of these narrow conical (linear) objects in the rock is linked with diagenetic fabrics connected with Fe-oxides and oxyhydroxides, thus influencing the magnetism-related microfabrics. For explanation of the sedimentary mechanisms responsible for templates of these microfabrics, the phenomenon of multiple dacryoconarid shell insertion (telescoping) was found as a critical moment and was, therefore, studied by petrological and experimental methods.

In addition, this project allowed to deepen knowledge of basalts and limestones in general. At this particular point, it relates to changes between the rocks which are relatively unaffected and, on the other hand, strongly affected by subsequent weathering processes. Some of these results have already been summarized and will contribute to the publication on weathering of carbonate rocks (and mineral composition of the weathering products, ending with notes on origin and mineral composition of rendzic leptosols).

COCKS L.R.M. & TORSVIK T.H. 2006: European geography in a global context from the Vendian to the end of the Palaeozoic. *In:* GEE D.G. & STEPHENSON R.A. (Eds.): European Lithosphere Dynamics. *Geological Society of London Memoirs,* 32, 83–95.

CHADIMOVÁ L., VACEK F., SOBIEŃ K., SLAVÍK L. & HLADIL J. (in press): Petrophysical record of the Late Silurian shallow-water carbonate facies across the Lau Event (Prague Synform, Czech Republic) and dynamic time warping alignment of the magnetic susceptibility logs. – *Geological Society of London Special Publication.*

TASÁRYOVÁ Z., SCHNABL P., ČÍŽKOVÁ K., PRUNER P., JANOUŠEK V., RAPPRICH V., ŠTORCH P., MANDA Š., FRÝDA J. & TRUBAČ J. (2014): Gorstian palaeoposition and geotectonic setting of Suchomasty Volcanic Centre

(Silurian, Prague Basin, Teplá –Barrandian Unit, Bohemian Massif). – *GFF*, 136, 1: 262–265.

No. GAP210/11/1369: **The fate of legacy mercury in forest ecosystems in the area of the Black Triangle, Czech Republic** (*T. Navrátil*, *J. Rohovec*, *I. Dobešová*, *J. Buchtová*, P. Krám, J. Hruška, F. Oulehle & O. Myška, Czech Geological Survey, Praha; 2011–2014)

Continued sampling of stream water at 5 selected catchments Lesní potok, Lysina, Pluhův bor, Jezeří a Liz (LES, LYS, PLB, JEZ and LIZ) enabled to assess the expected relationship between concentrations and export of dissolved organic matter (DOC) and Hg. But first of all, the UV absorbance (Abs254) and absorbance (Abs410) were evaluated as a useful proxy for DOC at all 5 sites. This was demonstrated by high statistical correlation between Abs254 and DOC, where 75 to 95 % of Abs254 variability could be explained by changes in DOC. Similar, even stronger statistical relationships were observed in terms of Abs410 and DOC concentrations (72 to 99 %) but with the exception of catchment JEZ (29 %). The mean DOC concentration in stream water at JEZ catchment was the lowest (3.1 $mg.l^{-1}$) of all the studied sites thus the Abs410 values are too close to the detection limit of UV absorbance at 410nm measurements. Mean concentrations of DOC in stream waters of other catchments were significantly higher (5.3, 11.9, 15.8 and 22.1 $mg.l^{-1}$) at LIZ, LES, LYS and PLB (Navrátil et al. 2013).

The highest mean Hg concentration (21.6 $ng.l^{-1}$) in the studied stream water is in compliance with the highest DOC concentration at PLB. The mean Hg concentration in PLB stream water is relatively high even by the World‘s measures. We suspect that it is not due to previous pollution of ecosystem by Hg atmospheric pollution there but due to relatively rapid DOC turnover and hydrological conditions with shallow flow paths. The lowest mean Hg concentration (2.1 $ng.l^{-1}$) in stream water occurred at site LIZ, which was supposed to be the site with the least Hg atmospheric load. At the same time LIZ stream water was characterized by relatively low DOC concentrations thus the connected Hg concentrations should be low. The estimated Hg output fluxes from the selected sites were in the range from 0.3 to 5.9 $\mu g.m^{-2}$ while relevant range for DOC was 651 to 6,444 $\mu g.m^{-2}$ (Navrátil et al. 2013). Calculated fluxes of exported Hg were related to the level of DOC export, not to the previous level of atmospheric pollution by Hg. This means that the stability of the soil organic matter at a particular site determines the output flux of Hg.

In year 2013 the meteorological situation in May/June period brought high levels of precipitation. The stream water at all sites except site JEZ were sampled during this extreme discharge event during the summer period. The discharge at site LES located in central part of the Czech Republic increased from average 1 $l.s^{-1}$ to 192 $l.s^{-1}$ (Fig. 11) which represents the highest discharge since the beginning of monitoring in year 1993. The turbulent flow caused mobilization of fine particulates from the streambed and riparian soil areas. Thus we measured not only the export of dissolved THg but also THg bound to carried fine particulate matter. The rate of export of dissolved Hg was not evaluated yet but the mass of Hg exported from the forest ecosystems in the form of suspended solid particulate matter will be extensive. First measurements indicated that THg concentrations found on the sampled suspended solid particulate matter (490–1,086 $\mu g.kg^{-1}$) were greater than those found in soils (393 and 54 $\mu g.kg^{-1}$ in organic and mineral soils). Thus the output flux in the form of suspended solid particulate matter during this extreme episodic situation will be substantial even with respect to the annual Hg export.

Data and knowledge on Hg in forest soils at selected sites throughout the Czech Republic were summarized in a single publication (Navrátil et al. 2014). Hg deposition associated with the extreme levels of S and N deposition was not directly measured thus we calculated Hg deposition rates from peat cores (100 $\mu g\ m^{-2}\ yr^{-1}$). We quantified the soil concentrations and pools of Hg with carbon (C), sulfur (S) and nitrogen (N) – elements closely associated with soil organic matter at five sites across the Czech Republic – four sites known for extreme deposition levels of S and N compounds in the 20th century, and one site relatively less impacted. The site specific means of O horizon Hg concentrations ranged from 277 to 393 $\mu g.kg^{-1}$, while means of Hg concentrations in mineral soil ranged from 22 to 95 $\mu g.kg^{-1}$. The mean Hg:C ratio across sites increased from 0.5 $\mu g\ Hg\ g^{-1}$ C in the Oi-horizon to 5 $\mu g\ Hg\ g^{-1}$ C in the C-horizon due to the progressive mineralization of soil organic matter. The soil Hg:C increase was accompanied by a soil C:N decrease, another indicator of soil organic matter mineralization. Soil Hg:C also increased as soil C:S decreased, suggesting that Hg was stabilized by S functional groups within the soil organic matter. Mineral soil Hg pools (9–130 $mg.m^{-2}$) dominated over organic soil Hg pools (5–10 $mg.m^{-2}$) at all sites. Mineral soil Hg pools correlated more strongly with total soil S and oxalate extractable Fe than with total soil C. Total soil Hg pools could be accounted for by a time period of atmospheric inputs that was short relative to the age of the soils. The association of Hg to TS follows from the known affinity of Hg for S functional groups in organic matter. The cross-site differences in mineral soil Hg pools were explained primarily by differences in soil thickness and the ability of the soil to store (stabilize) organic material. The least impacted site LIZ in terms of atmospheric loadings had the greatest soil Hg pool. The Hg turnover times in the soil were only a small fraction of soil age, further underscoring that local soil characteristics and vegetation are more important than Hg deposition history.

In the course of analytical works performed in 2013, the liquid/liquid MeHg separation and pre-concentration technique elaborated in 2012 was widely applied on various environmental samples. We successfully quantified MeHg amounts in sediments, performing MeHg separation on suspensions of sediments in the standard acidic aqueous phase medium (distilled H_2O, HBr, $CuSO_4$) combined with the organic extraction solvent dichloromethane (DCM). Methylmercury extracted in the form of MeHgBr was quantified using HPLC-ICP-MS, leading to MeHg values safely exceeding the MDL (method detection limit, sub $ng\ l^{-1}$). Analysis of liquid environmental samples (stream water, soil solution) was much more complicated. The overall progress in analytical procedure was presented in the form of a poster at attended conference meeting (Rohovec et al. 2013).

■ **Fig. 11.** The V-notch weir at the Lesní potok catchment on 2nd June 2013 (2:50 P.M.) during estimated discharge of 176 $l.s^{-1}$ (0.9 $mm.hr^{-1}$). The daily amount of precipitation on 2nd June 2013 reached 63.4 mm. The amount of precipitation for period 30th May – 3rd June 2013 summed up to 131 mm. Photo by T. Navrátil.

NAVRÁTIL T., ROHOVEC J., MATOUŠKOVÁ Š., MYŠKA O., KRÁM P. & TESAŘ M. (2013): Mercury in selected catchments within Czech Republic. – *11th International Conference on Mercury as a Global Pollutant, Jul 28-Aug 2, 2013. Abstract online: http://www.mercury2013.com/full-program/*: M69. Edinburgh.

NAVRÁTIL T., SHANLEY J.B., ROHOVEC J., HOJDOVÁ M., PENÍŽEK V. & BUCHTOVÁ J. (2014): Distribution and Pools of Mercury in Czech Forest Soils. – *Water, Air, and Soil Pollution*, 225: 1829.

ROHOVEC J., NAVRÁTIL T., HOJDOVÁ M., CORNS W. & CHEN B. (2013) Towards Sensitivity Improvement in MeHg Quantification By Cold Vapour Atomic Fluorescence Spectrometry. – *11th International Conference on Mercury as a Global Pollutant, Jul 28-Aug 2, 2013. Abstract online: http://www.mercury2013.com/full-program/*: W13. Edinburgh.

No. GAP210/12/2053: **Floristic changes as a result of climate development during Upper Palaeozoic ice age in the basins of the Czech Republic** (*J. Bek*, S. Opluštil, Faculty of Science, Charles University, Prague, J. Pšenička, West Bohemian Museum, Pilsen, M. Libertín, National Museum, Prague & Z. Šimůnek, Czech Geological Survey, Prague; 2012–2015)

The activities held during the second year of the project were focused on the following topics: (a) database tuning and its filling with data, (b) fieldwork including collection of fossils, (c) study of borehole cores and their sampling, (d) gathering the graphic borehole documentation, e) study of petrified plant fossils.

Data were extracted from published papers (e.g., Němejc, Šetlík, Kalibová) as well as unpublished archival reports and manuscripts (e.g., Šetlík, Rieger, Purkyňová, Valterová, Bek). Another equally important source of data is represented by collections of plant fossils stored in various domestic institutions as well as in collections abroad. These include specimens from the collections of the West Bohemian Museum, Pilsen, National Museum, Prague, Czech Geological Survey, Prague, Faculty of Science, Charles University, Prague, museums für Naturkunde in Chemnitz and Berlin (Germany), Museum für Naturkunde in Vienna (Austria) and the collection of Technische Universität in Freiberg (Germany) where specimens from Czech basins are stored. Only stratigraphically precisely located specimens were included in the database. Already fully completed is the fossil record from the Kounov Coal that will be used for preparation of an article in 2014. Currently, about 5,200 specimens of macrofossils and 2,000 palynological samples with several thousands miospore records have been inserted into the database. They come from c. 500 localities, stratigraphically ranging from the Langsettian to Gzhelian. It should be emphasized that an attempt to convert data of partly databased collection of the National Museum in Prague into the project MafDat database has been made at the end of the 2013. The current results suggest

that this process is feasible and transfer of 12,200 specimens from the National Museum plant fossil database will be possible during the third (2014) year of the project duration.

Fieldwork including collection of fossils was an important part of the activity related to the project. The team members explored plant-bearing successions in the Pilsen (loc. Kamenný Újezd, Týnec, Doubrava), Radnice (loc. Břasy), Kladno–Rakovník (loc. Lubná) and Intra-Sudetic (loc. Žacléř) basins. A major collection has been gathered from a large excavation in the Kamenný Újezd near Nýřany where plant assemblage buried *in situ* by volcanic ash was exposed over an area of about 40 m^2 and sampled in October. The material, now stored in the West Bohemian Museum in Pilsen, will be described during 2014.

Study of borehole sections and their cores provided (i) stratigraphically precisely located samples of macroflora from the Czech part of the Upper Silesian Basin and (ii) samples for palynological maceration. The latter include about 80 samples of coal and clastic rocks systematically taken throughout the complete section of the Lower Suchá Member. They will be processed by Lenka Bojdová within her MSc. thesis.

Members of the team published three papers in international journals with impact factor (Pšenička & Opluštil 2013, Opluštil et al. 2013 and Bek 2013), three talks were published in conference abstracts (Šimůnek 2013, Opluštil 2013 and Bek et al. 2013), one poster (Pšenička et al. 2013) and two papers were accepted in 2013, but will be published in 2014 (Libertín et al. 2014 and Bek & Dimitrova 2014).

BEK J. (2013): *Microspinosporites*, a new genus of Palaeozoic pseudosaccate miospores of flemingitalean affinity. – *Bulletin of Geosciences*, 88, 3: 573–581.

BEK J. & DIMITROVA T. (2014): Taxonomy and stratigraphic importance of the Carboniferous miospore genus *Vestispora*. – *Review of Palaeobotany and Palynology*, 202: 15–28.

BEK J., PŠENIČKA J., LABANDEIRA C.C. & WANG J. (2013): Two examples of insect-plant interactions from the Pennsylvanian of the Czech Republic and China. – *In:* PŠENIČKA J. (Ed.): *22nd International Workshop on Plant Taphonomy in Pilsen and Radnice 21–24th March 2013*: 11–13.

LIBERTÍN M., BEK J. & DRÁBKOVÁ J. (2014): New sphenophyllaleans from the Pennsylvanian of the Czech Republic. – *Review of Palaeobotany and Palynology,* 200: 196–210.

OPLUŠTIL S. (2013): Flora from the Líně Formation (Czech Republic) as an example of floristic dynamics around the Carboniferous/Permian boundary. – *In*: LUCAS S.G. et al. (Eds.): *The Carboniferous-Permian Transition. New Mexico Museum of Natural History and Science, Bulletin* 60: 314–321.

OPLUŠTIL S., ŠIMŮNEK Z., ZAJÍC J. & MENCL V. (2013): Climatic and biotic changes around the Carboniferous/Permian boundary recorded in the continental basins of the Czech Republic. – *International Journal of Coal Geology,* 119: 114–151.

PŠENIČKA J. & OPLUŠTIL S. (2013): The epiphytic plants in the fossil record and its example from in situ tuff from Pennsylvanian of Radnice Basin (Czech Republic). – *Bulletin of Geosciences*, 88, 2: 401–416.

PŠENICKA J., OPLUŠTIL S., RONCHI A., ŠIMUNEK Z., SANTI G. & SELVA A. (2013): The Oldest Flora From The Southern Alps (Italy). *New Mexico Museum of Natural History and Science Bulletin*, 60: 325–327.

ŠIMŮNEK Z. (2013): On two plant assemblages from the Malesice Member, Žihle Basin (Carboniferous, Czech Republic). – In: PŠENIČKA J. (Ed.): *22nd International Workshop on Plant Taphonomy in Pilsen and Radnice 21–24th March 2013*: 16.

No. GAP405/11/1729: **Medieval Castle in an alluvial plain** (M. Plaček, Archaia Brno, o. p. s., Brno, L. Petr, University of Western Bohemia, Pilsen & *L. Lisá*; 2011–2014)

During the last year all samples taken during the preparatory phases were evaluated and data started to be prepared for the final publication. Micromorphological samples, especially from floor sediments, have been evaluated and partly interpreted in a paper submitted and already accepted in Plos one. The situation of unique finds together with the evaluation of samples enabled formation of general methodology that has been verified also at other locations. This is reflected in project dedication in some outputs from other localities. Pedological drills in the surroundings of the locality have been made to compare the results with data gained from the research.

No. GP13-19250P: **Palaeobiological study of marine fossil fishes from the Oligocene of the Hermanowa locality (Poland)** (*T. Přikryl*; 2013–2015)

Numerous fish fossil have been found in the Oligocene–Miocene deposits of the Carpathian Basins over the last decades. These findings have been taxonomically studied but especially juvenile and larval specimens gained only a minor attention. The goal of the new project is to fill this gap by studying the exceptional fish collection from the Hermanowa locality. The stratigraphy of the Hermanowa locality has not been fully solved. According to Kotlarczyk et al. (2006) it belongs to Paleogene Flysch strata that are older than the Menilite Formation. The common occurrence of the genera *Hipposyngnathus* (Přikryl et al. 2011) and *Trachinus* in the sediments enables classify the strata into the IPM 2 zone (IPM zones in sense of Kotlarczyk & Jerzmańska 1976 and Kotlarczyk et al. 2006), but the stratigraphic range is probably wider.

During the first year, excavation continued at the locality and a detailed study of previously collected specimens started (+preparation, if necessary). The specimens were taxonomically determined on the basis of literature data, and a comparison of selected material with type specimens (if available) and Recent relatives was carried out. It is possible to say that fishes are represented by Teleostei (e.g., clupeids, various forms of gadiforms and perciforms, syngnathids etc.), with the most common genera *"Clupea", Glossanodon* and *Trachinus*. On the other hand, fishes with photophores (quite common in some layers of Oligocene–Miocene deposits of the Carpathian Basins) are completely missing in the assemblage. Elasmobranchii are represented by two types only: rarely found isolated branchiospines of basking shark *Cetorhinus* sp. and one unidentified imprint of an isolated jaw tooth.

The teleost specimens can be separated to all three developmental categories (larvae, juveniles and adults) and thus have

the potential to supply and improve our knowledge on the ontogeny of the respective taxa. With respect to taphonomy, the fish fossils are represented by complete skeletons, slightly disarticulated specimens or isolated bones, with no preferred orientation or sorting. The locality therefore, at a first sight, strongly reminds the upper part (D–G) of the Jamna Dolna locality (see Jerzmańska 1968) characteritzed by the dominance of neritic taxa. Complete absence of fish with luminescent organs is also characteristic for the Hermanowa locality.

JERZMAŃSKA A. (1968): Ichtyofaune des couches a menilite (flysch des Karpathes). – *Acta Palaeontologica Polonica*, 13, 3: 379–487.

KOTLARCZYK J. & JERZMAŃSKA A. (1976): Biostratigraphy of Menilite beds of Skole unit from the Polish flysch Carpathians. – *Bulletin de L'Academie Polonaise des Sciences - Série des Sciences de la Terre*, 24, 1: 55–62.

KOTLARCZYK J., JEZMAŃSKA A., ŚWIDNICKA E. & WISZNIOWSKA T. (2006): A framework of ichthyofaunal ecostratigraphy of the Oligocene-Early Miocene strata of the Polish Outer Carpathian basin. – *Annales Societatis Geologorum Poloniae*, 76: 1–111.

PŘIKRYL T., KRZEMIŃSKI W. & KANIA I. (2011): New information about the anatomy of a peculiar fish of the genus *Hipposyngnathus* Daniltshenko, 1960. – *Comptes Rendus Palevol*, 10, 7: 559–566.

4c. Technology Agency of the Czech Republic

No. TA03021289: **Measurement of migratory properties of rocks with fracture permeability using fluorescent solutions** (*J. Rohovec*, V. Lachman, R. Kovářová, P. Bílý, P. Novák, ISATech, s. r. o., R. Vašíček, Czech Technical University in Prague, V. Frydrych, Z. Patzelt, R. Šigut, L. Vachudová, M. Durajová, K. Koděrová, Geomedia, s. r. o.; 2013–2016)

The project is focused on the use of fluorescent properties during tracer tests. Fluorescent tracers do not modify hydrochemical properties of the environment and are not radioactive. The scope of the research project is to verify that the appropriate fluorescent tracers allow the evalutation of migration parametres without being toxic and with no need of special permissions from regulatory authorities.

A positive result is that the fluorescent tracers will enable a more accurate evalutation of absorption properties of the rock environment than chemical tracers in case of leakage of hazardous substances. In the field experiments, hydrological tracer tests are widely used in hydrogeology. It should be clarified if any substances can fully replace the role of active isotopes, which have a negative effect on the surrounding environment caused by their radioactivity and modify hydrochemical/geochemical properties of geological structures. Fluorescence salts offer the possibility of continuous monitoring of fluorescence changes without endangering the environment and without negative effects on hydrochemistry.

Solution of the project is planned according to the scheme literature review – laboratory research – field tests – mathematical modelling. In the course of our previous research work, we have obtained design rights concerning the developed facility and technology enabling a continous monitoring and evaluation of fluorescence changes in liquids. Continuous record of changes of the concentration of tracers in groundwater during field measurements seems to be essential for project solution.

The investigation of interaction between fluorescent salts and migratory properties of the rock environment is focused on rocks with fracture permeability. Further selection of fluorescence salts accomplishing the objectives of the project was based on a detailed bibliographic study and experimental tests. Particular fluorescent salts were investigated in laboratory scale on selected rocks. We have selected most promising fluorescence tracer solutions for consequent use for migration tests in specified rock environments with fracture permeability.

It was found that sorption properties of Fluorescein in neutral or weakly alkaline aqueous media closely approach the ideal non-sorbent behaviour. On the other hand, Rhodamine WT widely recommended for geochemical and hydrological tracing experiments is quite acceptable as well, but it has a higher sorption affinity than Fluorescein. The stability of both tracers is satisfactory for long-term experiments in field measurements. Eosin Y and Eosin B, derivatives of Fluorescein, show a higher sorption and a dramatically lower stability in alkaline aqueous media than the mother compound. For this reason, Eosin Y and Eosin B are not feasible tracers for general use in tracing experiments. It was also found that the presence of positively charged functional groups in the tracer molecule increases its sorption on granite. The presence of negatively charged functionalities is a pre-requisite for a successful application of the tracer.

Components of granite from Panske Dubenky were separated and XRD characterised as quartz, muscovite, biotite and plagioclase. Batch-type sorption tests were performed on all of them. The highest sorption potential was found for muscovite, less important sorption was found also for biotite, while quartz and palgioclase are of low sorption affinity.

In the Josef underground research center an experimental polygon equipped with small-diameter boreholes was set up, interconnected by fracture network with two networks sections – with and without sorption properties. This polygon will be used for field testing of the behaviour of tracers in fracture network. The results of both laboratory and field tests will be validated by mathematical models.

Verification of the project progress is continuously documented by the results of laboratory tests, filed tests in the research polygon and the mathematical model. Imput data for the status of proven technology will be available as a fair-copy version to date of project completion.

4d. Grant Agency of the Czech Academy of Sciences

Finished projects

No. IAA300130902: **Characteristics of the mantle sources and crystallization history of the subvolcanic alkaline rock series: Geochemical and Sr-Nd isotope signature (an example from the České stredohoří Mts., Ohře/Eger Rift)** (*R. Skála, J. Ulrych, V. Böhmová, L. Ackerman, J. Filip*, Z. Řanda, J. Mizera, J. Kučera, Nuclear Physics Institute, Řež, E. Jelínek & D. Matějka, Faculty of Science, Charles University, Praha; 2009–2013)

Similar to other places in the European Cenozoic Rift System (ECRIS; Prodehl et al. 1995) magmatic rocks of the Ohře/Eger Graben (OR) are typically anorogenic silica-undersaturated alkaline types (e.g., Ulrych et al. 2011). However, the OR contains, in addition to volcanic rocks, hypabyssal rocks of the high-level intrusions, which are rare in the other parts of the ECRIS. The České středohoří Mts. represents an erosional relict within the OR graben. The largest center of magmatic activity of the České středohoří is the Roztoky Intrusive Complex (RIC). The intrusive magmatic activity of the RIC lasted from ca 33 to 25 Ma (Ulrych et al. 2011). The center is composed of an elliptical crater vent (3 km by 1.5 km) filled with trachytic breccia and a cluster of trachybasaltic to phonolitic shallow intrusions. Hypabyssal intrusions of monzodiorite, essexite, sodalite syenite as well as a radial dyke swarm of (semi)lamprophyres and felsic differentiates occur in close proximity to the center (Ulrych et al. 2006). In contrast to the volcanic rocks, information on the hypabyssal rocks is limited although they can provide constraints on the genesis of the hypabyssal and subvolcanic level of volcanism and refine the ideas on the rift history. They can also contribute to a recent debate on whether intraplate magmatic activities in the ECRIS are related to mantle plumes.

The goal of the project was, based on whole-rock major and trace element concentrations, Sr-Nd isotope ratios analyses and mineral chemistry data of on hypabyssal and subvolcanic rocks of the Roztoky Intrusive Complex to constrain the petrogenesis of the igneous complex.

Twenty-four fresh samples were selected for this study. Whole-rock major element concentrations were determined at the Faculty of Science, Charles University in Prague, using wet chemical methods. The trace-element analyses of whole-rock samples were carried out by ICP-MS PQ3 VG Elemental installed at Charles University in Prague. Mineral analyses were carried out on a CAMECA SX 100 electron microprobe at the Institute of Geology, v.v.i., Czech Academy of Sciences, Prague. The Sr-Nd isotope compositions were determined in the isotope laboratory at Universität München.

The rocks studied included essexite (nepheline monzodiorite), monzodiorite, sodalite (analcime) syenite, sodalite-bearing monzosyenite to syenite, and (semi) lamprophyric dyke rocks (monchiquite, camptonite, gauteite, bostonite). Three distinct petrographic types of *essexite* were recognized: the most common dark fine-grained type which is equigranular with hypidiomorphic texture. It occurs in the central part of the intrusions. In marginal parts of the bodies, the light fine- to medium-grained type, which is equigranular with prismatic granular texture, is common, but it also forms lenses in the central part. The least common is the porphyritic type, which is characterized by the presence of 1–2 cm long prismatic clinopyroxene phenocrysts. The *monzodiorite* shows distinct compositional and textural variations including a magmatic rhythmic layering. Equigranular types with hypidiomorphic granitic to prismatic textures are prominent in the intrusions. They are predominantly fine-grained passing into medium-grained varieties, which contain typical lath-shaped plagioclase. The central part of the Roztoky monzodiorite body ("rongstockite") shows an unusual magmatic rhythmic layering. The banded rock contains numerous feldspathic medium-grained 2 to 5 mm wide bands, which alternate with prevailing pyroxene–biotite melamonzodioritic bands. The porphyritic types with transitions to medium-grained types are characterized by large phenocrysts (up to 10 mm in length) of clinopyroxene and biotite enclosed in granular groundmass. The *sodalite (analcime) syenitic rocks* occur mainly in the outer parts of the RIC, as well as in some isolated intrusions up to 5 to 10 km from the center. They are predominantly fine-grained syenites or high-level intrusive trachytic rocks. Fine- to medium-grained rocks are usually equigranular, rarely with a hypidiomorphic granular texture. Sodalite is nearly completely replaced by analcime. *Sodalite-bearing monzodiorite* forms one small intrusion at Býčkovice about 15 km from the RIC. The rock is mostly fine-grained, equigranular and has mineral characteristics similar to those of sodalite syenite. *Camptonite* is composed of hornblende and phlogopite phenocrysts set in fine-grained groundmass free of glass. *Monchiquite* is composed of clinopyroxene and hornblende phenocrysts in groundmass containing glass and/or analcime. It forms not only independent dykes but also "chilled margins" of camptonite dykes. *Gauteite* forms transitions to camptonites as well as bostonites. *Bostonite* is composed mainly of alkali feldspar phenocrysts in fine-grained groundmass.

Clinopyroxenes of all subvolcanic and dyke rocks of the RIC occur as phenocrysts and/or grains in the matrix and correspond to aluminian ferroan *diopside*. Many clinopyroxene phenocrysts show concentric oscillation- and/or sector-zoning, in some cases patchy zoning was observed as well. The sector zoning is mainly present in the dyke rocks. Concentric zoning usually displays the pattern with cores enriched in Mg and partly in Si whereas Al, Fe and Ti are depleted; Ca is constant across the entire grains. *Amphiboles* are abundant in lamprophyres and in sodalite syenite where they occur as phenocrysts, grains in matrix and rarely even as xenocrysts. They also occur in minor amounts in essexites and monzodiorites. Amphiboles predominantly correspond to potassian *kaersutite* or ferrokaersutite though a few analyses represent potassian titanian *pargasite* or ferropargasite. Kaersutites in the matrix of monchiquite are typically enriched in TiO_2 (up to 7.5 wt. %). Contents of F vary between 0.5 to 2.1 wt. %, Cl contents were not detected in the studied amphiboles. Most *micas* correspond to *biotite*. Typical feature of all analyzed micas is elevated content of titanium. The highest titanium content, up to 10.5 wt. % TiO_2 (0.6 a.p.f.u. in formulae based on 22 positive charges per formula unit), was found in essexites. In hypabyssal rocks, *plagioclase* is the major feldspar only in monzodiorite and essexite. It is distinctly zoned with An_{26-66} (in monzodi-

orite and essexite), and An_{2-30} (in sodalite syenite). Plagioclases of dyke rocks are compositionally variable with An_{19-65} in mafic (semi)lamprophyres and An_{33-44} in bostonite. *Alkali feldspar* occurs in monzodiorite and essexite both as phenocrysts and dispersed grains in matrix. Phenocrysts in monzodiorite typically range in composition between $Or_{55}Ab_{38}$ to $Or_{67}Ab_{29}$, whereas those in essexite are Na-rich (An_{19-33}), in contrast to sanidine-albite solid solution ($Or_{83}Ab_{16}$ to $Or_{52}Ab_{44}$), which is present in matrix. In sodalite syenite, the chemical composition of alkali feldspar varies between Or_1Ab_{97} and $Or_{56}Ab_{41}$. In camptonite, almost pure albite has been found. Hornblendite contains both plagioclase ($An_{\sim 46}$) and alkali feldspar ($Or_{50}Ab_5$). *Nepheline* is a common constituent of essexite and a minor phase in sodalite syenite. In tinguaites, it forms reddish orange phenocrysts and cloudy grains in matrix (with hauyne and sodalite). *Sodalite* was probably the dominant primary mineral in sodalite syenite but was almost completely replaced by *analcime*, which in addition also forms euhedral crystals in miarolitic cavities. In essexite, sodalite is rare. Two major series of the Fe-Ti oxide minerals were identified in the studied rocks: *ilmenite*–hematite and *magnetite–ulvöspinel*. The position of the latter off the ideal line Usp-Mag points out to substantial isomorphic substitutions.

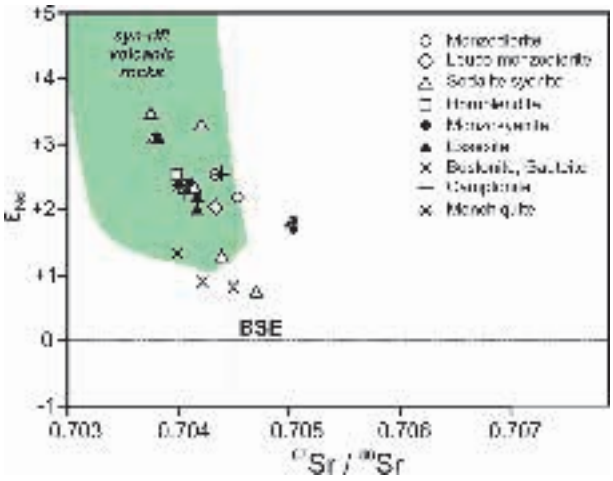
Bulk chemical composition of the samples ranges in SiO_2 from 41 to 53 wt. % and plots at high Na_2O and K_2O in the field of alkaline field. Using Mg-values (Mg # [100*(Mg / (Mg + Fe_{tot})]), the sample suite can be subdivided into: (1) *hypabyssal weakly alkaline* series (essexite – monzodiorite – sodalite syenite) with Mg # ca 39–56 and hornblendite cumulate (Mg # ~59) in sodalite syenite; (2) *weakly alkaline dyke series* (WAS) (gauteite / camptonite – bostonite) with Mg # ca 42–61; and (3) *strongly alkaline dyke series* (SAS) (camptonite / monchiquite – tinguaite) with Mg # ca 18–31.

Trace element variations of the hypabyssal intrusive rock series essexite – monzodiorite – sodalite syenite include: (1) progressive enrichment in incompatible elements (e.g., rare earth elements – REE, large ion lithophile elements – LILE) and depletion in compatible elements (e.g., Cr, Co, Ni, Sc), (2) an increase in total concentrations of REE, and (3) a slight increase in light REE (LREE) relative to heavy REE (HREE). Primitive mantle-normalized REE patterns of the hypabyssal rocks show a general enrichment in LREE with the $(La/Yb)_N$ ratios varying from ca 25 for monzodiorite to ca 33 for sodalite syenite; hornblendite has the lowest value of ca 10. The REE patterns of lamprophyre dykes are similar to those of the hypabyssal rocks with the $(La/Yb)_N$ varying in the range of 18 to 22. Almost all rocks exhibit a small negative Eu anomaly (Eu/Eu* = 0.9–1.0). Primitive mantle-normalized trace element diagrams display a progressive enrichment in incompatible elements in monzodiorite to sodalite syenite. A slight depletion in P is typical of mafic rocks (essexite, monzodiorite) while a strong negative anomaly is typical of felsic types (e.g., sodalite syenite). When compared to the patterns of hypabyssal rocks, the hornblendite cumulate has substantially lower contents of LREE and other incompatible elements, while it is enriched in Ti consistent with the accumulation of kaersutite / titanian magnetite. Among the hypabyssal rocks, the hornblendites have the highest K/Rb ratio (ca 635), other rocks display a broad variation between ca 230 and ca 480.

The lamprophyre dykes are more enriched in incompatible elements compared to the hypabyssal rock series. The trace element patterns show depletions in Cs, Rb, P, Ti and enrichment in Zr and Ba relative to neighbouring elements. Enrichment in incompatible elements and depletion in compatible elements is even more pronounced in felsic rock types. Their patterns also show depletion in P and Ti and enrichment in Nb and Zr.

Most of the hypabyssal rocks and associated dykes are distinctly differentiated as indicated by their low MgO contents and Mg-numbers. However, those with MgO contents over 7 wt.% and/or Mg-numbers higher than 56 show PM-normalized trace element patterns consistent with primitive volcanic rocks of the OR and resemble those of HIMU-OIB with enrichment in high-field-strength elements (HFSE) and frequently with a negative K anomaly.

Initial $^{87}Sr/^{86}Sr$ ratios of the ca. 30 Ma old hypabyssal rock series range from 0.70375 (sodalite syenite) to 0.70503 (sodalite monzosyenite). The $^{143}Nd/^{144}Nd$ ratios show a wide variation and initial εNd values ranging from +0.7 to +3.4. Except for the sodalite monzosyenite samples, the samples plot at the lower end of the field for 42–16 Ma syn-rift volcanic rocks of Ulrych et al. (2011) and are in some cases less radiogenic in their Nd isotopic composition (Fig. 12).



■ **Fig. 12.** Initial $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ isotope ratios for subvolcanic rocks of the Roztoky Intrusive Complex. The colored field of 42–16 Ma old syn-rift volcanic rocks encompasses data of Cenozoic volcanic rocks from Ulrych et al. (2011) and Ulrych (unpublished data). *Original.*

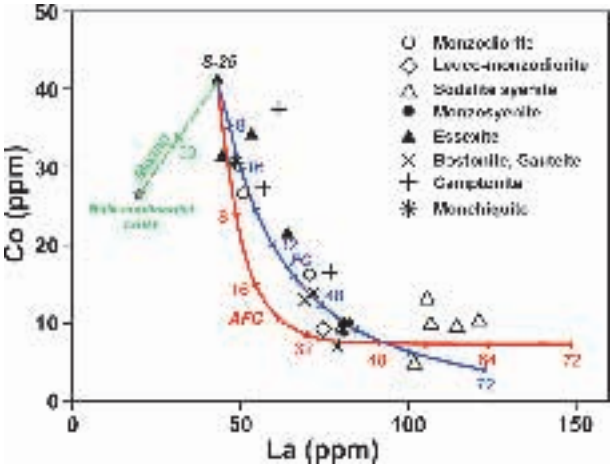
The subvolcanic rock suites of the RIC formed by essexite – monzodiorite – sodalite syenite series and weakly and strongly alkaline dyke series appear to be closely genetically related. This is indicated by: (1) radial orientation of a dyke swarm around the core composed of hypabyssal intrusions of monzodiorite, essexite and partly also sodalite syenite; (2) comparable ages of hypabyssal rock series (33–28 Ma) and dyke rocks (30–25 Ma); (3) covariations of major and trace element contents of the hypabyssal intrusions and dykes; (4) overlap of the Sr-Nd isotope composition of the hypabyssal rocks and dykes.

The intrusions of RIC are texturally and compositionally heterogeneous. The significant heterogeneity of individual intrusions

is also demonstrated by alternation of bands of various grain sizes, texture (porphyritic vs. equigranular), contents of mafic minerals (leucocratic vs. mesocratic) and clinopyroxene / biotite ratio. These variations are probably due to flowage differentiation during the emplacement of the intrusion at a deeper crustal level.

The variations of major elements, petrographical characteristics and mineral chemistry indicate that the RIC suite, including hypabyssal rocks of intrusions and both dyke series, may be derived from parent magmas of alkali basalt affinities by fractional crystallization. For RIC suite, whole-rock MgO contents positively correlate with TiO_2, CaO and FeO contents and negatively correlate with SiO_2 and Al_2O_3 contents. These trends could be explained by the fractionation of clinopyroxene, plagioclase and olivine. The presence of kaersutite+diopside±olivine, fluorapatite, labradorite, titanite cumulates (e.g., our sample S-6) in sodalite syenites and some lamprophyres support this model.

However, fractional crystallization process alone cannot explain all compositional variations within the RIC suite, particularly the variations of trace elements and Sr-Nd isotopes. For example, the high contents of several incompatible trace elements (e.g., LREE, Th, Ba) in the sodalite syenites suggest that it is unlikely these rocks are simply products of continuous fractional crystallization of alkaline basaltic magma and suggest assimilation of crustal material. To provide additional constraints on the role of crustal contamination, the importance of fractional crystallization (FC), assimilation-fractional crystallization (AFC) and mixing processes were examined. For FC process the Rayleigh fractionation model was used (e.g., Allègre et al. 1977), the AFC model was tested by a procedure of DePaolo (1981) and for mixing of two components (parent magma and continental crust) a model of Powell (1984) was used. To test these models, elements with different degrees of compatibility during magma fractionation were selected: compatible Co and incompatible La. Compositionally closest to the expected composition of parental magma appears to be the essexite sample S-25, which yielded the highest temperatures and pressures of crystallization among all samples of the studied rock suite. The modal composition and cobalt and lanthanum contents of this sample were chosen to represent the composition of the modeled parent magma. The composition of bulk continental crust was chosen as assimilant. The mass ratio of assimilant/mass fractionated used in our AFC model is 0.7. The modeled FC, AFC and mixing paths constructed using FC-AFC-FCA-Mixing modeler (Ersoy & Helvaci 2010) are shown in Fig. 13. The most of hypabyssal rocks and lamprophyres dykes of RIC suite show well developed fits with the calculated curves. Figure 13 shows that the compositional variation of RIC suite cannot be explained by simple mixing of two different components (e.g., S-25 and bulk composition crust). On the other hand, FC and/or AFC processes could have played an important role in the evolution of the RIC rocks. The essexite, monzodiorite and most of the lamprophyre dykes (camptonite, monchiquite, gauteite) can be accounted for by ca 8–40 % of parent magma crystallization without any contribution of crustal material. In contrast, monzosyenite, leucomonzodiorite and sodalite syenite (S-23) composition with highly variable Sr and Nd isotopic composition can be explained by AFC process with ca 35–40 % crystallization of parental magma. The composition of most sodalite syenites suggests significant contribution of crustal material to their magmas, and therefore, the



■ **Fig. 13.** Cobalt vs. lanthanum diagram for samples of the Roztoky Intrusive Complex. Shown are calculated data trends for fractional crystallization (FC), assimilation-fractional crystallization (AFC), and mixing of parental melt with assimilant (dashed line). As parental magma composition, essexite sample S-25 (Mg# 56) was chosen. Bulk continental crust represents an assimilant (indicated by an asterisk). Original.

importance of AFC process at ca 55–65 % of fractionation of the parent melt. The fractional crystallization and/or assimilation-fractional crystallization was likely accompanied by other processes such as the late-magmatic transfer of volatile-fluids containing Zr, U, Th and REE as implied by the occurrence of rare minerals, which concentrate these elements (Zr-minerals) in the RIC. These fluids could be derived from a metasomatized mantle source such as the subcontinental lithospheric mantle beneath the Bohemian Massif sampled by metasomatized mantle xenoliths.

The Sr-Nd isotopic compositions (Fig. 12) provide further constraints on the evolution of the RIC suite. Except for monzosyenites with highly radiogenic $^{87}Sr/^{86}Sr$, all rocks share depleted mantle compositions and most of them plot in the least depleted portion of a data field for syn-rift Cenozoic volcanic rocks of the Bohemian Massif (Ulrych et al. 2011). However, wide variations in the Sr-Nd isotopic compositions of individual rock types in spite of their similar petrography and whole-rock chemistry suggest variable crustal contributions and/or highly heterogeneous mantle source. The latter is very likely as $^{87}Sr/^{86}Sr$ ratios of 0.70314 to 0.70399 in mantle xenoliths from Cenozoic volcanic rocks (Blusztajn & Shimizu 1994, Ackerman et al. 2007, Ackerman unpubl. data) indicate large isotopic heterogeneities in the subcontinental mantle. However, chemically evolved rocks with high $^{87}Sr/^{86}Sr$, Rb/Sr ratios and low εNd values may have been also modified by the assimilation of crustal material during magma ascent. The crustal contamination in a high-level magma chamber is supported by the presence of crustal xenoliths (e.g., Carboniferous and Upper Cretaceous sediments, Saxothuringian gneisses and altered granites; Ulrych et al. 2000) in the RIC hypabyssal rocks and dykes.

ACKERMAN L., MAHLEN N., JELINEK E., MEDARIS L.G., ULRYCH J., STRNAD L. & MIHALJEVIC M. (2007): Geochemistry and evolution of subcontinental lithospheric mantle in Central Europe: evidence from peridotite xeno-

liths of the Kozakov volcano, Czech Republic. – *Journal of Petrology*, 48, 12: 2235–2260.

ALLÈGRE C.J., TREUIL M., MINSTER J.F., MINSTER J.B. & ALBAREDE F. (1977): Systematic use of trace element in igneous process. Part I: fractional crystallization processes in volcanic suites. – *Contributions to Mineralogy and Petrology*, 60, 1: 57–75.

BLUSZTAJN J. & SHIMIZU N. (1994): The trace-element variations in clinopyroxenes from spinel peridotite xenoliths from southwest Poland. – *Chemical Geology*, 111, 1–4: 227–243.

DEPAOLO D.J. (1981): Trace element and isotopic effects of combined wall-rock assimilation and fractional crystallization. – *Earth and Planetary Science Letters*, 53, 2: 189–202.

ERSOY Y. & HELVACI C. (2010): FC–AFC–FCA and mixing modeler: A Microsofts Excel & spreadsheet program for modeling geochemical differentiation of magma by crystal fractionation, crustal assimilation and mixing. – *Computers & Geosciences*, 36, 3: 383–390.

POWELL R. (1984): Inversion of the assimilation and fractional crystallization (AFC) equations; characterization of contaminants from isotope and trace element relationships in volcanic suites. – *Journal of the Geological Society*, 141, 3: 447–452.

PRODEHL C., MÜLLER S. & HAAK V. (1995): The European Cenozoic rift system. – *In*: OLSEN K.H. (Ed.) *Continental rifts: Evolution, structure, tectonics*: 133–212. Elsevier, Amsterdam.

ULRYCH J., DOSTAL J., ADAMOVIČ J., JELÍNEK E., ŠPAČEK P., HEGNER E. & BALOGH K. (2011): Recurrent Cenozoic volcanic activity in the Bohemian Massif (Czech Republic). – *Lithos*, 123, 1–4: 133–144.

ULRYCH J., NOVÁK J.K., LANG M., BALOGH K., HEGNER E. & ŘANDA Z. (2006): Petrology and geochemistry and K-Ar ages for Cenozoic tinguaites from the Ohře/Eger Rift (NW Bohemia). – *Neues Jahrbuch für Mineralogie – Abhandlungen*, 183, 1: 41–61.

ULRYCH J., PIVEC E., HÖHNDORF A., BALOGH K., BENDL J. & RUTŠEK J. (2000): Rhyolites from the Roztoky Intrusive Centre, České středohoří Mts.: xenoliths or dyke rocks? – *Chemie der Erde*, 60, 4: 327–352.

4e. Grants of the State Departments

State Office for the Nuclear Safety, No. 7403: **Evaluation of geological, geotechnical, hydrological and meteorological safety report for site installations of new nuclear facilities at Temelín** (Coordinator: *V. Cílek*; D. Drábová, J. Štuller, SÚJB, The State Institute of Nuclear Safety, *V. Cílek, J. Adamovič, K. Breiter* & *R. Mikuláš*; 2013)

Team of ČEZ experts completed a 1000 page study of the safety factors concerning the newly planned nuclear facility of the existingTemelín nucler power plant for Blocks 3 and 4. Geological and other Earth science security risks such as neotectonics, seismicity, hydrological modelling etc. (some 200 pages of the report and about 10 thousand pages of ca 300 supplementary studies) were subject to a wide assessment of the geological safety of the site especially in the field of possible neotectonic movements and seismicity. The mutual meetings with ČEZ experts and proposed field work improved the original data. The whole safety study was returned by SÚJB to ČEZ for rewriting. A new field study of tectonic hazards including morphological (LIDAR) analysis, geophysical methods and geological analyses within a 25km circle around the existing nuclear power plant was proposed and partly realised. The project is postponed due to new restrictions after the Fukushima disaster and international methodology of IAEA in Vienna and it will continue on the basis of a new agreement between SÚJB and Institute of Geology CAS, v. v. i. in 2014.

Ministry of Education, Youth and Sports of the Czech Republic, "KONTAKT II", Project No. LH12079: **Laboratory simulations of space weathering – the role of iron nanoparticles in the reflectance spectra of asteroids** (*T. Kohout*, *G Kletetschka*, *R. Skála*, J. Čuda, J. Filip, R. Zbořil & J. Tuček, Palacký University Olomouc, Czech Republic; 2012–2015)

The project focuses on the optical effects of asteroid surface space weathering associated with micrometeorite bombardment and related occurrence of nanosized metallic iron. New methodology of quantitatively controlled artificial production of nanosized metallic iron particles in size range of ca 1 nm to ca 100 nm and their deposition in surface layers of silicate minerals (olivine and pyroxene) and meteorites is being developed. Subsequently, the changes in reflectance spectra of such modified minerals and meteorites are measured and correlated to nanosized metallic iron concentration and grain size. These spectral trends related to artificially produced nanosized metallic iron are subsequently compared to the observed space weathering trends observed in reflectance spectra of silicate-rich asteroids.

4f. Industrial Grants and Projects

Severočeské doly, a. s., Project No. 7006: **Magnetostratigraphy of the Libkovice Lake (Most Basin)** (*P. Schnabl*)

Samples from core HK591 were measured using a 3-axis 2-G liquid-helium free superconducting rock magnetometer (type 755 4K SRM). Magnetic susceptibility (k) of specimens was determined using a KLY-4 Kappabridge. Specimens were subjected to detailed AF demagnetization in 10–12 steps up to the field of 60 (100) mT. Results of measurements were analyzed using the Remasof software package.

The sediments are characterized by a large scatter of the NRM intensities (0.1–303 $mA.m^{-1}$). Samples are characterized by low to high magnetic values. According to the values, the profile

from core HK591 can be divided into five parts with different mean values of NRM, from 1.2 mA.m^{-1} (interval 147–243 m) to 138.8 mA.m^{-1} (interval 34–46 m).

Magnetic polarity obtained from the drill-cored sediments (HK591) produced unequivocal results mainly in its upper part, while in the lower part, retrieved inclinations were scattered. The lower part of the sediment fill was also sampled in outcrops in the Bílina and Tušimice mines. Five magnetozones (three normal and two reverse) were identified in the clastics overlying the coal seam.

The time span of the studied section was interpreted to be much shorter than was assumed. The age was interpeted as Burdigalian.

Charles University, Praha, Project No. 7012: **Zonality of REE concentrations in garnets from the Dunkelsteiner Wald granulite massif** (*M. Svojtka*)

The studied garnet clinopyroxenite/eclogite garnets, sampled in the Dunkelsteiner Wald granulite massif were analyzed for REE concentrations using laser ablation ICP-MS technique. The results show that significant interaction including metasomatic processes took part between felsic granulite and mantle rocks during their common metamorphic history.

Czech Geological Survey, Praha, Project No. 7014: **Time-temperature contrast in Createcous sediments from the James Ross Island (Antarctic Peninsula)** (*M. Svojtka*)

We used apatite fission-track analysis for samples from the James Ross Island, Antarctic Peninsula. The samples were collected with respect to the temperature profile: thermally affected sandstones (by intrusion of doleritic basalt) were sampled first, and sampling proceeded to thermally unaffected Cretaceous sandstones. We detected time-temperatute dependence from thermally affected sediments closest to the intrusion (dated about 15 Ma) to the samples away from intrusion (up to ca. 2 m) with ages of 64 Ma, 69 Ma and 89 Ma, respectively. Finally, we confirmed the Lower Cretaceous – Albian age (ca. 113 Ma) for sandstones farther away from the intrusion contact.

Moravian Museum in Brno, Project No. 7035: **Geoarchaeological report on sediments from the Kůlna Cave, Moravian Karst** (*L. Lisá*, *P. Lisý*, A. Bajer, Mendel University, Brno & P. Kubálek)

During the revision excavations of the upper Palaeolithic of the Kůlna Cave located in Moravian Karst, knowledge of the sedimentary filling of the cave was also revised. Facies analyses as well as micromorphological analyses, grain size distribution and geochemical composition were studied. The project resulted in the interpretation of formation processes which took place there and are connected with the climatic and geoarchaeological record of MIS6–MIS3.

Velkolom Čertovy schody, Inc., Project No. 7302: **Documentation of progress of quarry walls – reclamation of the Quarry–West** (*P. Bosák*)

The reclamation exploitation of the Koněprusy Limestone (Pragian, Lower Devonian) was limited to two benches in the

■ **Fig. 14.** Inclined thermomineral chimney with calcite crystals (Giant Quarry of Devil's Steps – Quarry West). Photo by P. Bosák.

quarry also in 2013. The continuation of calcite veins and cavities of the thermomineral paleokarst (sometimes also with calcite crystals) discovered in 2009 and 2010 was documented. It seems that thick calcite veins split to thinner branches and pinch out towards the SSW at a distabce of several tens to hundreds of meters. Several isolated small thermomineral cavities with speleogens typical for ascending warm fluids developed along some calcite veins. Some of the cavities were covered with quite large calcite crystals (Fig. 14).

Institute of Archaeology of the CAS, Brno, v. v. i., Project No. 7364: **Micromorphological evaluation of the infilling of Slavic structure in Chotěbuz** (*L. Lisá*)

The presence of a trampled floor layer was confirmed micromorphologically. This provides a wider context of a case study more deeply discussing one of the possible types of environments of the Medieval hill fort at Chotěbuz.

Faculty of Philosophy, Masaryk University in Brno, Project No. 7365: **Micromorphological report on the sample from the Great Moravian Rotunda at Pohansko** (*L. Lisá*)

The parameters of sediments found under the destruction of the Great Moravian Rotunda in Pohansko were evaluated based on micromorphological study. The lithified floor layer was identified covering the refuse material from the building phases.

University College London, Department of Anthropology, London, UK, Project No. 7393: **Report on micromorphological analysis from Twin Barrow A from Pebblebeds Research of Prof. Tilley (UK)** (*L. Lisá*)

Micromorphological analysis from Twin Barrow A from Pebblebeds Research of Prof. Tilley is the subject of this report. During the excavations of the barrow, a lithological description was provided by K. Pauknerova from UCL, Prague and one sample 4.5 × 7 cm in size, covering macroscopically divided layers 4 and 5, was sampled for the purpose of microstratigraphical evaluation. Layer 5 corresponds to the anthropogenically influenced type of luvisol. The O horizon is partly missing but a thin layer of charcoal and microcharcoal mixed with mineral components appears. The uppermost part of the charcoal layer is illuviated which suggests that the site was left uncovered for a while at the time of charcoal deposition. Anthropogenically divided layer 4 situated above is composed of non-burned turf deposited upside down, so the soil layer corresponding to bioturbated Olfh horizon followed by Ahe horizon composes the final episode of sedimentation observed in studied thin section.

Administration of the Bohemian Switzerland National Park, Krásná Lípa, Project No. 7407: **Monitoring of Atmospheric Precipitation in the Bohemian Switzerland National Park** (*T. Navrátil, I. Dobešová, J. Rohovec & S. Hubičková*)

Monitoring of chemical composition of bulk precipitation proceeded in 2013 at the Kuní vrch locality in the territory of the Bohemian Switzerland National Park and followed the monitoring of 2008 to 2012. The monthly bulk precipitations significantly differ according to the climatic conditions. According to the bulk precipitation, the hydrological year 2013 can be assessed as above-average, the bulk precipitation at the Kuní vrch locality reached 989 mm. The value of pH is the important measured parameter of the atmospheric deposition. The low values of pH are caused predominantly by anthropogenic factors. The pH of the precipitation on an open place at KV-dkx is between 4.32 and 6.52, which is comparable with the values of pH in hydrological year 2012. The values of pH of throughfall at KV-thsf locality range from 4.20 to 5.68. The terrigenous dust contains soil and rock particles and influences the deposition fluxes of Al, Ca, K, Mn, Sr, Mg, and Fe elements. The values of deposition fluxes of most of these elements in hydrological year 2013 are comparable with those in the past years.

The acidification of environment represents a significant problem influenced primarily by atmospheric deposition of sulphur dioxide and oxides of nitrogen. The decrease of annual deposition flux of SO_4^{2-} at the KV-dkx locality in hydrological year 2013 was measured and could correspond to the values of hydrological year 2011. The annual deposition flux of SO_4^{2-} on the open place reached 12.5 $kg.ha^{-1}.year^{-1}$, at the KV-thsf locality – throughfall –25.5 $kg.ha^{-1}.year^{-1}$. The deposition fluxes of SO_4^{2-} mostly come from the remote emission sources. The monthly deposition fluxes can correspond to the seasonal character of some emission sources.

The deposition fluxes of NO^{3-} on the open place in hydrological year 2013 are comparable with those of hydrological year 2012, the annual deposition flux reached 23.3 $kg.ha^{-1}.year^{-1}$. The monitored deposition fluxes of throughfall at the KV-thsf locality reached 37.8 $kg.ha^{-1}.year^{-1}$. This represents 72 % of the deposition in the preceding hydrological year. The NO_x emissions are generated mostly from anthropogenic burning processes, predominantly from traffic.

The higher values of deposition fluxes of throughfall confirm the washing effect of the forest trees and the leaching of metabolites. In particular, K, Mg, Mn, and Rb are the elements metabolized by the forest vegetation.

Jihočeský kraj, Project No. 7427: **Paleomagnetic dating of sediments in the PP Skalka Quarry at Sepekov** (*J. Kadlec & K. Čížková*)

The age of floodplain sediments intercalated in fluvial and slope deposits was estimated using the paleomagnetic polarity approach. Based on interpreted normal paleomagnetic polarities, the age of sediments younger than Brunhes/Matuyama boundary is the most probable.

Česká společnost archeologická o.p.s., Praha, Project No. 7427: **Magnetic fabric of sediments from selected archeological sites in Prague City and surroundings** (*J. Kadlec & K. Čížková*)

Anisotropy of magnetic susceptibility enables to assess primary sedimentary structure or post-depositional deformations. This approach was applied to the study of sediments affected by slope processes or anthropogenic impacts in the context of archeological research.

Faculty of Science, Charles University, Praha, Project No. 7427 (subcontract of the project "Navrat" MSMTLK21303): **Traces of the catastrophe that caused megamammal extinction 12,900 years ago** (*G. Kletetschka, J. Kadlec, K. Čížková, J. Petráček, P. Pruner, P. Schnabl, S. Šlechta & D. Venhodová*)

Sediments from cores drilled in the Švarcenberk Lake and at the Velanská cesta were analysed using mineral magnetic and paleomagnetic approaches to detect the magnetically enhanced horizon related to the Clovis Comet Event. The architecture and chemical composition of the Late Glacial and industrial microspherules containing iron were studied using microprobe analyses to explain their origin.

Institute of Archaeology of the CAS in Praha, v. v. i., Praha, Project No. 7503: **Micromorphological evaluation of Chrudim locality** (*L. Lisá*)

The infillings of archaeological objects excavated during the rescue archaeological excavations of Chrudim were micromorphologically evaluated. The formation processes which took place during the origin of different features were described together with the provenance studies and evaluation of human impact at this locality.

Labrys, o. p. s., Project No. 7506: **Litomyšl - evaluation of formation processes in context of the Monastery surroundings (lower court)** (*L. Lisá*)

Floor deposits of the Medieval part of Litomyšl Monastery were interpreted based on micromorphological evaluation. The way the floors were maintained was interpreted and space connections were suggested on the basis of typical features.

Českomoravský cement, a. s., Project No 7508: **Paleomagnetic investigation of rocks from Mokrá Quarry** (*S. Šlechta*)

Paleomagnetic dating of the loess-soil complex was carried out within the archaeological survey in the western area of the Mokrá Quarry (southern part of the Moravian Karst). The profile 3 m high was sampled in 5cm intervals using 6.7cm^3 plastic boxes. Remanent magnetization was measured using the 2G Enterprises cryogenic magnetometer. All measured samples show normal polarity of remanent magnetization indicating the age before the Brunhes/Matuyama boundary, i.e. less than 780 ka.

ARCADIS CZ, a. s., division Geotechnika, Project No. 7516: **Palynological analysis of borehole sediment IK3 Prackovice** (*M. Svobodová*)

The presence of stratigraphically important angiosperm pollen of the Normapolles – *Menatipollis triangulus* Kedves and *Verrutricolporites ovalis* (Potonié) Kedves (Kedves & Russel, 1982) described from the Thanetian as well as dinocysts *Spinidinium sagittula* (Drugg 1970b) Lentin & Williams 1976 and aff. *Hystrichokolpoma eisenackii* Wiliams & Downie 1966a evidenced the Paleocene age. This fact was important for the determination of the origin of sediments involved in a large landslide at highway D8 near Dobkovičky.

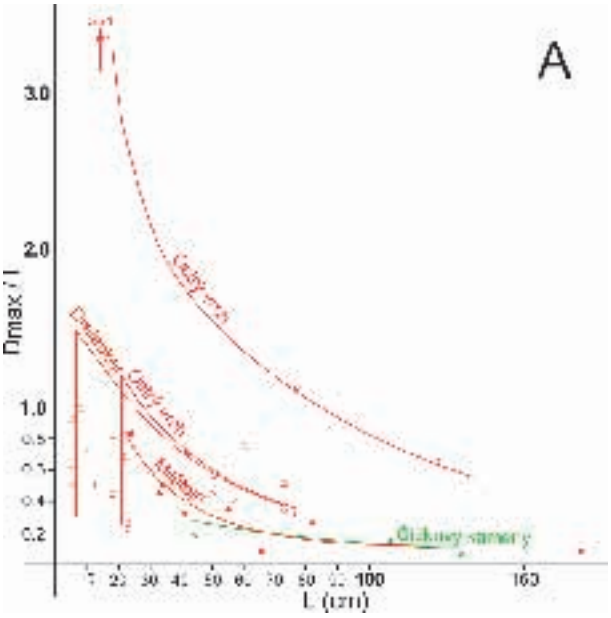
KEDVES M. & RUSSEL D.E. (1982): Palynology of the Thanetian layers of Menat. – *Palaeontographica B*, 182, 4–6: 87–150.

4g. Programmes of Institutional Research Plan

Project No. 9330: **Chemical and biochemical factors of the origin of weathering pits** (*J. Adamovič*)

Weathering pits (also solution basins, gnammas, tinajitas) are round depressions on top surfaces of sandstone outcrops. They are rounded or elliptical, tens of centimetres to metres across, sharply bounded, with occasional drainage runnels, filled with water or loose sand. Coalesced weathering pits are irregular, lobate in plan view. Populations of weathering pits were studied at many sites across the temperate zone of Europe within the finished grant project on sandstone microrelief from the Grant Agency of the Czech Academy of Sciences. Within the current project, these sites were revisited and extensively sampled for sandstone lithology and chemistry of the entrapped water. Mercury porosimetry was used to determine the pore-size distribution in the sandstone and SEM was applied to study quartz grain surfaces.

The values of total effective porosity of 10–15 % were found optimum for the weathering pits formation (but definitely less than 17 %), with the macropores/micropores ratio considerably lower compared to uncemented sandstone. Based on morphometry data, two stages of the "growth" of weathering pits can be distinguished in most areas (Fig. 15): 1) enlargement

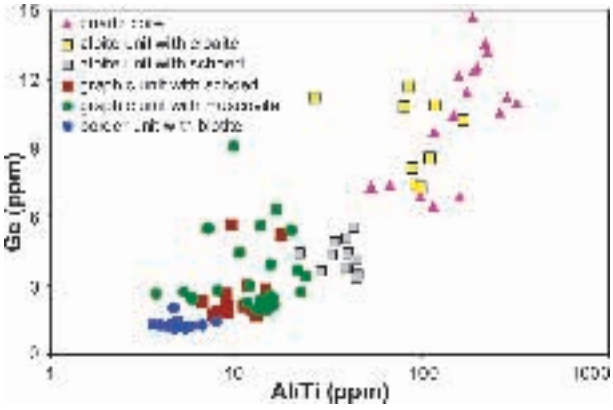


■ **Fig. 15.** A – A diagram showing the evolution of the depth aspect with the increasing size of the weathering pits at sites in the Bohemian Cretaceous Basin: Ostrý vrch in the Kokořín area (two size populations), Dreiecker near Waltersdorf and Milštejn near Svor, Čížkovy kameny near Trutnov. Dmax – maximum depth of the pit, L – length of the pit in horizontal direction.

■ **Fig. 15. (continued)** B – An example of the weathering pit at Pfaffenstein Hill near Königstein. Original.

to the depth marked by a progressive decrease in the diameter/depth ratio in smaller pits, 2) side enlargement with a progressive increase in the diameter/depth ratio in larger pits and formation of overhanging walls. The first stage is explained as dissolution-dominated while the second stage can be viewed as controlled by frost weathering. The pH values of water trapped in the weathering pits range between 5.5 and 7, with somewhat higher values measured in the autumn than in the spring. The concentrations of dissolved Si are considerably higher in the spring when Si in solution and in clay-sized fraction are accumulated after winter. Quartz grain corrosion was found to be of two essential types, mostly comprising sub-μm etching traces: sheet-like corrosion and cavity- and canal-shaped corrosion. The latter is clearly associated with the activity of fungi and lichens, which were identified under SEM. Samples of lichens, green algae and diatoms were acquired in the field where biogenic films show a zoned distribution on the walls of the weathering pits. The research clearly shows a combination of lithological, climatic and biogenic factors in the origin of weathering pits on sandstones in the humid temperate zone of Europe.

Project No. 9331: **Trace elements in quartz from pegmatites – possibilities for genetic interpretation** (*K. Breiter* & M. Novák, Masaryk University Brno)



■ **Fig. 16.** Evolution of trace element contents in quartz in the Rožná pegmatite during fractionation of parental melt from the border zone to the quartz core. Original.

Evolution of the trace element patterns in quartz during crystallization of pegmatite melt was investigated using laser ablation inductively coupled plasma mass spectrometry (Fig. 16). Contents of Al, B, Ba, Be, Cr, Fe, Ge, Li, Mn, P, Rb, Sn, Sr and Ti were analyzed in quartz from the border, intermediate and core zones of four granitic pegmatites differing in the degree of fractionation and origin. They belong to the pegmatite district of the Strážek Unit, Moldanubian Zone, Bohemian Massif, Czech Republic and include lepidolite LCT (Li-Cs-Ta) pegmatite of Rožná, beryl-columbite LCT pegmatite of Věžná, anatectic pegmatite of Znětínek, and intragranitic NYF (Nb-Y-F) pegmatite of Vladislav from the Třebíč Pluton. Contents of the analyzed elements varied in wide intervals: <1 to 32 ppm Li, 0.5 to 6 ppm B, <1 to 10 ppm Ge, 1 to 10 ppm P, 10–450 ppm Al, 1 to 45 ppm Ti, and <1 to 40 ppm Fe (average sample contents). Concentrations of Be, Rb, Sr, Sn, Ba, Cr, and Mn are usually <1 ppm. Quartz from LCT pegmatites exhibits a distinct evolutionary trend: a decrease in Ti and an increase in Al, Li, and Ge from the pegmatite border to the core. In comparison with the most fractionated rare-metal granites, pegmatitic quartz is relatively depleted in Al and Li, but strongly enriched in Ge. Quartz from simple anatectic and NYF pegmatite is poor in all trace elements with the evolution marked by a decrease in Ti contents and a small increase in Ge contents. The contents of Al and Li remain low without systematic behaviour. Using the Ti-in-quartz thermobarometer, outer zones of the Znětínek and Vladislav pegmatites crystallized approximately at 670 °C, while the border zone in Rožná yields the temperature near 610 °C (Breiter et al. 2014).

BREITER K., ACKERMAN L., ĎURIŠOVÁ J., SVOJTKA M. & NOVÁK M. (2014): Trace element composition of quartz from different types of pegmatites: A case study from the Moldanubian Zone of the Bohemian Massif (Czech Republic). – *Mineralogical Magazine*, 78, 3: 703–722.

Project No. 9332: **Alpine tectonic phases of sub-Cenozoic Age: Estimation of paleostress characteristics and timing from Bohemian Massif** (*M. Coubal* & *M. Šťastný*)

Kinematics of brittle structures were studied in the belt of the NW–SE-striking Lusatian Fault – a major thrust fault mediating

uplift of the Lusatian Block in the Alpine tectonic history of the Bohemian Massif. An analysis of fault-slip data and other methods of paleostress analysis yielded parameters of eight successive paleostress patterns Late Cretaceous to Plio-Pleistocene in age. The oldest member of the succession is paleostress pattern group α of latest Cretaceous to Eocene age composed of three individual NE- to NNW-directed compressions, referred to as α1–α3. Periods of relaxation were dominated by WNW-directed extensions associated with the emplacement of polzenite-group volcanics (peak at ca 68–59 Ma), referred to as αβ1–2. The last of the α-group compressions caused lateral extension – αβ3 phase is of Early Oligocene age, as evidenced by faulting of dated phonolite volcanics. Paleostress pattern β, N- to NE-directed extension in normal fault regime, is responsible for downfaulting of the hangingwall block of the Lusatian Fault and also for Late Oligocene–Early Miocene Eger Graben formation. The latest identified paleostress patterns are Mid Miocene NE-directed compression γ and Pliocene (to Pleistocene?) NW- to NNW-directed compression δ. The identified paleostress patterns can be well correlated with the individual phases of paleostress history of the Alpine foreland.

Project No. 9333: **The Late Miocene lagomorphs of Central and Eastern Europe: taxonomic and paleobiogeographic analysis of the genera** ***Prolagus*** **(Prolagidae) and** ***Alilepus*** **(Leporidae)** (*S. Čermák*)

The project was focused on the revision of poorly known lagomorphs of Central and Eastern Europe: (1) *Prolagus* from the Late Miocene Hungarian localities of Sümeg (MN10/11) and Polgárdi (MN13); and (2) *Alilepus* from 8 Late Miocene (MN10–13) localities of Ukraine and Moldova.

A taxonomic revision of abundant material of *Prolagus* from Sümeg and Pogárdi, based on morpho-dimensional observations and comparisons, and supported by a cladistic analysis, evidenced a presence of two new species. Such species are closely related, probably by a direct ancestor-descendant relationship. Although they share characters common to other eastern European species, testifying the existence of an eastern lineage separate from western European one(s) (already since MN10/11), their peculiar morpho-dimensional characters distinguish them from other known forms of Europe. They also follow particular evolutionary trends, especially in their p3 (enlargement of the crochet and not evident size increase after MN12) that distinguish them from the studied Late Miocene continental European lineages. These facts evidence that they are continental isolated species, a conclusion confirmed by palaeogeographical data.

Based on the new *Alilepus* material from the Late Miocene of Ukraine, a detailed morphometric re-description and emended diagnosis of *A. laskarewi* were provided. The taxonomic consideration of new material was supported by a direct analysis and revision of yet very poorly known type materials of *A. laskarewi, A. hungaricus* and *A. ucrainicus*. The species *A. laskarewi* was compared with all species referred from Europe and Asia. In the light of the present taxonomic state of the art, also with the aid of newly discovered material showing some very particular morphological features in p3, a possible evolution and dispersal scenarios of the earliest Leporinae in the Holoarctic context were hypothesized.

Project No. 9334: **Lithogeochemistry and Sr-Nd isotopic composition of psammo-pelitic metasediments of the Teplá Crystalline Complex: geotectonic and lithostratigraphic interpretation** (*J. Fiala*)

A profile through clastic metasediments from the Teplá Crystalline Complex (West Bohemia) was analysed for major and trace elements, REE and Sr and Nd isotopes. The metamorphic grade of these rocks, of presumed Neoproterozoic protolit age, increases from SE to NW from very low-grade to amphibolite facies. The rock geochemistries indicate that the sedimentary protoliths for the whole sequence consisted of immature (pelitic) greywackes of the continental island arc geotectonic settings. No significant changes in composition from lowest to highest grade or across strike of isograds are observed. Variations due to sedimentary fractionation within a single locality exceed the variation among samples of different metamorphic grade or of different geographic position. The prevailing REE spectra with distinct negative Eu anomalies show a close similarity with those of continental island arcs modern turbidites. Several samples without any Eu anomaly resemble the REE patterns of less differentiated island arc andesites. LREE leaching under oxidizing conditions is suggested by several REE patterns with positive Ce anomalies. The Sm-Nd model ages T_{DM} of samples with Ce anomalies are higher (T_{DM} 1.8–2.0 Ga) than those of all other samples (T_{DM} 1.1–1.5 Ga). Sr_i for all samples is fairly constant and compatible with an assumed dominance of detritus which is isotopically not very evolved. An alternative idea of an accretionary wedge provenance of the Teplá-Barrandian unit (meta-)sediments can be also accepted from the viewpoint of their geochemical characteristics.

Project No. 9335: **Devonian lower-eukaryotic microproblematics – a Phanerozoic perspective** (*J. Hladil*)

The project was focused on a selection of problematic marine microfossils which have mostly been referred to parathuramminid foraminifers, algae incertae sedis and "calcispheres". It relates to a number of taxa formally defined elsewhere across bacteria, protists, animal and plant kingdoms, and represent a call for an essential reassessment of understanding what these organisms actually were. With participation of an international team of experts, it was gradually revealed that these fossils can most likely be classified as belonging to various life stages of large-sized amoeboid protists with complex life cycles. In addition, the evidence for stratigraphic ranges of these organisms was extended from the Devonian to almost the entire Paleozoic, then Mesozoic and even Cenozoic. The new, still partly hypothetical group of these protists was introduced under a working name of a "thaumatoporella group", according to one type of the common, medium-sized remnants. This type possesses thin, homogeneous to perforate, dark coloured, and early diagenetically formed micritic "walls". Very common, and in some cases and environments even prevailing, are numerous small "cysts" of *Bisphaera* type. However, two papers published during this one-year project (Schlagintweit et al. 2013a, 2013b) represent only the first steps on the long way towards a full understanding of the palaeobiology of these organisms, including a not-negligible potential to explain

some of the related fenestral fabrics in sediments (infaunal and even cryptoendolithic life stages) but also rhythms and events in the palaeocommunity dynamics on the carbonate ramps.

SCHLAGINTWEIT F., HLADIL J. & NOSE M. (2013a): New observations and interpretations of the enigmatic poorly known Late Paleozoic Irregularina Bykova, 1955. – *Acta Palaeontologica Romaniae*, 9, 1: 3–22.

SCHLAGINTWEIT F., HLADIL J., NOSE M. & SALERNO C. (2013b): Palaeozoic record of Thaumatoporella PIA, 1927 (incertae sedis)? – *Geologia Croatica*, 66, 3: 155–182.

Project No. 9336: **The influence of sample drying procedure on mercury concentration analyzed in soils** (*M. Hojdová, J. Rohovec, K. Žák, Š. Matoušková & T. Navrátil*)

Different drying procedures (freeze-drying, air-drying and 105 °C oven-drying) of soil samples were investigated to evaluate the influence of drying on mercury concentration analyzed in soils. Freeze-drying represented the smallest Hg loss from contaminated soils, while air-drying of soils caused Hg loss from the samples. A key importance of microbial activity during sample drying was suggested.

Project No. 9337: **Reconstruction of Cenozoic lacustrine, fluvial and eolian processes using mineral magnetic and mineralogical method** (*J. Kadlec, K. Čížková, P. Schnabl & S. Šlechta*)

Supplementary mineral magnetic and microprobe anlalyses helped in final interpretation of the origin of sediment sequences controlled by paleoenvironmental changes. In the case of the Lower Morava Basin we have reconstructed the Late Pleistocene lacustrine, fluvial and eolian history of the area influenced by climate changes. The Miocene Cypris Fm. deposited in the Sokolov Basin reveal changes in magnetic assemblage and magnetic fabric in response to lake level oscillations.

Project No. 9338: **Reconstruction of post-Variscan time–temperature evolution of sedimentary basins and their source areas along Lusatian Fault (Bohemian Massif) using Apatite Fission-Track Analysis** (*D. Kořínková*)

The aims of this project are to 1) reconstruct the time-(low)temperature evolution of basinal sediments and source areas (i.e. uplifted blocks along the Lusatian Fault from NW and NE Bohemia, Saxony and Silesia) related to tectonic-erosion activity at the Lusatian Fault Zone and 2) bring new data about the tectonic subsidence/uplift (cooling rate) in the studied areas using Apatite Fission-Track Analysis. A total of 31 samples were collected: from the crystalline blocks north of the LF and the sedimentary basin fill (Turonian quartzose sandstones) south of the Lusatian Fault across western and central Sudetes. They were dated and their T–t evolution was modeled. Samples from the Krkonoše-Jizera Region provided AFT-ages in the range of 154±11 Ma to 87±6 Ma, samples from the Lusatian Plutonic Complex yielded AFT ages of 100±10 Ma to 72±4 Ma. Granitoid samples from the Elbe Zone from Saxony provided these values: one sample from Dresden 228±17 Ma, sample from around the Meissen 145±15 Ma and sample from the Elbe Canyon 159±14 Ma. Although the last two samples come from the subsided block south of the Lusatian Fault, their post-Cretaceous development is close to that of the crystalline blocks to the north of the fault, and not to the adjacent sandstones. The studied sandstones yielded AFT ages of 177±12 Ma, 177±17 Ma and 225±17 Ma.

Project No. 9339: **The use of ICP-MS for U-series dating of cave carbonates** (*Š. Matoušková*, *J. Rohovec* & H. Hercman, Institute of Geological Sciences, Polish Academy of Sciences, Warsaw)

The U-series dating method is frequently used to determine the age of cave carbonates. This method is based on the radioactive disequilibrium of some members of decay series. It is realized by the measurement of activity ratios of different uranium and thorium isotopes using alpha spectrometry. There are some disadvantages of the alpha spectrometry (high sample weight, overlap of emitted energy of key isotopes, time question, troubles with the detection of low concentration samples). The TIMS is also used, but this method is arduous, the preparation of samples is very difficult and time-consuming and the measurement is quite expensive. These are reasons why we decided to find a new possibility of the measurement of activity ratios – the Sector Field Mass Spectrometer with Inductive Coupled Plasma, Element II Thermo Scientific.

During the optimization of the methodics some experimental decomposition of cave carbonates was realized, and concentrations of uranium and thorium in natural samples were verified and compared to certified values. The concentration of ^{230}Th is very low and the separation on columns is needed. A method on ICP-MS was optimized for the measurement of uranium and thorium isotopes on artificial (prepared from standards) samples. The lowest measurable concentration of uranium and thorium in samples was found. The next step will be the verifying of this method on natural samples prepared specifically for the ICP-MS. A really big issue is the sample preparation using column separation – this step is performed in the cooperative institution in Warsaw, Poland (H. Hercman).

After the development of the methodics is finished, its implementation at our Institute will be beneficial for many of its scientific departments.

Project No. 9340: **Ichnofabric of the Cambrian in the Železné hory Mts. area** (*R. Mikuláš*)

Ichnofossils attributable to the ichnogenus *Zoophycos* isp. found at the Palác Hill of the Železné hory Mountains (eastern Bohemia) were re-studied. The finds come from shales belonging to the Middle Cambrian, and are interpreted as lobate and helical. As such, they represent the oldest recorded occurrence of helical *Zoophycos*. Such complex *Zoophycos* has so far been recorded from the Ordovician onwards, becoming frequent in the Mesozoic.

Project No. 9341: **Euro-American genus *Eopelobates*, and re-definition of the family Pelobatidae (Amphibia, Anura)**

(*Z. Roček*, J.D. Gardner, Royal Tyrrell Museum of Palaeontology, Alberta, Canada & B.-A. S. Bhullar, Harvard University, USA)

The extinct *Eopelobates* (Eocene of western North America; Eocene–Pliocene of Europe) and *Pelobates* (Oligocene – Recent of Europe; Recent of northern Africa and the Middle East) are superficially toad-like anurans that are united within the family Pelobatidae mainly on the basis of a unique, tripartite frontoparietal complex. Both genera have a relatively good fossil record consisting of isolated bones, skeletons, and developmental series of tadpoles through adults, all of which are potentially informative for tracing the evolutionary history of the family. *Eopelobates* is of interest for several reasons. Of the two pelobatid genera, *Eopelobates* appears earlier in the fossil record (early Eocene vs late Oligocene) and is more primitive in lacking many of the features associated with fossoriality in extant *Pelobates*. The taxonomic composition of *Eopelobates* has been contentious and at least one putative new species has yet long been recognized, but never described. Here we provide updated taxonomic accounts for Pelobatoidea, Pelobatidae, *Pelobates*, and *Eopelobates* and document development within a series of tadpoles and juveniles of *E. bayeri* from Bechlejovice (late Oligocene in age), Czech Republic. We also provide updated accounts for the five previously named and currently accepted species of *Eopelobates*. For the European congeners, *E. anthracinus* (late Oligocene) and *E. bayeri* (early Oligocene to mid Miocene) can confidently be regarded as separate species; although the distinction between *E. hinschei* and *E. wagneri* (both early Eocene) is less certain, we provisionally maintain those as separate species. Micro CT scans for the holotype skeleton of *E. grandis* (late Eocene, USA) help to resolve some problematic features, most notably showing that cranial sculpture is of the pit-and-ridge style that is typical for *Eopelobates*. A sixth congener is named and described based on two skeletons from the middle Eocene portion of the Green River Formation, in Wyoming, USA. We caution that reports of *Eopelobates*-like anurans from the pre-Eocene of western North America and the early Eocene of India are founded on isolated bones that cannot be assigned with confidence to that genus. The presence of *Eopelobates* in both North America and Europe may be explained by dispersal via the high latitude land bridge that connected those two continents during the late Paleocene through Eocene. The pelobatid fossil record is informative for documenting the nature and timing of changes in cranial features (e.g., ornament patterns, shape of nasals, pattern of frontoparietal-squamosal contact) from the inferred primitive condition seen in most *Eopelobates* to the more derived condition seen in extant *Pelobates*, but it is less informative for tracing the evolution of fossoriality, which is the key attribute of extant *Pelobates*.

Project No. 9342: **Magnetostratigraphy and magnetomineralogy of Jurassic/Cretaceous boundary interval on the sites Le Chouet, St Bernad Spring a Barlya** (*P. Schnabl, P. Pruner, K. Čížková, J. Petráček, S. Šlechta*)

The study refers on the Le Chouet section, its lithologies, facies, magnetic properties and fossil record (ammonites, calcareous nannofossils, calpionellids and calcareous dinoflagellates). Data obtained have been applied to give a precise biostratigraphy for this carbonate sequence as well as a paleoenvironmental reconstruction. Its relationship to magnetostratigraphy, based on a modern study of a French site, is important. Investigation of the micro- and macrofossils shows that the site comprises a sedimentary sequence in the *Microcanthum* to *Jacobi* ammonite Zones, and the *Chitinoidella*, *Crassicollaria* and *Calpionella* Zones. Several calpionellid and nannofossil bioevents have been recorded on the basis of the distribution of stratigraphically important planktonic organisms. The site allows us to calibrate the levels of various biomarkers and biozonal boundaries, and correlate them with magnetozones M20n, M19r and M19n (Wimbledon et al. 2013).

Hundreds of samples were drilled in the Barlya (Bulgraria) and Carcabuey (Spain) sections during the field campaigns. Reconnaissance of several Bulgarian (Ruzhintsi, Bielogradcik, Kopanice), Czech (Kurovice) sites was performed. The preliminary result was presented during the 10th Berriasian working group meeting in Warsaw, Poland.

WIMBLEDON W. A. P., REHÁKOVÁ D., PSZCZÓŁKOWSKI A., CASELLATO C. E., HALÁSOVÁ E., FRAU C., BULOT L. G, GRABOWSKI J., SOBIEŃ K., PRUNER P., SCHNABL P. & ČÍŽKOVÁ K. (2013): An account of the bio- and magnetostratigraphy of the upper Tithonian – lower Berriasian interval at Le Chouet, Drôme (SE France). – *Geologica Carpathica,* 64, 6: 437–460.

Project No. 9343: **Faunistic assemblages, coprolitic deposits, palynospectra and development of sedimentary environment in Lower Turonian (nearshore facies)** (*M. Svobodová, R. Vodrážka, J. Žítt*)

Upper Cenomanian–Lower Turonian sedimentary succession was studied at new temporary exposures (road bypass, 2009) near Kolín. Abundant macrofauna (mainly sponges and bivalves) and palynomorphs provided palaeoecological data. Non-calcareous dinoflagellate cysts prevail in all studied samples. Depositional environment reflects shallow-marine conditions which are documented by the dominance of peridinioid cyst of *Palaeohystrichophora infusorioides.* Rare presence of the Normapolles pollen confirms the Lower Turonian age (*Complexiopollis vulgaris, Atlantopollis microverrucosus*). Finds of sandy limestones overlain by highly glauconitic sandstones (Upper Cenomanian, section 2) and sandy facies rich in phosphatic clasts (Lower Turonian, section 1) illustrate the rocky coast and nearshore environments.

Project No. 9344: **Conditions of origin of melilitic mineral associations in Cenozoic volcanic rocks of the Bohemian Massif** (Co-ordinator: *J. Ulrych*; contributions: *J. Adamovič, L. Ackerman*, E. Hegner, Department of Geowissenschaften, Universität München & K. Balogh, Institute of Nuclear Research, Hungarian Academy of Sciences, Debrecen)

Principal conclusions of our study of mineral associations on the melilitic and melilite-bearing volcanic rocks of northern Bohemia can be summarized as follows:

Dykes of the Late Cretaceous to Early Tertiary (79.5±3.5 to 60.7±2.4 Ma) melilitic rock series of the Osečná Complex and the Devil's Walls dyke swarm, including ultramafic lamprophyres – polzenites – of Scheumann (1913) occur dispersed in the entire Upper Ploučnice River basin in northern Bohemia.

Polzenites and associated melilitic rocks are characterized by the mineral association of olivine+melilite±nepheline, haüyne, monticellite, phlogopite, carbonates, perovskite, spinels and apatite (cf. Ulrych & Štěpánková-Svobodová 2014). New data on their mineral and chemical compositions from original Scheumann's localities (the Vesec, Modlibohov, Luhov types) argue (Ulrych & Krmíček 2013) against the abolition of the group of ultramafic lamprophyres and the terms "polzenite" and "alnöite" by the Le Maitre (2002) classification.

Marginal facies and numerous flat apophyses of the lopolith-like body known as the Osečná Complex show an olivine micromelilitolite composition (lamprophyric facies). The porphyritic texture, chemical composition and the presence of characteristic minerals such as monticellite and phlogopite point to their affinity with ultramafic lamprophyres – polzenites of the Vesec type. Melilite-bearing olivine nephelinites to olivine melilitites (olivine+clinopyroxene+nepheline+melilite±haüyne and spinels with apatite) form a swarm of subparallel dykes known as the Devil's Walls.

The Scheumann's non-melilite dyke rock "wesselite", spatially associated with polzenites and often erroneously attributed to the polzenite group, is an alkaline lamprophyre of monchiquite to camptonite composition (kaersutite+phlogopite+diopside+olivine phenocrysts in groundmass containing clinopyroxene, phlogopite, haüyne, analcime, titanian magnetite, apatite±glass/plagioclase). First K–Ar data show Oligocene ages (30.9±1.2 to 27.8±1.1 Ma) and an affinity to the common tephrite–basanite rock series. The results were published in Ulrych et al. (2014).

Principal conclusions of the study of mineral associations on the melilitic and non-melilitic volcanic rocks with the carbonatite affinity of the Bohemian Massif can be summarized as follows:

Melilitic alkaline rock suite of the Osečná Complex and mildly alkaline rock suite of the Roztoky Intrusive Complex, both with carbonatite affinity, were studied to determine the source of magma for alkaline volcanism in the Cenozoic Central European Volcanic Province. No significant correlation in primary chemical composition exists between element contents in the extremely SiO_2-undersaturated melilitic rock suite of the Osečná Complex. All geochemical variations can be explained by metasomatic overprinting. The rocks represent a product of primitive mantle-derived magma. Enrichment in incompatible elements, high Zr/Hf, Ce/Pb ratios, relative depletion in HREE and negative K and Rb anomalies in the PM-normalized multielement variation diagrams point to a metasomatized mantle source with amphibole and/or phlogopite and garnet in the residuum.

The rocks of the essexite – monzodiorite – sodalite syenite series and associated differentiated dykes of the Roztoky Intrusive Complex are characterized by mean SiO_2 contents, are depleted in compatible elements, and their magma represents an evolved melt. Negative correlations between SiO_2 and MgO, TiO_2, P_2O_5 and CaO, and positive correlations between SiO_2 and K_2O, Na_2O and Al_2O_3 point to fractional crystallization of olivine, clinopyroxene, Fe-Ti oxides and apatite. The rocks geochemically correspond to the trachybasaltic lavas of the České středohoří Mts., and the same magma source can be presumed, i.e. mantle-related magma that was affected by some crustal assimilation.

Based on the presence of negative K and Rb anomalies in the PM-normalized multielement variation diagram in the Lower Paleozoic magmatic rocks of the Bohemian Massif we suggest that metasomatism of mantle lithosphere started already in the Early Cambrian. HIMU-OIB like Sr and Nd isotopic composition of the rocks of the Osečná Complex and variations in chemical composition of the volcanic rocks of the Central European Volcanic Province can be explained by continuous melting and subsequent metasomatism of mantle lithosphere. Geochemical similarities of ultramafic rocks from different world magmatic complexes show that subcontinental metasomatized mantle lithosphere is probably more homogeneous than sometimes presumed.

Le MAITRE R.W. (2002): *Igneous Rocks. A Classification and Glossary of Terms*. 2nd Edition. 236 pp. Cambridge University Press, Cambridge.

SCHEUMANN K.H. (1913): Petrographische Untersuchungen and Festeinen des Polzegebietes in Nord-Böhmen. –*Abhandlungen der Sächsischen Gesellschaft der Wissenschaften. Mathematisch-Physikalische Klasse. Leipzig*, 32: 607–776.

ULRYCH J. & KRMÍČEK L. (2013): Recent views on lamprophyric melilitic rocks (polzenites) of the Bohemian Massif. – *Mineralogical Magazine,* 77, 5: 237.

ULRYCH J. & ŠTĚPÁNKOVÁ-SVOBODOVÁ J. (2014, in press): Cenozoic alkaline volcanic rocks with carbonatite affinity in the Bohemian Massif: their sources and magma generation. – *Mineralia Slovaca*.

ULRYCH J., ADAMOVIČ J., KRMÍČEK L., ACKERMAN L. & BALOGH K. (2014): Revision of Scheumann´s classification of melilitic lamprophyres and related melilitic rocks in light of new analytical data. – *Journal of Geosciences*, 59, 1: 3–22.

Project No. 9345: **Research of selected units of ichthyoliths from the Líně Formation (Stephanian C) in the Central and Western Bohemian Basins** (J. Zajíc)

Remains of euselachian (hybodontid) sharks were documented and described not only from the Central and Western Bohemian Basins but also from the Krkonoše Piedmont Basin. Two taxa (*Sphenacanthus carbonarius* and *Lissodus lacustris*) could be described on specific level. Other remains were determined as Euselachii indet. The distribution of euselachiid sharks in the Variscan fold belt was refined by the present study.

Project No. 9346: **The soils on volcanic rocks in central and northern Bohemia** (Co-ordinator: *A. Žigová*, contribution: *M. Šťastný*)

The character of the parent material is a base line that must be known for the evaluation of individual stages of pedogenesis. This study is focused on the analysis of the development of soil cover on volcanic rocks in the protected landscape areas.

Representative soil sequences were excavated down to the parent material. The soil profile in the České středohoří Mts. Protected Landscape Area was sampled at the altitude of 675 m. Parent material is basalt. Soil sequence in the Křivoklátsko Protected Landscape Area is located at the altitude of 510 m. Parent material is andesite. Soil profile in the Bohemian Karst Protected Landscape Area is located at the altitude of 418 m. Parent material is dolerite. Volcanic rocks were characterized on the basis of thin section petrography. Soil profiles were evaluated on the basis of morphological analysis, particle size distribution, pH values, cation exchange capacity, base saturation, soil organic matter parameters and mineral composition of clay fraction.

Morphological analysis and diagnostic criteria allowed classifying all soils as Haplic Cambisols although they show some differences in the intensity of soil development. All studied sequences have the same configuration of soil profiles but various thicknesses of diagnostic horizons.

The particle size distribution of Haplic Cambisols is probably a function of the type of volcanic rocks and local conditions in the development of these soils. Chemical properties of the studied soils are influenced by the variability of volcanic rocks.

The results indicate that the quality of soil organic matter was probably closely connected with the source of biomass and climatic conditions of the individual sites.

Petrography of parent material allows to document differences in the texture, character and amount of rock-forming minerals.

Smectite is the most characteristic clay minerals of the analysed Haplic Cambisols on volcanic rocks. The main pedogenic process in soils developed on volcanic rocks is weathering of parent material and development of Bw horizon. The intensity of the soil development according to the type of volcanic rocks decreases in the succession andesite>dolerite>basalt.

Project No. 9347: **Taxonomy of early spelaeoid bears** (*J. Wagner*)

The first phase of a detailed morphometric evaluation of ursid cheek teeth from the Late Biharian locality of Stránská skála (material is deposited in the Moravian museum, Brno) was realized. Obtained data will be used (together with data from other localities) as a basis for critical reevaluation of present-day taxonomical model of early spelaeoid bears (*Ursus* gr. *deningeri*).

Project No. 9508: **Fission track laboratory** (*J. Filip*)

The development of the new external detector method of fission track dating analysis by using of titanite in cooperation with with Nuclear Physics Institute CAS was continued. For sample irradiation was used the suitable irradiation channel at Řež reactor which acceptability for titanite dating was tested last year. Titanite standards Durango and Fish Canyon and real rock samples which come from amphibole-biotite granodiorite near Brno-Obřany and from the Demitz-Thumitz quarry (Cadomian granodiorite complex of Radeberg-Löbau, FRG) were processed by standard separation methods and etched in accordance with the Wagner-Jonckheere method. Low-uranium muscovite detectors were fastened on polished surfaces of samples and stacked in an irradiation cassette with CN5 glass neutron dosimeters and irradiated. Sample processing and measuring was done by two independent observers with a good agreement. Independent age determinations, ζ-calibration (ζ-factor), counting efficiency Q and range deficit R were measured and counted. The obtained results revealed the necessity of processing and measuring of rocks with different and sufficient titanite amounts for subsequent testing of the method.

4h. Defended theses

Ďurišová J. (2013): Metal separation using a combination of electrochemical and ion-exchange methods. Ph.D. Thesis.

Mutual separation of metals from aqueous solutions was investigated using a method combining electrochemical valence control of metal ions in solution and ion exchange technology. Mutual separations of V-Mo, V-W, Re-W and Co-Ni were studied. The selective electrochemical reduction or oxidation of metal ions was performed in a laboratory flow-through electrolyser equipped with a three-dimensional carbon felt working electrode. After that, separation on an ion exchange column with improved sorption selectivity was performed.

The V(V) polyoxovanadate anionic species were transformed to the V(IV) cation by the electro-reduction at weakly acidic pH. It was demonstrated that quantitative separation of this V(IV) from W(VI) is possible using a chelating sorbent with 1-deoxy-1-methyl-aminoglucitol functional group or using a strongly acidic cation exchange resin. The Mo(VI) polyoxovanadates were reduced to Mo(V) species at -1.5 V vs. Ag/AgCl. The speciation of the obtained Mo(V) was dependent on pH and also on the accompanying electrolyte. Quantitative mutual separation of Mo from V using a strongly acidic cation exchange resin was achieved after electro-reduction of both Mo and V. The reduced V(IV) cation was taken up, while the reduced Mo(V) passed through the column. The perrhenate anion Re(VII) was electrochemically reduced in citrate solution of pH 3 to 4, producing an anionic Re(V)-citrate complex. However, mutual separation from of Re(V) from W(VI) was not succesful due to the gradual back-oxidation of Re(V). Selectivity of a chelating resin with iminodiacetic acid functional group was improved for Ni(II) over cobalt after electrochemical oxidation of the Co(II) cation to the Co(III) in oxalate solution. Selective adsorption of Ni(II) was achieved.

Mikuláš R. (72013): Fossil behaviour related to specific substrates: a review of the Phanerozoic fossil record. DSc. Thesis.

From the beginning of the Phanerozoic Eon (ca. 540 Ma) to the present, new substrates exploited by biota originated mostly by the life activity itself. Alternatively, mineral substrates were strongly modified by biota. At the onset of the Phanerozoic, shifting or rapidly consolidating clastic bottoms were colonized; the proportion of other substrates, including rockgrounds, was negligible. Through geologic time, soft bioturbated bottoms (firmgrounds and rockgrounds) appeared, being followed by woodgrounds, lithic and firm bioclasts (invertebrate shells,

bones, leaves etc.). The spread of the biosphere to terrestrial settings broadened the variety of substrates more than anything else. Moreover, the already existing materials of marine or freshwater bottoms were diversified by biogenic processes, e.g., by specific regimes of organic nutrient influx.

The appearance of new substrates brought, and still brings, new possibilities of life strategies. Therefore, a positive feedback between new substrates and new behavioural patterns can be traced, however, only within the largest geologic timescale (eons and eras). The studies collected in this thesis helped to analyse the degree of this feedback. They were motivated by the effort to recognize, describe and understand the as yet overlooked forms of the fossil record related to the understudied substrates. They concern, among others, subaerial rockgrounds and firmgrounds, settings rich in xylic substrates and various specific marine environments.

The knowledge brought by these studies was incorporated into the broadly accepted but still developing concept of ichnofacies. Whenever possible and desirable, this knowledge also resulted in the erection of new ichnotaxa, i.e. morphologically recurring fossil traces of life activity.

Xylic substrates were studied, e.g., in the Holocene fluvial sediments of the Labe River. Numerous traces of insect larvae, of fungal enzymatic activity, and also man-made substrates were recognized. This suite has interconnected ichnology and archaeology in an unusual way. Three phases of the use of wood as substrate were recognized: 1, on living trees; 2, on dread trees before their burial in the sediment; 3, on exhumed semifossil tree trunks. Circumstances and proportions of the three types showed that most of the wood mass deposited by the river had been derived from live, "healthy" floodplain forests affected by extreme floods. The recognized and interpreted traces support the idea of erecting at least one terrestrial ichnofacies for xylic substrates; however, the Holocene material cannot be used for this purpose.

Terrestrial/subaerial rock surfaces are commonly used by organisms and can preserve specific traces. Among them, endolithic microborings of fungi and algae, macroborings made by lichens, traces of repeated locomotion of large mammals (e.g., polished surfaces in karst caves) and several varieties of root corrosion of higher plants are the most frequent examples. Preservation of these traces in the fossil record (i.e. passing the fossilization barrier) is rare but not impossible. With a comparable frequency, terrestrial/subaerial firmgrounds (claystones, marls or weakly cemented sandstones) bearing trace fossils of insects, mammals and plants can be preserved in the geologic record. Both the rockgrounds and the firmgrounds can be buried, e.g., by volcanic ash, loess, travertine or tufa, or through surface hardening (rock crust formation) followed by the fall of the crust to talus sediments. Hard and firm terrestrial substrates have (similarly to terrestrial woodgrounds) a potential for erecting a new ichnofacies.

The Coprinisphaera Ichnofacies is established for terrestrial soil substrates. Most of the hitherto described examples come form the South American continent which has a specific, long-lasting regime of andesite volcanism. Volcanic ash periodically buries soil profiles with traces of organisms, leaving a unique fossil record of terrestrial settings. The author of the thesis recognized the Coprinisphaera Ichnofacies in the Oligocene of the Doupov Mts. built by basaltic ashes and lavas. Basaltic volcanism is generally characterized by frequent, relatively weak eruptions. In the intervals between them, only early succession stages of plant and animal assemblages can usually develop. The author proposed to generalize these data through a subdivision of the Coprinisphaera Ichnofacies (C.I.) to the C.I. of andesite areas and C.I. of basalt areas.

Among the numerous observations and interpretations of trace fossil assemblages in marine settings, it was ascertained that the essentially high-energy and shallow-water Skolithos Ichnofacies can support massively used chemosymbiotic feeding strategy that has so far been considered available chiefly in low-energy dysoxic settings.

The following ichnogenera proposed by the author have been diagnosed with regard to substrate criteria: *Lamniporichnus* Mikuláš, Dvořák & Pek 1998, *Nihilichnus* Mikuláš, Kadlecová, Fejfar & Dvořák 2006, *Machichnus* Mikuláš, Kadlecová, Fejfar & Dvořák 2006, *Circolites* Mikuláš 1992, *Tombownichnus* Mikuláš & Genise 2003 and *Lazaichnus* Mikuláš & Genise 2003. These proposals were cited and accepted by subsequent researchers. The author proposed also numerous new ichnotaxa on the ichnospecific level, usually from the material resulting from the fieldwork appropriate to the grant projects he himself coordinated.

Navrátil T. (2011): The dynamics of mercury in the environement. Habilitation thesis.

The dynamics of mercury in the environment deserves a special attention due to its high toxicity, ability to bioaccumulate and enter the foodchain. Similar to any other elements, the atmospheric emissions of mercury to the environment can be divided to natural and anthropogenic. One of the natural sources of mercury emissions are forest fires. Mercury emissions from this natural source in the Czech Republic were quantified and assessed as negligible with respect to the anthropogenic ones. Other major sources of mercury for the environment were ore mining and processing industries. The surroundings of the mining and smelting areas have been heavily contaminated but the contamination did not disperse further due to relative stability of cinnabar in the soil. Mercury accumulates in forest soils and is strongly associated with the soil organic carbon. The output of mercury from forest ecosystems due to degradation of soil organic matter was evaluated as relatively minor with respect to the total deposition fluxes of mercury. Finally, time scale of the environmental contamination by mercury can be approached by studies of the geochemical archives such as peat or tree rings. The performed studies indicate the highest mercury emissions in the period from 1960s to 1980s.

5. Publication activity of staff members of the Institute of Geology

5a. Papers published in 2013

*publications in journals included in the ISI Web of Science (IF value according to a list from 2013)

9.809* NAPIER W.M., BUNCH T.E., KENNETT J.P., WITTKE J.H., TANKERSLEY K.B., *KLETETSCHKA G.,* HOWARD G.A. & WEST A. (2013): Reply to Boslough et al.: Decades of comet research counter their clams. – *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 110, 45: E4171.

9.809* WITTKE J.H., BUNCH T.E., KENNETT J.P., KENNETT D.J., CULLETON B.J., TANKERSLEY K.B., DANIEL I.R., JR., KLOOSTERMAN J.B., *KLETETSCHKA G.,* WEST A. & FIRESTONE R.B. (2013): Reply to van Hoesel et al.: Impact-related Younger Dryas boundary nanodiamonds from The Netherlands. – *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 110, 41: E3897–E3898.

9.809* WITTKE J.H., BUNCH T.E., TANKERSLEY K.B., DANIEL I.R., KLOOSTERMAN J.B., *KLETETSCHKA G.*, WEST A. & FIRESTONE R.B. (2013): Reply to Ives and Froese: Regarding the impact-related Younger Dryas boundary layer at Chobot site, Alberta, Canada. – *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 110, 41: E3900.

9.809* WITTKE J.H., WEAVER J.C., BUNCH T. E., KENNETT J.P., KENNETT D.J., MOORE A.M.T., HILLMAN G.C., TANKERSLEY K.B., GOODYEAR A.C., MOORE CH.R., DANIEL I.R., RAY J.H., LOPINOT N.H., FERRARO D., ISRADE-ALCÁNTARA I., BISCHOFF J.L., DECARLI P.S., HERMES R.E., KLOOSTERMAN J.B., REVAY Z., HOWARD G.A., KIMBEL D.R., *KLETETSCHKA G.*, *NABELEK L.*, LIPO C.P., SAKAI S., WEST A. & FIRESTONE R.B. (2013): Evidence for deposition of 10 million tonnes of impact spherules across four continents 12,800 y ago. – *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 110, 23: E2088–E2097.

4.571* ANTOINE P., ROUSSEAU D.-D., DEGEAI J.-P., MOINE O., LAGROIX F., KREUTZER S., FUCHS M., HATTÉ CH., GAUTHIER C., SVOBODA J. & *LISÁ L.* (2013): High-resolution record of the environmental response to climatic variations during the Last Interglacial-Glacial cycle in Central Europe: The loess-palaeosol sequence of Dolní Věstonice (Czech Republic). – *Quaternary Science Reviews*, 67: 17–38.

4.485* *ACKERMAN L.*, ŠPAČEK P., MAGNA T., *ULRYCH J., SVOJTKA M.*, HEGNER E. & BALOGH K. (2013): Alkaline and Carbonate-rich Melt Metasomatism and Melting of Subcontinental Lithospheric Mantle: Evidence from Mantle Xenoliths, NE Bavaria, Bohemian Massif. – *Journal of Petrology*, 54, 12: 2597–2633.

4.485* ŠPAČEK P., *ACKERMAN L.*, HABLER G., ABART R. & *ULRYCH J.* (2013): Garnet breakdown, symplectite formation and melting in basanite-hosted peridotite xenoliths from Zinst (Bavaria, Bohemian Massif). – *Journal of Petrology*, 54, 8: 1691–1723.

4.398* MELCHIN M., MITCHELL C.E., HOLMDEN C. & *ŠTORCH P.* (2013): Environmental changes in the Late Ordovician – early Silurian: Review and new insights from black shales and nitrogen isotopes. – *The Geological Society of America Bulletin*, 125, 11–12: 1635–1670.

4.250* *ACKERMAN L.,* PITCHER L., STRNAD L., PUCHTEL I.S., JELÍNEK E., WALKER R.J. & *ROHOVEC J.* (2013): Highly siderophile element geochemistry of peridotites and pyroxenites from Horni Bory, Bohemian Massif: Implications for HSE behaviour in subduction-related upper mantle. – *Geochemica et Cosmochimica Acta*, 100: 158–175.

4.250* FARKAŠ J., CHRASTNÝ V., NOVÁK M., ČADKOVÁ E., PAŠAVA J., CHAKRABARTI R., JACOBSEN S., *ACKERMAN L.* & BULLEN T. (2013): Chromium isotope variations (δ53/52Cr) in mantle-derived sources and their weathering products: Implications for environmental studies and the evolution of δ 53/52Cr in the Earth's mantle over geologic time. – *Geochimica et Cosmochimica Acta*, 123: 74–92.

3.994* ŽÁK J., VERNER K., *SLÁMA J.*, KACHLÍK V. & CHLUPÁČOVÁ M. (2013): Multistage magma emplacement and progressive strain accumulation in the shallow-level Krkonoše–Jizera plutonic complex, Bohemian Massif. – *Tectonics*, 32, 5: 1493–1512.

3.902* *DRAHOTA P.*, FALTEISEK L., REDLICH A., *ROHOVEC J.*, MATOUŠEK T. & ČEPIČKA I. (2013): Microbial effects on the release and attenuation of arsenic in the shallow subsurface of a natural geochemical anomaly. – *Environmental Pollution*, 180: 84–91.

3.794* JUŘIČKOVÁ L., HORÁČKOVÁ J., JANSOVÁ A. & *LOŽEK V.* (2013): Mollusc succession of a prehistoric settlement area during the Holocene: A case study of the České středohoří Mountains (Czech Republic). – *Holocene*, 23, 12: 1811–1823.

3.794* PÁNEK T., SMOLKOVÁ V., HRADECKÝ J., SEDLÁCEK J., ZERNITSKAYA V., *KADLEC J.,* PAZDUR A. & REHÁNEK T. (2013): Late-Holocene evolution of a floodplain impounded by the Smrdutá landslide, Carpathian Mountains (Czech Republic). – *Holocene*, 23, 2: 218–229.

3.792* KOSLER J., *SLAMA J.*, BELOUSOVA E., CORFU F., GEHRELS G., GERDES A., HORSTWOOD M., SIRCOMBE K., SYLVESTER P., TIEPOLO M., WHITEHOUSE M. & WOODHEAD J. (2013): U-Pb detrital zircon analysis – results of inter-laboratory comparison. – *Geostandards and Geoanalytical Research*, 37, 3: 243–259.

3.709* *KLETETSCHKA G.,* FISCHER T., MLS J. & DĚDEČEK P. (2013): Temperature fluctuations underneath the ice in Diamond Lake, Hennepin County, Minnesota. – *Water Resources Research*, 49, 6: 3306–3313.

3.654* *BREITER K., ACKERMAN L., SVOJTKA M.* & MÜLLER A. (2013): Behavior of trace elements in quartz from plutons of different geochemical signature: A case study

from the Bohemian Massif, Czech Republic. – *Lithos* 175–176: 54–67.

3.534* DONG L., *ROČEK Z.,* WANG Y. & JONES M.E.H. (2013): Anurans from the Lower Cretaceous Jehol group of Western Liaoning, China. – *PLoS ONE*, 8, 7: e69723.

3.534* HORÁČEK I., KNITLOVÁ M., *WAGNER J.*, KORDOS L. & NADACHOWSKI A. (2013): Late Cenozoic history of the genus *Micromys* (Mammalia, Rodentia) in Central Europe. – *PLoS One*, 8, 5: e62498.

3.383* ZACHARIÁŠ J., *ŽÁK K.*, PUDILOVÁ M. & SNEE L.W. (2013): Multiple fluid sources/pathways and severe thermal gradients during formation of the Jílové orogenic gold deposit, Bohemian Massif, Czech Republic. – *Ore Geology Reviews*, 54: 81–109.

3.313* MACH K., SÝKOROVÁ I., *KONZALOVÁ M.* & OPLUŠTIL S. (2013): Effect of relative lake-level changes in mire-lake system on the petrographic and floristic compositions of a coal seam, in the Most Basin (Miocene), Czech Republic. – *International Journal of Coal Geology*, 105: 120–136.

3.313* OPLUŠTIL S., ŠIMŮNEK Z., *ZAJÍC J.* & MENCL V. (2013): Climatic and biotic changes around the Carboniferous/Permian boundary recorded in the continental basins of the Czech Republic. – *International Journal of Coal Geology*, 119: 114–151.

3.264* GRYNDLER M., SOUKUPOVÁ L., HRŠELOVÁ H., GRYNDLEROVÁ H., *BOROVIČKA J.*, STREIBLOVÁ E. & JANSA J. (2013): A quest for indigenous truffle helper prokaryotes. – *Environmental Microbiology Reports*, 5, 3: 346–352.

2.841* *NAVRÁTIL T.*, *HLADIL J.*, STRNAD L., *KOPTÍKOVÁ L.* & *SKÁLA R.* (2013): Volcanic ash particulate matter from the 2010 Eyjafjallajokull eruption in dust deposition at Prague, central Europe. – *Aeolian Research*, 9: 191–202.

2.752* HOLCOVÁ K. & *SLAVÍK L.* (2013): The morphogroups of small agglutinated foraminifera from the Devonian carbonate complex of the Prague Synform, (Barrandian area, Czech Republic). – *Palaeogeography, Palaeoclimatology, Palaeoecology*, 386: 210–224.

2.724* HROUDA F., POKORNÝ J., JEŽEK J. & *CHADIMA M.* (2013): Out-of-phase magnetic susceptibility of rocks and soils: A rapid tool for magnetic granulometry. – *Geophysical Journal International*, 194, 1:170–181.

2.667* *ACKERMAN L.*, PAŠAVA J. & ERBAN V. (2013): Re-Os geochemistry and geochronology of the Ransko gabbro-peridotite massif, Bohemian Massif. – *Mineralium Deposita*, 48, 7: 799–804.

2.577* *KLETETSCHKA G.*, HOOKE R.L., RYAN A., FERCANA G., McKINNEY E. & SCHWEBLER K.P. (2013): Sliding stones of Racetrack Playa, Death Valley, USA: The roles of rock thermal conductivity and fluctuating water levels. – *Geomorphology*, 195: 110–117.

2.509* JIRKŮ V., KODEŠOVÁ R., NIKODEM A., MÜHLHANSELOVÁ M. & *ŽIGOVÁ A.* (2013): Temporal variability of structure and hydraulic properties of topsoil of three soil types. – *Geoderma*, 204–205: 43–58.

2.390* GRABOWSKI J., SCHNYDER J., SOBIEN K., *KOPTIKOVA L.*, KRZEMINSKI L., PSZCZOLKOWSKI A., HEJNAR J. & *SCHNABL P.* (2013): Magnetic susceptibility and spectral gamma logs in the Tithonian-Berriasian pelagic carbonates in the Tatra Mts (Western Carpathians, Poland): Palaeoenvironmental changes at the Jurassic/Cretaceous boundary. – *Cretaceous Research*, 43: 1–17.

2.390* *ŽÍTT J.* & *VODRÁŽKA R.* (2013): *Terebella phosphatica* Leriche (Polychaeta) associated with phosphatic crusts and particles (Lower Turonian, Bohemian Cretaceous Basin, Czech Republic). – *Cretaceous Research,* 41: 111–126.

2.383* FUCHS M., KREUTZER S., ROUSSEAU D.-D., ANTOINE P., HATTÉ CH., LAGROIX F., MOINE O., GAUTHIER C., SVOBODA J. & *LISÁ L.* (2013): The loess sequence of Dolní Věstonice, Czech Republic: A new OSL-based chronology of the Last Climatic Cycle. – *Boreas*, 42, 3: 664–677.

2.383* JUŘIČKOVÁ L., HORÁČKOVÁ J., *LOŽEK V.* & HORSÁK M. (2013): Impoverishment of recent floodplain forest mollusc fauna in the lower Ohře River (Czech Republic) as a result of prehistoric human impact. – *Boreas*, 42, 4: 932–946.

2.269* KULAVIAK L., *HLADIL J.*, RŮŽIČKA M.C., DRAHOŠ J. & SAINT-LARY L. (2013): Arching structures in granular sedimentary deposits. – *Powder Technology*, 246: 269–277.

2.191* FERRETTI A., CARDINI A., CRAMPTON J., SERPAGLI E., SHEETS H.D. & *ŠTORCH P.* (2013): Rings without a Lord? Enigmatic fossils from the lower Palaeozoic of Bohemia and the Carnic Alps. – *Lethaia* 46, 2: 211–222.

2.128* *LISÁ L.* & JONES M. (2013): Tjeerd Van Andel's Stage Three challenge. – *Quaternary International*, 294, 29: 1–2.

2.128* *LISÁ L.*, ŠKRDLA P., HAVLÍN NOVÁKOVÁ D., BAJER A., *ČEJCHAN P.*, NÝVLTOVÁ FIŠÁKOVÁ M. & *LISÝ P.* (2013): The role of abiotic factors in ecological strategies of Gravettian hunter–gatherers within Moravia, Czech Republic. – *Quaternary International*, 294, 29: 71–81.

2.084* HOFFMANN U., BREITKREUZ C., *BREITER K.*, SERGEEV S., STANEK K. & TICHOMIROVA M. (2013): Carboniferous-Permian volcanic evolution in Central Europe – U/Pb ages of volcanic rocks in Saxony (Germany) and northern Bohemia (Czech Republic). – *International Journal of Earth Scienecs*, 102, 1: 73–99.

2.059* BAČÍK P., CEMPÍREK J., UHER P., OZDÍN D., FILIP J., NOVÁK M., ŠKODA R., *BREITER K.*, KLEMENTOVÁ M. & ĎUĎA R.(2013): Oxy-schorl, a $(Fe^{2+}_2Al)Al_6Si_6O_{18}(BO_3)_3(OH)_3O$, a new mineral species from Přibyslavice, Czech Republic and Zlatá Idka, Slovak Republic: Description and crystal structure. – *American Mineralogist*, 98, 2–3: 485–492.

2.059* ČUDA J., *KOHOUT T.*, FILIP J., TUČEK J., KOSTEROV A., HALODA J., SKÁLA R., SANTALA E., MEDŘÍK I. & ZBOŘIL R. (2013): Low-temperature magnetism of alabandite: Crucial role of surface oxidation. – *American Mineralogist*, 98, 8–9: 1550–1556.

2.021* *DRAHOTA P.*, NOVÁKOVÁ B., MATOUŠEK T., MIHALJEVIČ M., *ROHOVEC J.* & *FILIPPI M.* (2013): Diel variation of arsenic, molybdenum and antimony in a stream draining natural As geochemical anomaly. – *Applied Geochemistry*, 31: 84–93.

1.943* NUTZ A., GHIENNE J.-F. & *ŠTORCH P.* (2013): Circular, cryogenic structures from the Hirnantian deglaciation sequence (Anti-Atlas, Morocco). – *Journal of Sedimentary Research*, 83, 1: 115–131.

1.943* *ŽÁK K.*, ORVOŠOVÁ M., *FILIPPI M.*, VLČEK L., ONAC B.P., PERŞOIU A., *ROHOVEC J.* & SVĚTLÍK I. (2013): Cryogenic cave pearls in the periglacial zone of ice caves. – *Journal of Sedimentary Research*, 83, 2: 207–220.

1.898* *BREITER K.,* GARDENOVÁ N., VACULOVIČ T. & KANICKÝ V. (2013): Topaz as an important host for Ge in granites and greisens. – *Mineralogical Magazine* 77, 4: 403–417.

1.898* ONDRUŠ P., *SKÁLA R.*, PLÁŠIL J., SEJKORA J., VESELOVSKÝ F., ČEJKA J., *KALLISTOVÁ A.*, HLOUŠEK J., FEJFAROVÁ K., ŠKODA R., DUŠEK M., GABAŠOVÁ A., MACHOVIČ V. & LAPČÁK L. (2013) Švenekite, $Ca[AsO_2(OH)_2]_2$, a new mineral from Jáchymov, Czech Republic. – *Mineralogical Magazine*, 77, 6: 2711–2724.

1.898* PLÁŠIL J., KASATKIN A.V., ŠKODA R., NOVÁK M., *KALLISTOVÁ A.*, DUŠEK M., *SKÁLA R.*, FEJFAROVÁ K., ČEJKA J., MEISSER N., GOETHALS H., MACHOVIČ V. & LAPČÁK L. (2013): Leydetite, $Fe(UO_2)(SO_4)_2(H_2O)_{11}$, a new uranyl sulfate mineral from Mas d'Alary, Lodeve, France. – *Mineralogical Magazine*, 77, 4: 429–441.

1.679* *NAVRÁTIL T.*, VAŘILOVÁ Z. & *ROHOVEC J.* (2013) Mobilization of aluminum by the acid percolates within unsaturated zones of sandstones. – *Environmental Monitoring and Assessment*, 185, 9: 7115–7131.

1.495* *BEK J.* (2013): Microspinosporites, a new genus of Palaeozoic pseudosaccate miospores of flemingitalean affinity. – *Bulletin of Geosciences*, 88, 3: 573–581.

1.495* *ČERMÁK S.* & ANGELONE C. (2013): Revision of the type material of the Pliocene species *Prolagus bilobus* Heller, 1936 (Mammalia, Lagomorpha), with comments on the taxonomic validity of *P. osmolskae* Fostowicz-Frelik, 2010. – *Bulletin of Geosciences,* 88, 1: 45–50.

1.495* MAVRINSKAYA T. & *SLAVÍK L.* (2013): Correlation of Early Devonian (Lochkovian–early Pragian) conodont faunas of the South Urals (Russia). – *Bulletin of Geosciences*, 88, 2: 283–296.

1.495* *MIKULÁŠ R.*, MEŠKIS S., IVANOV A., LUKŠEVIČS E., ZUPINŠ I. & STINKULIS G. (2013): A rich ichnofossil assemblage from the Frasnian (Upper Devonian) deposits at Andoma Hill, Onega Lake, Russia. – *Bulletin of Geosciences*, 88, 2: 389–400.

1.444* SCHAUER F., NADÁŽDY V., GMUCOVÁ K., WEIS M., KUŘITKA I., *ROHOVEC J.*, TOUŠEK J., TOUŠKOVÁ J. & LÁNYI Š. (2013): Charge Transient, Electrochemical and Impedance Measurements as Tools for Characterization of Nano-Heterostructural Organic/Inorganic Semiconductors. – *Nanoscience and Nanotechnology Letters*, 5, 4: 439–443.

1.424* *LOKAJÍČEK T.*, GOEL R.K, RUDAJEV V. & DWIVEDI R.D. (2013): Assessment of velocity anisotropy in rocks. – *International Journal of Rock Mechanics & Mining Sciences*, 57: 142–152.

1.424* *PETRUŽÁLEK M.*, *VILHELM J.*, RUDAJEV V., *LOKAJÍČEK T.* & *SVITEK T.* (2013): Determination of the anisotropy of elastic waves monitored by a sparse sensor network. – *International Journal of Rock Mechanics & Mining Sciences*, 60: 208–216.

1.397* *ULRYCH J.*, *ACKERMAN L.*, BALOGH K., HEGNER E., JELÍNEK E., PÉCSKAY Z., PŘICHYSTAL A., UPTON B.G.J., ZIMÁK J. & FOLTÝNOVÁ R. (2013): Plio-Pleistocene basanitic and melilititic series of the Bohemian Massif: K-Ar ages, major/trace element and Sr–Nd isotopic data. – *Chemie Erde-Geochemistry*, 73, 4: 429–450.

1.338* VODRÁŽKOVÁ S., FRÝDA J., SUTTNER T.J., *KOPTÍKOVÁ L.* & TONAROVÁ P. (2013): Environmental changes close to the Lower–Middle Devonian boundary; the Basal Choteč Event in the Prague Basin (Czech Republic). – *Facies*, 59, 2: 425–449.

1.301* *VILHELM J.,* RUDAJEV V., *LOKAJÍČEK T.* & ŽIVOR R. (2013): Velocity dispersion in fractured rocks in a wide frequency range. – *Journal of Applied Geophysics*, 90: 138–146.

0.835* *BREITER K.,* GARDENOVÁ N., KANICKÝ V. & VACULOVIČ T. (2013): Galium and germanium geochemistry during magmatic fractionation and post-magmatic alteration in different types of granitoids: a case study from the Bohemian Massif, Czech Republic. – *Geologica Carpathica*, 64, 3: 171–180.

0.835* WIMBLEDON W.A.P., REHÁKOVÁ D., PSZCZÓŁKOWSKI A., CASELLATO C.E., HALÁSOVÁ E., FRAU C., BULOT L.G, GRABOWSKI J., SOBIEŃ K., *PRUNER P.*, *SCHNABL P.* & *ČÍŽKOVÁ K.* (2013): An account of the bio- and magnetostratigraphy of the upper Tithonian- lower Berriasian interval at Le Chouet, Drôme (SE France). – *Geologica Carpathica,* 64, 6: 437–460.

0.804* SCHNEIDER S., JÄGER M., KROH A., MITTERER A., NIEBUHR B., *VODRÁŽKA R.*, WILMSEN M., WOOD C.J. & ZÁGORŠEK K. (2013): Silicified sea life – Macrofauna and palaeoecology of the Neuburg Kieselerde Member (Cenomanian to Lower Turonian Wellheim Formation, Bavaria, southern Germany). – *Acta Geologica Polonica*, 63, 4: 555–610.

0.752* *KLETETSCHKA G., SCHNABL P., ŠIFNEROVÁ K.,* TASÁRYOVÁ Z., MANDA Š. & *PRUNER P.* (2013): Magnetic scanning and interpretation of paleomagnetic data from Prague Synforms volcanics. – *Studia Geophysica et Geodaetica,* 57, 1: 103–117.

0.744* KOHÚT M., TRUBAČ J., NOVOTNÝ L., *ACKERMAN L.*, DEMKO R., BARTALSKÝ B. & ERBAN V. (2013): Geology and Re-Os molybdenite geochronology of the Kuriskova U-Mo deposit (Western Carpathians, Slovakia). – *Journal of Geosciences*, 58, 3: 275–286.

0.714* CHUMAKOV N.M., DRONOV A.V. & *MIKULÁŠ R.* (2013): New Ichnospecies of Scratching Traces from Phosphatic nodules (Cenomanian, England). – *Stratigraphy and Geological Correlation*, 21, 3: 50–59.

0.714* *MIKULÁŠ R.* (2013): Ichnotaxonomy and Interpretation of "Incipient" Insect Trace Fossils in the Archaeological Context of Abusir (Holocene, Egypt). – *Stratigraphy and Geological Correlation*, 21, 3: 85–100.

0.714* *MIKULÁŠ R.*, BOOROVÁ D. & HOLCOVÁ K. (2013): Problematic microscopic trace (?) fossils, Oligocene, Slovakia. – *Stratigraphy and Geological Correlation*, 21, 3: 60–71.

0.707* *SLAVÍK L., ŠTORCH P.*, MANDA Š. & FRÝDA J. (2013): Integrated stratigraphy of the Ludfordian in the Prague Synform. – *GFF Geologiska Föreningen*, 136, 1: 1–5.

0.667* *ŽIGOVÁ A., ŠŤASTNÝ M.* & KODEŠOVÁ R. (2013): Development of soils on paragneiss and granite in the southeastern part of Bohemia. – *Acta Geodynamica et Geomaterialia*, 10, 1: 85–95.

0.541* *ČERMÁK S.* & *WAGNER J.* (2013): The Pliocene record of *Trischizolagus* and *Pliopentalagus* (Leporidae, Lagomorpha, Mammalia) in Central Europe with comments on taxonomy and evolutionary history of Leporinae. – *Neues Jahrbuch für Geologie und Paläontologie – Abhandlungen*, 268, 1: 97–111.

0.541* *PŘIKRYL T.* & SKUPIEN P. (2013): Some new Eocene elasmobranch reports from the Outer Western Carpathians (Moravia, Czech Republic). – *Neues Jahrbuch für Geologie und Paläontologie – Abhandlungen*, 268, 1: 113–123.

0.500* SCHLAGINTWEIT F., *HLADIL J.*, NOSE M. & SALERNO C. (2013): Palaeozoic record of Thaumatoporella PIA, 1927 (incertae sedis)? – *Geologia Croatica*, 66, 3: 155–182.

BAJER A., DEJMAL M., *LISÁ L.,* KOČÁR P., KOČÁROVÁ R., NÝVLTOVÁ FIŠÁKOVÁ M. & PETR L. (2013): Středověká stáj ve světle moderních environmentálních metod: příkladová studie Veselí nad Moravou. – *Rekonstrukce a experiment v archeologii: živá archeologie,* 15: 39–44.

BAJER A., OTAVA J., VÍT J. & *LISÁ L.* (2013): Nález reliktu miocenních sedimentů v jeskyni Pod hradem, Moravský kras. – *Zprávy Vlastivědného muzea v Olomouci*, 305, 1: 120–126.

BÁRTA M. & *CÍLEK V.* (2013): Barevné fajánsové korálky z pyramidových polí Staré říše: technologie a složení. – *Pražské egyptologické studie*, XI: 31–36.

BERAN V., HAJNALOVÁ M., KOS P., *LISÁ L.* & PARMA D. (2013): Geoarcheologický výzkum raně středověké kovárny z Modřic u Brna. – *Rekonstrukce a experiment v archeologii: živá archeologie,* 15: 25–31.

BOSÁK P. (2013): Excursion – Cave „Na Turoldu", Mikulov (24th April 2013). Jeskyně Bradla Turold u Mikulova. – *Geomorfologický sborník*, 11: 72–74.

BOSÁK P., GERŠL M. & NOVOTNÁ J. (Eds., 2013): Speleofórum 2013, Vol. 32. – Česká speleologická společnost: 1–128 and 1–16 color plates.

BOSÁK P., RAK Š. & *ŽÁK K.* (Eds., 2013): Český kras (Beroun), No. XXXIX, 2013. – Museum of the Czech Karst: 1–76.

BOSÁK P., ŠLECHTA S., HERCMAN H. & *PRUNER P.* (2013): Výzkum sedimentů a speleotém ve Zbrašovských aragonitových jeskyních. – *Acta Speleologova*, 4 (Zbrašovské aragonitové jeskyně. 100. výročí objevení): 53–56.

CAJZ V., SKÁCELOVÁ Z., *SCHNABL P.* & RADOŇ M. (2013). Svrchněkenozoický severomoravský vulkanismus: rekonstrukce činnosti, paleomagnetismus, geofyzikální obraz, návrh litostratigrafie [Upper Cenozoic volcanic activity in Northern Moravia: reconstruction, paleomagnetism, geophysical image, proposal of litostratigraphy]. – *Zprávy o geologických výzkumech v roce 2012*: 20–25.

ČERMÁK S. & TÁSLER R. (2013): Medvědí jeskyně ve východních Krkonoších (Česká Republika), předběžná zpráva. – *Opera Corcontica*, 50: 227–233.

FILIPPI M. & *BOSÁK P.* (Eds., 2013): Proceedings of the 16th International Congress of Speleology, July 21–28, Brno, Vol. 1. – Czech Speleological Society: 1–453.

FILIPPI M. & *BOSÁK P.* (Eds., 2013): Proceedings of the 16th International Congress of Speleology, July 21–28, Brno, Vol. 2. – Czech Speleological Society: 1–507.

FILIPPI M. & *BOSÁK P.* (Eds., 2013): Proceedings of the 16th International Congress of Speleology, July 21–28, Brno, Vol. 3. – Czech Speleological Society: 1–499.

FILIPPI M. & FRANĚK J. (2013): Nový výskyt pseudoleucitu u Loučné v Krušných horách. – *Minerál*, XXI, 6: 535–540.

HAVLÍN NOVÁKOVÁ D., *CÍLEK* V. & ŠTULLER J. (2013): Licenční proces nového jaderného zdroje Temelín 3,4 – umisťování (1). – *Bezpečnost jaderné energie*, 21, 5/6: 130–134.

HOŠEK J., HAMBACH U., *LISÁ L.,* HAVLÍČEK P. & KNÉSL I. (2013): Dobšice a Zeměchy – perspektivní sprašové lokality pro paleoenvironmentální výzkum svrchního pleistocénu [Dobšice and Zeměchy – perspective loess localities for paleoenvironmental research of Upper Pleistocene]. – *Zprávy o geologických výzkumech v roce 2012*: 121–125.

CHMEL P., KOTÍK J., *ROHOVEC J.* & *ŽÁK K.* (2013): Nové geodetické zaměření středověké studny hradu Karlštejna a její hydrogeologické souvislosti [New geodetic surveying of the medieval water well of the Karlštejn Castle and its hydrogeological context]. – *Český kras*, XXXIX: 29–44.

KADLEC J. (2013): Stratigrafie čtvrtohor. – *Geografické rozhledy, Kvartér,* 23: 2–3.

KOHOUT T., KARLQVIST R., LASSILA I., ESKELINEN J., HORTLING A., PESONEN L. J. & HÆGGSTRÖM E. (2013): Ultrasonic Determination of Porosity in Homogeneous Ceramic Samples. – *Geophysica*, 49, 1–2: 25–32.

KUNA M., HAJNALOVÁ M., KOVAČIKOVÁ L., *LISÁ L.,* NOVÁK J., BUREŠ M., *CÍLEK V.*, HOŠEK J., KOČÁR P., MAJER A., MAKOWIECKI D., SCOTT CUMMINGS L., SŮVOVÁ Z., SVĚTLÍK I., VANDENBERGHE D., VAN NIEULAND J., YOST CH. & ZABILSKA-KUNEK M. (2013): Raně středověký areál v Roztokách z pohledu ekofaktů. – *Památky archeologické*, 104: 59–147.

LISÁ L., BAJER A., VÁLEK D., KVĚTINA P. & ŠUMBEROVÁ R. (2013): Micromorphological evidence of Neolithic rondel like ditch infillings; case studies from Těšetice-Kyjovice and Kolín, Czech Republic. – *Interdisciplinaria Archaeologica – Natural Sciences in Archaeology*, 4, 2: 135–146.

LISÁ L., NERUDA P., NERUDOVÁ Z. & BAJER A. (2013): Geoarcheologický záznam středního a mladého paleolitu

v jeskyni Kůlně, Moravský kras. – *Acta Musei Moraviae – Scientiae sociales*, 98, 2: 197–214.

LOŽEK V. & *ŽÁK K.* (2013): Měkkýši "Vápenného kálku" v severním úbočí Mokrého vrchu u Bubovic a jejich výpověď [Molluscs of the "Vápenný kálek" site in the northern slope of the Mokrý Hill near Bubovice and their interpretation]. – *Český kras*, XXXIX: 60–62.

MIKULÁŠ R. & BUDIL P. (2013): Ichnofosilie *Rusophycus* cf. *cryptolithi* Osgood, 1970 – stopa trilobita *Deanaspis goldfussi* (Barrande, 1846) z letenského souvrství (svrchní ordovik Barrandienu) [The ichnofossil *Rusophycus* cf. *cryptolithi* Osgood, 1970 as a trace of the trilobite *Deanaspis goldfussi* (Barrande, 1846) from the Letná Formation (Upper Ordovician, Barrandien area, Czech Republic)]. – *Zprávy o geologických výzkumech v roce 2012*: 192–194.

MIKULÁŠ R. (2013): Mělce podpovrchové bioturbační textury zachovalé v řevnických křemencích (svrchní ordovik Barrandienu) [The shallow-tier bioturbate structures preserved in the Řevnice Quartzite (Upper Ordovician, Barrandian area, Czech Republic)]. – *Zprávy o geologických výzkumech v roce 2012*: 189–191.

MRÁZOVÁ Š., CHLUPÁČOVÁ M., & *CAJZ V.* (2013): Termomagnetické křivky vybraných fonolitů a trachytů Českého středohoří [Thermomagnetic curves of selected phonolites and trachytes of the České středohoří Mts]. – *Zprávy o geologických výzkumech v roce 2012*: 316–318.

PROUZA V., *COUBAL M.* & *ADAMOVIČ J.* (2013): Problematika jihovýchodního pokračování lužického zlomu v západním Podkrkonoší [Southeastern continuation of the Lusatian Fault in the western Krkonoše Mts. piedmont region]. – *Zprávy o geologických výzkumech v roce 2012*: 59–63.

PŘIKRYL T. (2013): An annotated list of the Oligocene fish fauna from the Osíčko locality (Menilitic Fm.; Moravia, the Czech Republic). – *Acta Musei Nationalis Pragae, Series B, Historia Naturalis*, 69, 3–4: 195–203.

PŘIKRYL T. & *BOSÁK P.* (Eds., 2013): Research Reports 2011. – Institute of Geology CAS, v. v. i.: 1–116.

PŘIKRYL T. & *BOSÁK P.* (Eds., 2013): Research Reports 2012. – Institute of Geology CAS, v. v. i.: 1–71.

ROČEK Z. (2013): Mesozoic and Tertiary Anura of Laurasia. – *Palaeobiodiversity & Palaeoenvironments*, 93, 4: 397–439.

ROHR D.M., BLODGETT R.B., SANTUCCI V. & *SLAVÍK L.* (2013): Shallow and Deep Water Origins of Silurian Rocks at Glacier Bay, Alaska. – *Alaska Park Science*, 12, 1: 36–41.

SCHLAGINTWEIT F., *HLADIL J.* & NOSE M. (2013): New observations and interpretations of the enigmatic poorly known Late Paleozoic Irregularina Bykova, 1955. – *Acta Palaeontologica Romaniae*, 9, 1: 3–22.

ŠKRDLA P., *ADAMOVIČ J.* & RYCHTAŘÍKOVÁ T. (2013): Hradsko u Mšena – nejzápadněji položená lokalita bohunicienu [Hradsko u Mšena – the most westerly Bohunician site]. – *Archeologické rozhledy*, 65: 895–905.

ULRYCH J., PALUSKA A., FEDIUK F. & SUHR P. (2013): Karl-Hermann Scheumann (*1881 Metz – †1964 Bad Hersfeld): před 100 lety zazářila petrografická nova na horním toku Ploučnice. – *Minerál*, 21: 173–174.

VÁLEK D., *LISÁ L.,* DOLÁKOVÁ N., UHLÍŘOVÁ H. & BAJER A. (2013): Nové poznatky o genezi sedimentů a artefaktuální výpovědi rondelového příkopu v Těšeticích-Kyjovicích (okr. Znojmo). – *Acta Musei Moraviae – Scientiae sociales*, 98, 2: 215–238.

VODRÁŽKA R., BUBÍK M., ŠVÁBENICKÁ L. & *ŽÍTT J.* (2013): Late Cretaceous (Upper Cenomanian–Lower Turonian) transgressive deposits near Kutná Hora and Kolín (central Bohemia, Bohemian Cretaceous Basin). – *The Micropalaeontological society, Foraminifera and nannofossil groups, Spring meeting 2013. - Guide to the Field trip, June 22, 2013*: 1–27.

ZAJÍC J. (2013): První nález svrchnokarbonské fauny v jižní části žihelské pánve (Český masív) [First discovery of the Upper Carboniferous fauna in the south part of the Žihle Basin (Bohemian Massif)]. – *Zprávy o geologických výzkumech v roce 2012*: 34–35.

ZUPAN HAJNA N., MIHEVC A., *PRUNER P.* & *BOSÁK P.* (2013): Jama pod Babjim zobom. – *21th International Karstological School "Classical Karst", Hypogene Speleogenesis (between Theory and Reality), June 10–14, 2013, Guide Book & Abstracts*: 33–37.

ŽÁK K., KOLČAVA M., BRUTHANS J. & ŽIVOR R. (2013): Evidence jeskyní Českého krasu: doplňky a změny za období 1. října 2011 až 30. září 2013 [Inventory of caves of the Czech Karst: Supplements and changes during the period from October 1, 2011 to September 30, 2013]. – *Český kras*, XXXIX: 63–67.

ŽÁK K., MOTYČKA Z. & *BOSÁK P.* (2013): 16. mezinárodní speleologický kongres v Brně a předkongresová exkurze do Českého krasu [16th International Congress of Speleology in Brno and pre-congress field trip to the Czech Karst]. – *Český kras*, XXXIX: 69–72.

ŽÍTT J., VODRÁŽKA R. & *SVOBODOVÁ M.* (2013): Nové poznatky o svrchní křídě u Kolína (střední Čechy) [New data on the Upper Cretaceous near Kolín (Central Bohemia)]. – *Zprávy o geologických výzkumech v roce 2012*: 102–108.

ŽÍTT J. & SKLENÁŘ J. (2013): K jubileu RNDr. Olgy Nekvasilové, CSc. – *Zpravodaj České geologické společnosti*, 17: 12–14.

5b. Books and chapters in books

ADAMOVIČ J., MIGOŃ P., GOŁAB Z., KOPECKÝ J., JENKA O., MERTLÍK J., PEŠA V., HAVRÁNEK P., KUKLA J. & KOMAŠKO A. (2013): *16th International Congress of Speleology, July 21–28, 2013, Brno. Sandstone caves and rock cities of Bohemia*. – Czech Speleological Society: 1–56. Praha.

ČECH S., ADAMOVÁ M., BALDÍK V., BŘÍZOVÁ E., BURDA J., ČÁP P., DVOŘÁK I.,GRYGAR R., HOLÁSEK O., HRADECKÁ L., HROCH T., JANDERKOVÁ J., KONDROVÁ L., KRUMLOVÁ H., KRUPIČKA J., MERTLÍK J., MLČOCH B., NOVOTNÝ R., PROUZA V., RAPPRICH V., REJCHRT M., RÝDA K, ŘÍDKOŠIL T., SKÁCELOVÁ Z.,

SMUTEK D., *SVOBODOVÁ M.,* ŠEBESTA J., ŠIMŮNEK Z., ŠTAFFEN Z. & ŠVÁBENICKÁ L. (2013): *Výsvětlivky k základní geologické mapě České republiky 1:25.000, 03-342 Rovensko pod Troskami*. – Česká geologická služba: 1–200. Praha.

CHADIMOVÁ L. (2013): IGCP Project No. 580. Application of magnetic susceptibility on Palaeozoic sedimentary rocks. – *In*: PAŠAVA J. & VYMAZALOVÁ A. (Eds.): *Forty years of IGCP: From Czechoslovak to Czech and Slovak IGCP National Committees*: 48–53. Czech Geological Survey. Praha.

CÍLEK V. (2013): Dějiny přírodních zdrojů a technologií. – *In*: BÁRTA M. & KOVÁŘ M. (Eds): *Dějiny a civilizace*: 470–492. Academia. Praha.

DOBEŠ M., LIMBURSKÝ P., BRNIĆ, Ž., LIKOVSKÝ J., POPELKA M., KYSELÝ R. & *HLAVÁČ J.* (2013): *Pohřebiště staršího eneolitu a šňůrové keramiky ve Vliněvsi*. – Archeologický ústav AV ČR v.v.i., 1–192. Praha.

GREMLICA T., VRABEC V., *CÍLEK V*., ZAVADIL V. & VOLF O. (2013): *Industriální krajina a její přirozená obnova. Právní východiska a rekultivační metodika oblastí narušených těžbou*. – Novela Bohemica: 1–110. Praha.

KALVODA J., KOŠLER J. & *SVOJTKA M*. (2013): Landform evolution of the Makalu - Barun region in the East Nepal Himalaya. – *In*: KUHLE M. (Ed.): *Tibet and High Asia*, vol VIII: 309–333. Shaker Verlag. Aachen.

PALUSKA A., VESELÝ P., RAPPRICHV. & *ULRYCH J*. (2013): Field trip 1: Ultramafic volcanic rocks in the Osečná – Upper Ploučnice river region in North Bohemia. – *In*: BÜCHNER J. & RAPPRICH V. (Eds.): *Basalt 2013 Cenozoic Magmatism in Central Europe 24th to 28th April, Görlitz / Germany. Abstracts & Excursions Guides*: 244–271. Czech Geological Survey Prague & Senckenberg Museum of Natural History Görlitz. Praha.

PROUZA V., ADAMOVÁ M., BŘÍZOVÁ E., DRÁBKOVÁ J., DVOŘÁK I.J., HAVLÍČEK P., HRAZDÍRA P., KONDROVÁ L., KRUPIČKA J., KYCL P., MALEC J., RAMBOUSEK P., RAPPRICH V., RÝDA K., ŘÍDKOŠIL T., SKÁCELOVÁ D., SKÁCELOVÁ Z., ŠEBESTA J., ŠIMŮNEK Z., *ZAJÍC J.* & ŽÁČKOVÁ E. (2013): *Vysvětlivky k Základní geologické mapě České republiky 1:25 000, 03-413 Semily*. – Česká geologická služba: 1–127. Praha.

ROČEK Z., GARDNER J.D., EATON J.G. & *PŘIKRYL T.* (2013): Anuran Ilia from the Upper Cretaceous of Utah—Diversity and Stratigraphic Patterns. *In*: TITUS A.L. & LOEWEN M.A. (Eds) *At the Top of the Grand Staircase: The Late Cretaceous of Southern Utah*: 273–294. Indiana University Press Bloomington & Indianapolis. Bloomington.

STÁRKOVÁ M., ADAMOVÁ M., BŘÍZOVÁ E., BURDA J., ČÁP P., DRÁBKOVÁ J., DVOŘÁK I.J., GRYGAR R., HOLÁSEK O., HROCH T., JANDERKOVÁ J., KYCL P., KRUMLOVÁ H., KRUPIČKA J., MENCL V., *MIKULÁŠ R.*, PÉCSKAY Z., RAPPRICH V., RÝDA K., ŘÍDKOŠIL T., SKÁCELOVÁ Z., ŠEBESTA J., ŠIMŮNEK Z., TASÁRYOVÁ Z. & *ZAJÍC J.* (2013): *Vysvětlivky k Základní geologické mapě České republiky 1:25 000, 03-431 Lomnice nad Popelkou*. – Česká geologická služba: 1–143. Praha.

ZAJÍC J. (2013): IGCP Project No. 491 Middle Palaeozoic vertebrate biogeography, palaeogeography and climate. . – *In*: PAŠAVA J. & VYMAZALOVÁ A. (Eds.): *Forty years of IGCP: From Czechoslovak to Czech and Slovak IGCP National Committees*: 78–80. Czech Geological Survey. Praha.

ŽÁK K., KOMAŠKO A., BLÁHA V. & FALTEISEK L. (2013): *16th International Congress of Speleology, July 21–28, Brno. Excursion Guide B5CZ Bohemian Karst*. – Czech Speleological Society: 1–82. Praha.

5c. Electronic media 2013

*ČEJCHA*N P.A. (2013): Bibliography of seriation methods. – web contribution. https://www.researchgate.net/publication/251571839_Bibliography_of_seriation_methods

ČEJCHAN P.A. (2013): Compositions: Functions to deal with compositional data. – *code*. http://code.google.com/p/compositions

ČEJCHAN P.A. (2013): Go-eco: Functions for use in (paleo)ecology, Release 2013. – *code*. http://code.google.com/p/go-eco/

ČEJCHAN P.A. & ASMUTH J. (2013): Probab: a library of probability distribution functions, statistics, and Bayesian inference, with sample programs, Release 2013. – *code*. http://code.google.com/p/probab/

ČEJCHAN P.A., GETREUER P. & GÁBOR H. (2013): Chroma: a library of chromatic adaptation, white balance, colorspace conversion and color distance functions, Release 2013. – *code*. https://code.google.com/p/chroma/

ČEJCHAN P.A., KOSTOPOULOS A., GOULERMAS Y. & GÁBOR H. (2013): Seriation: A library of matrix seriation functions. – *code*. http://code.google.com/p/seriation/

5d. Extended abstracts and abstracts 2013

ACKERMAN L., KOCHERGINA Y., ŠPAČEK P. & MAGNA T. (2013): Highly siderophile element geochemistry of upper mantle xenoliths from NE Bavaria. – *Mineralogical Magazine*, 77, 5: 555. Twickenham.

ACKERMAN L., ŠPAČEK P. & *ULRYCH J.* (2013): Petrology and geochemistry of mantle xenoliths from České Středohoří Mts. and Lusatia, Bohemian Massif. – *In*: BÜCHNER J., RAPPRICH V. & TIETZ O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 39–40. Prague–Görlitz.

ADAMOVIČ J., MIKULÁŠ R. & MERTLÍK J. (2013): Origin of regular cavities in European sandstones: field evidence for dissolution of carbonate and silica cement. – *In*: MIGOŃ P.

& KASPRZAK M. (Eds.): *Sandstone Landscapes. Diversity, Ecology and Conservation. Proceedings of the 3rd International Conference on Sandstone Landscapes, Kudowa Zdrój (Poland), 25–28 April 2012*: 13–18. Wrocław.

ADAMOVIČ J., MIKULÁŠ R., NAVRÁTIL T. & MERTLÍK J. (2013): Cave formation initiated by dissolution of carbonate cement in quartzose sandstones. – *In*: *FILIPPI M.* & *BOSÁK P.* (Eds.): *Proceedings of the 16th International Congress of Speleology, July 21–28, 2013, Brno. Volume 3*: 217–220. Praha.

BEK J., PŠENIČKA J., LABANDEIRA C.C. & WANG J. (2013): Two examples of insect-plant interactions from the Pennsylvanian of the Czech Republic and China. – *In:* PŠENIČKA J. (Ed.): *22nd International Workshop on Plant Taphonomy in Pilsen and Radnice 21-24th March 2013*: 11–13. Plzeň.

BERAN V., HAJNALOVÁ M., KOS P., *LISÁ L.* & PARMA D. (2013): Raně středověká kovárna z Modřic u Brna. – *45. mezinárodní konference archeologie středověku na téma „Zdroje a zpracování surovin v archeologii středověku", Kutná Hora, September 16th-19th, 2013, Book of Abstracts*: 16–17. Kutná Hora.

BEŠTA T., NOVÁK J., JANKOVSKÁ V., *LISÁ L.*, HOUFKOVÁ P., BERNARDOVÁ A., DRESLEROVÁ D., VALENTOVÁ D., TÁTOSOVÁ J. & VONDRÁK D. (2013): Vývoj Komořanského jezera ve světle nových informací ze zachráněných profilů – *9. konference environmentální archeologie 2013, Homo climaticus. Klimatické změny, příroda a společnost, České Budějovice, January 28–30, 2013, Book of Abstracts*: 23. České Budějovice.

BOSÁK P. & BELLA P. (2013): Ascending Speleogenesis in the Czech Republic and Slovakia. – *21st International Karstological School – Classical Karst: Hypogene speleogenesis (between theory and reality…). Guide Book & Abstracts*: 59–67. Postojna.

BOSÁK P. & BELLA P. (2013): Ascending speleogenesis of some Slovak and Czech caves. – *Geomorfologický sborník*, 11: 2–3. Ostrava–Brno.

BOSÁK P., PRUNER P., ŠLECHTA S., ČÍŽKOVÁ K. & BELLA P. (2013): Paleomagnetizmus travertínov pri Bešeňovej, Liptovských Sliačov a Ludrovej (Liptovská kotlina) – predbežné výsledky. – *Aragonit*, 18: 45–47. Liptovský Mikuláš.

BUCHTOVÁ J., NAVRÁTIL T., ROHOVEC J., MATOUŠKOVÁ Š., MYŠKA O., KRÁM P. & TESAŘ M. (2013) Mercury in selected catchments within Czech Republic. – *11th International Conference on Mercury as a Global Pollutant, Jul 28-Aug 2,2013. Abstract online: http://www.mercury2013.com/full-program-info/*: M69. Edinburgh.

CAJZ V., SCHNABL P., BÜCHNER J., TIETZ O., SUHR P., PÉCSKAY Z., ČÍŽKOVÁ K., *ŠLECHTA S.* (2013): First paleomagnetic results from Cenozoic volcanics of Lusatian region, Saxony/Bohemia. – *In*: Büchner J., Rapprich V. & Tietz O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 189–190. Prague–Görlitz.

CHADIMA M. (2013): Continuous measurement of viscous magnetization decay: an alternative tool in magnetic granulometry of sediments and soils. – *AGU Fall Meeting, San Francisco, USA, December 9–13, 2013, Abstract Book:* 1807923. San Francisco.

CHADIMA M. & STUDYNKA J. (2013): Fully automated measurement of field-dependent AMS using MFK1-FA Kappabridge equipped with 3D rotator. – *EGU General Assembly 2013, Vienna, Austria, April 7–13, 2013, Geophysical Research Abstracts*, 15: 1 p. Vienna.

CHADIMA M., HROUDA F. & *KADLEC J.* (2013): Out-of-phase susceptibility and time-dependent acquisition of viscous magnetization: two intercorrelating magnetic proxies in magnetic granulometry of sediments and soils. – *IAGA 12th Scientific Assembly, Merida, Mexico, August 26–31, 2013*, *Abstract Volume*: 151. Merida.

CHADIMA M., HROUDA F., STUDYNKA J. & SUZA P. (2013): Separation of field-independent and field-dependent susceptibility tensors using a sequence of fully automated AMS measurements. – *IAGA 12th Scientific Assembly, Merida, Mexico, August 26–31, 2013*, *Abstract Volume*: 132. Merida.

CÍLEK V. (2013): Eolian phenomena in sandstones and limestones of Egyptian Western Desert and their implication for Central European sandstone relief. – *In*: MIGON P. & KASPRAK M. (Eds.): *Sandstone landscapes. Diversity, Ecology and Conservation, April 25-28, 2012*: 28–33. Wroclaw.

ČUDA J., FILIP J., TUCEK J., *KOHOUT T.*, *SKÁLA R.*, BRITT D., BRADLEY T. & ZBOŘIL R. (2013): Space weathering simulations through laboratory production of iron nanoparticles on mineral grains. – *44th Lunar and Planetary Science Conference(2013), Woodlands, Texas, March 18-22, 2013, LPSC (2013)*: 2524. Woodlands.

DAGSSON-WALDHAUSEROVA P., ARNALDS O., OLAFSSON H., ŠKRABALOVÁ L., SIGURDARDOTTIR G.M., *HLADIL J.*, *SKÁLA R.*, *NAVRÁTIL T.*, *CHADIMOVÁ L.*, VON LOWIS OF MENAR S. & THORSTEINSSON T. (2013): Dust storm events in Iceland: physical properties of Icelandic dust. – *7th International Workshop on Sand/Duststorms and Associated Dustfall, Frascati, December 2–4, 2013, Abstracts*: 2 pp. Rome.

DEJMAL M, *LISÁ L.,* NÝVLTOVÁ-FIŠÁKOVÁ, M., BAJER A., PETR L., KOČÁR P., KOČÁROVÁ R., RYBNÍČEK M., CULP R. & VAVRČÍK H. (2013): Středověká stáj ve svelte moderních environmentálních metod. – *9. konference environmentální archeologie 2013, Homo climaticus. Klimatické změny, příroda a společnost, České Budějovice, January 28–30, 2013, Book of Abstracts*: 23. České Budějovice.

DRAGOUN J., *ŽÁK K.*, VEJLUPEK J., *FILIPPI M.*, NOVOTNÝ J. & DOBEŠ P. (2013): Na Javorce Cave – a new discovery in the Bohemian Karst (Czech Republic): Unique example of relationships between hydrothermal and common karstification. – *In*: *FILIPPI M.* & *BOSÁK P.* (Eds): *Proceedinds of 16th International Congress of Speleology, July 21–28, Brno. Volume 3*: 179–184. Praha.

FILIPPI M., BRUTHANS M., JAGER O., ZARE M. & ASADÍ N. (2013): Project NAMAK: Some of the most spectacular findings in the Iranian salt karst. – *In*: *FILIPPI M.* & *BOSÁK P.* (Eds): *Proceedings of the 16th International*

Congress of Speleology, July 21–28, Brno. Volume 3: 48–53. Praha.

GRABOWSKI J., KRZEMIŃSKI L., SCHNYDER J., SOBIEŃ K., HEJNAR J., *KOPTIKOVÁ L.*, PSZCZÓŁKOWSKI A. & *SCHNABL P.* (2013): Integrated magnetic susceptibility and geochemical record of δ13C anomalies in the Berriasian and Valanginian sections from the Tethyan domain (Western Carpathians, Poland). – *The 1st International Congress on Stratigraphy STRATI 2013, Lisbon, July 1–7, 2013, Abstracts*: 3 pp. Lisbon.

GRITSEVICH M., *KOHOUT T.,* GROKHOVSKY V., YAKOVLEV G., LYYTINEN E., VINNIKOV V., HALODA J., HALODOVA P., MICHALLIK R., PENTTILÄ A., MUINONEN K., PELTONIEMI J., LUPOVKA V. & DMITRIEV V. (2013): A Comprehensive Study of Chelyabinsk Meteorite: Physical, Mineralogical, Spectral Properties and Solar System Orbit. – *45th Annual meeting of the Division for Planetary Sciences of the American Astronomical Society, Denver, CO, USA, October 6–11, 2013, Abstract*: 205.01. Denver.

GRITSEVICH M., LYYTINEN E., GROKHOVSKY V.I., VINNIKOV V., *KOHOUT T*., LUPOVKA V. & DMITRIEV V. (2013): The Chelyabinsk Meteorite Orbit, Trajectory and Recovery. – *European Planetary Science Congress 2013, London, UK, September 8–13, 2013, Abstract*: 1071. London.

GRITSEVICH M., LYYTINEN E., GROKHOVSKY V., VINNIKOV V., *KOHOUT T.* & LUPOVKA V. (2013): Orbit, Trajectory, and Recovery of Chelyabinsk Meteorite. – *76th Annual Meeting of the Meteoritical Society, Edmonton, Canada, July 29 – August 2, 2013, Abstract*: 5228. Edmonton.

GRYGAR T.M., MACH K., LAURIN J. & *SCHNABL P.* (2013): Lacustrine rekord of early stage of Miocene Climatic Optimum in Central Europe: Most Basin, Ohře (Eger) Graben, Czech Republic. – *Crustal evolution and geodynamic processes in Central Europe. Proceedings of the Joint conference of the Czech and German geological societes held in Plzeň (Pilsen), September 16–19, 2013*, *SDGG (Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften)*, 82: 78. Stuttgart.

HAVLÍN NOVÁKOVÁ D., *CÍLEK V.* & ŠTULLER J. (2013): Nová interpretace geologických, geotechnických, hydrogeologických a hydrologických bezpečnostních kritérií pro umísťování jaderných zařízení a velmi významných zdrojů ionizujícího záření po havárii v jaderné elektrárně Fukushima-Daiichi. – *Hydrogeochemia 13, XIV. miedzynarodowa konferejcja naukowa, July 15, 2013*: 28–31. Sosnowiec.

JIRKU V., KODESOVA R., NIKODEM A., MUHLHANSELOVA M. & *ZIGOVA A.* (2013): Temporal variability of selected chemical and physical properties of topsoil of three soil types. – *EGU General Assembly 2013, Vienna, April 7-12, 2013, Geophysical Research Abstracts, 15*: EGU2013-7650-1. Vienna.

KADLEC J. (2013): Klimatické změny v geologické minulosti a současnosti. – *9. konference environmentální archeologie KEA 2013, České Budějovice, January 28–30, 2013, Sborník abstraktů:* 36. České Budějovice.

KADLEC J., BELLA P., *ČÍŽKOVÁ K*., GRANGER D.E., HERCMAN H., HOLÚBEK P., *CHADIMA M.,* ORVOŠOVÁ M., *PRUNER P., SCHNABL P*. & *ŠLECHTA S.* (2013): Valley incision in the Nízké Tatry Mts. (Slovakia) estimated based on paleomagnetic and radiometric cave sediments datings. – *In*: *FILIPPI M.* & *BOSÁK P.* (Eds): *Proccedings of the 16th International Congress of Speleology, July 21-28, 2013. Brno. 2013 ICS Proceedings, Volume 3*: 94–95. Praha.

KADLEC J., HERCMAN H., *CHADIMA M., LISÁ L.*, OBERHÄNSLI H. & OSINTSEV A. (2013): Magnetic fabric and mineralogy of cave deposits in Botovskaya Cave (Eastern Siberia, Russian Federation). – *In*: *FILIPPI M.* & *BOSÁK P.* (Eds): *Proccedings of the 16th International Congress of Speleology, July 21-28, 2013. Brno. 2013 ICS Proceedings, Volume 3*: 96–98. Praha.

KADLEC J., HERCMAN H., *ŽÁK K.* & *ŠLECHTA S.* (2013): Sedimentary archives opened in the Holštejnská Cave, Moravian Karst (Czech Republic). – *Crustal evolution and geodynamic processes in Central Europe. Proceedings of the Joint conference of the Czech and German geological societes held in Plzeň (Pilsen), September 16–19, 2013*, *SDGG (Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften)*, 82: 60. Stuttgart.

KADLEC J., KOCUREK G., MOHRING D., STEHLÍK F., SINGHVI A.K., SVOBODOVÁ-SVITAVSKÁ H., BENEŠ V., SVĚTLÍK I. & RYBNÍČEK M. (2013): Lower Moravian Basin – late glacial and Holocene lake, fluvial and eolian processes. – *Proceedings and excursion guide of the conference State of geomorphological research in the year*, *Mikulov, April 24–26, 2013, Geomorfologický sborník*, 11: 58–59. Ostrava–Brno.

KADLEC J., STEHLÍK F., KALICKI T., KRUPA J., SVITAVSKÁ-SVOBODOVÁ H., BENEŠ V., SVĚTLÍK I. & RYBNÍČEK M. (2013): Late Holocene human impacts to the Morava River floodplain development. – *In*: KALICKI T. & KRUPA J. (Eds): *Geoarchaeology of river valleys. Kielce-Suchedniów (Poland), May 13–15, 2013, Abstract Book and Field Guide*: 60–61. Kielce–Suchedniów.

KADLEC J., STEHLÍK F., KALICKI T., SVITAVSKÁ-SVOBODOVÁ H., SVĚTLÍK I. & RYBNÍČEK M. (2013): Vliv vegetace na vývoj říční nivy Moravy na Strážnickém Pomoraví. – *Konference České botanické společnosti: Historie flóry a vegetace v pozdním glaciálu a holocénu ve světle aktuálních poznatků. Praha, November 23–24, 2013, Sborník abstraktů*: 22. Praha.

KADLEC J., SVITAVSKÁ-SVOBODOVÁ H. & *ČÍŽKOVÁ K.* (2013): Environmentální záznam v sedimentech Vracovského jezera v Dolnomoravském úvalu. – *19. Kvarér, Brno, November 29, 2013, Sborník abstraktů*: 27. Brno.

KAŠTOVSKÝ J., BERRENDERO E., *HLADIL J.* & JOHANSEN J.R. (2013): A new cyanobacterial genus from Karlovy Vary, Czech Republic, plus some notices about new cyanobacterial genera. – *54th Conference of Czech Phycological Society, September 16–18, 2013, Book of Abstracts*: 13. Třeboň.

KAŠTOVSKÝ J., BERRENDERO E., *HLADIL J.* & JOHANSEN J.R. (2013): A new cyanobacterium from the thermal springs of Karlovy Vary, Czech Republic. – *19th Symposium of the International Association for Cyanophyte Research (IAC2013), July 28 – August 2, 2013, Program and Abstracts*: 53. Cleveland.

KIDO E., SUTTNER T., PONDRELLI M., CORRADINI C., CORRIGA M.G., SIMONETTO L., VODRÁŽKOVÁ S.,

JOACHIMSKI M. & *KOPTÍKOVÁ L.* (2013): Eifelian–Givetian crisis: Evidence from lithological, geochemical and geophysical records of the Carnic Alps. – *Pre-Cenozoic climates international workshop, Toulouse, June 17–19, 2013, Abstracts*: 36–37. Toulouse.

KOBAYASHI T., HARLEY S.L., HIROI Y., HIRAJIMA T. & *SVOJTKA M.* (2013): High-pressure melting and rapid exhumation of Grt-rich gneiss at Ktiš in the Lhenice shear zone (Moldanubian Zone of the southern Bohemian Massif). – *10th International Eclogite Conference, Università di Torino, Courmayeur, September 2–10. Abstract volume*: 61. Courmayeur.

KOHOUT T., CUDA J., BRADLEY T., BRITT D., FILIP J., TUCEK J., MALINA O., KASLIK J., SISKOVA K., *KLETETSCHKA G.* & ZBORIL R. (2013): Space Weathering Evolution on Airless Bodies – Laboratory Simulations with Olivine. – *45th Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society, Denver, CO, USA, October 6–11, 2013, Abstract Book*: 112.03. Denver.

KOHOUT T., GRITSEVICH M., GROKHOVSKY V. & YAKOVLEV G. (2013): Physical properties of Chelyabinsk meteorites - implications on parent body. – *European Week of Astronomy and Space Science 2013, Turku, Finland, July 8–13, 2013, Abstracts*: 153. Turku.

KOHOUT T., GRITSEVICH M., GROKHOVSKY V.I. & YAKOVLEV G.A. (2013): Physical properties of the Chelyabinsk meteorite fragments. – *European Planetary Science Congress 2013, London, UK, September 8–13, 2013, Abstract*: 1027. London.

KOHOUT T., GRITSEVICH M., GROKHOVSKY V.I. & YAKOVLEV G.A. (2013): Physical properties of the Chelyabinsk meteorite fragments. – *76th Annual Meeting of the Meteoritical Society, Edmonton, Canada, July 29 – August 2, 2013, Abstract*: 5273. Edmonton.

KOHOUT T., KALLONEN A., SUURONEN J.P., ROCHETTE P., HUTZLER A., GATTACCECA J., BADJUKOV D.D., *SKÁLA R.* & ČUDA J. (2013): Changes to meteoroid shape, porosity and internal structure during high velocity atmos*pheric entry. – 44th Lunar and Planetary Science Conference, Woodlands, Texas, March 18–22, 2013, Abstract*: 2486. Woodlands.

KOMAR M. & *BOSÁK P.* (2013): Palynological content of speleothems in the Belianska Cave as a reflection of the palaeoenvironment in its vicinity. – *Paleoecological reconstructions – lacustrine, peat and cave sediments, 22.–24.05.2013 Białka Tatrzańska. Abstrakt Book*: 66–67. Warszawa.

KONOPÁSEK J., KOŠLER J., *SLÁMA J.* & JANOUŠEK V. (2013): Neoproterozoic sedimentation along the SW margin of the Congo Craton (Kaoko Belt, NW Namibia). – *Goldschmidt 2013 Conference, August 25–30, Florence, Italy Goldschmidt 2013 Conference Abstracts*: 1493. Middlesex.

KOPTÍKOVÁ L., VACEK F., SOBIEN K. & *SLAVÍK L.* (2013): Petrophysical and sedimentological record of the Late Silurian Lau event in the shallow water carbonate facies (Prague Synform, Czech Republic). – *Meeting of the IGCP 580 and 596, Geophysical and Geochemical Techniques: A Window on the Paleozoic World, August 27 – September 1, 2013, Calgary, Canada, Programme and Abstracts*: 39–40. Calgary.

KOŘÍNKOVÁ D., *ADAMOVIČ J.*, *SVOJTKA M.* & *FILIP J.* (2013): Reconstruction of low time-temperature history of the crystalline blocks and sedimentary rocks along Lusatian Faul, Bohemian Massif. – *11th Meeting of the Central European Tectonic Studies Group, Geological and Geophysical Institute of Hungary, Várgesztes, May 24–27. Occasional Papers of the Geological and Geophysical Institute of Hungary*: 30–31. Várgesztes.

KULAVIAK L., *HLADIL J.* & RŮŽIČKA M.C. (2013): Arching structures in granular sedimentary deposits. – *The workshop Smart and Green Interfaces, European Cooperation in Science and Technology, Materials, Physical and Nanosciences, COST action MP1106, March 21–22, 2013, Abstracts*: 63. Praha.

LISÁ L. (2013): Horse stable in Medieval Central Europe; reconstruction of Medieval maintenance practice. – *25th International Soil Micromorphology Workshop, Cambridge, 9th–11th of May, 2013, Book of Abstracts*: 26. Cambridge.

LISÁ L. (2013): Role abiotických faktorů na ekologické strategie Gravettienských lovců-sběračů na Moravě. – *2. Geologicko-Paleontologicko-Archeologická Diskusia 2013: Paleoekológia: spôsoby interakcie medzi človekom a ekosystémom v paleolite. Nitra, 25th of April, 2013, Book of Abstracts*: 8. Nitra.

LISÁ L., DEJMAL D., PARMA D. & BERAN V. (2013): Medieval horse husbandry; case studies based on micromorphological approach. – *Developing International Geoarchaeology Conference 2013 and International Workshop on Archaeological Soil Micromorphology, Basilej 2nd-6th, 2013, Book of Abstracts*: 56. Basel.

LISÁ L., FIŠÁKOVÁ-NÝVLTOVÁ M. & PETR L. (2013): Horse stable in Medieval Central Europe; reconstruction of Medieval maintenance practices. – *In*: KALICKI T. & KRUPA J. (Eds): *Geoarchaeology of river valleys. Kielce-Suchedniów (Poland), May 13–15, 2013, Abstract Book and Field Guide*: 95. Kielce–Suchedniów.

LISÁ L., NERUDA P., NERUDOVÁ Z. & BAJER A. (2013): Geoarcheologický záznam středního a mladého paleolitu v jeskyni Kůlně, Moravský kras. – *19th Quaternary Conference 2013, Brno, 29th of November, 2013, Book of Abstracts*: 39. Brno.

LISÁ L., NERUDOVÁ Z., NERUDA P. & BAYER A. (2013): Význam a možnosti interpretace jeskynních sedimentů v archeologickém kontextu, příkladová studie jeskyně Kůlna, Moravský kras. – *9. konference environmentální archeologie 2013, Homo climaticus. Klimatické změny, příroda a společnost, České Budějovice, 28th–30th of January, 2013, Book of Abstracts*: 49. České Budějovice.

LISÁ L. & PETR L. (2013): Recognition of agricultural practices in Nile slag water deposits: the case study from Jebel Sabaloka, 6th Nile Cataract, northern Sudan. – *Geoarchaeology of river valleys conference, Suchedniow, 13th–15th of May, 2013, Book of Abstracts*: 96–97. Kielce.

LOKAJÍČEK T. (2013): Laboratory approach to the study of elastic anisotropy on spheres by simultaneous longitudinal and transversal sounding under confining pressure. – *Proceedings of the 19th International conference "Deformation*

mechanisms, rheology & tectonics" 2013. 16-18 September 2013: 64. Leuven.

MAGNA T., *ACKERMAN L.* & ŠPAČEK P. (2013): Lithium isotope evidence for pervasive metasomatism of subcontinental lithospheric mantle in peridotitic xenoliths from the Upper Palatinate, Germany. – *In*: BÜCHNER J., RAPPRICH V. & TIETZ O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 29–30. Prague–Görlitz.

MAGNA T., *ACKERMAN L.* & ŠPAČEK P. (2013): Lithium isotope evidence for pervasive metasomatism of subcontinental lithospheric mantle. – *Mineralogical Magazine*, 77, 5: 1668. Twickenham.

MARGIELEWSKI W., URBAN J., *ŻAK K.* & ZERNITSKAYA V. (2013): Dated speleothems of the non-karst caves in the Polish Flysch Carpathians and their relation to climatic changes during the Late Glacial-Holocene. – *11th International Conference "Methods of absolute chronology", 15–18.5.2013, Podlesice, Poland, Abstract & Programme*: 23. Gliwice–Podlesice.

MAVRINSKAYA T. & *SLAVÍK L.* (2013): Lochkovian conodont biostratigraphy in the South Urals. – *In:* EL HASSANI A., BECKER R.T. & TAHIRI A. (Eds.): *International Field Symposium "The Devonian and Lower Carboniferous of northern Gondwana", Erfoud, Morocco, March 22-29, 2013, Abstract book. Document de l'Institut Scientifique, Rabat*, 26: 83. Rabat.

MEDARIS L.G., MICHELS Z.D., TOY V.G., BENFORD B., TIKOFF B., *ACKERMAN L.* & JELÍNEK E. (2013): Chemical and physical properties of central European lithospheric mantle from the Moho to a depth of 83 km: evidence from Kozákov spinel peridotite xenoliths. – *In*: BÜCHNER J., RAPPRICH V. & TIETZ O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 35–36. Prague–Görlitz.

MELCHIN M.J., MITCHELL C.E., HOLMDEN C., *ŠTORCH P.* & GOLDMAN D. (2013): Changing plankton community structure in the late Katian-early Hirnantian: evidence from graptolites and nitrogen isotopes. – *GSA Abstracts with Programs*, 45, 7: 495. Denver.

MIHEVC A., HORÁČEK I., *PRUNER P.*, ZUPAN HAJNA N., *ČERMÁK S., WAGNER J.* & *BOSÁK P.* (2013): Miocene-Pliocene age of cave Sněžna jama na Raduhi, Southerns Alps, Slovenia. – *In*: *FILIPPI M.* & *BOSÁK P.* (Eds.): *Proccedings of the 16th International Congress of Speleology, July 21-28, 2013. Brno. 2013 ICS Proceedings, Volume 3*: 379–383. Praha.

MIKULÁŠ R. & *HLADIL J.* (2013): Ichnofabric of nodular limestones (Devonian, Czech Republic). – *XII. International Ichnofabric Workshop, Canakkale – Dardanelles, June 30 – July 5, 2013, Abstracts*: 53. Ankara.

MIKULÁŠ R., ADAMOVIČ J. & *CÍLEK V.* (2013): Between sand and sandstone: microrelief on very weakly cemented sandstones. – *In*: MIGOŃ P. & KASPRZAK M. (Eds.): *Sandstone Landscapes. Diversity, Ecology and Conservation. Proceedings of the 3rd International Conference on Sandstone Landscapes, Kudowa Zdrój (Poland), 25–28 April 2012*: 127–131. Wrocław.

MITCHELL C.E., MELCHIN M.J., HOLMDEN C., FINNEY S.C. & *ŠTORCH P.*: An alternative international correlation of the latest Ordovician (late Katian & Hirnantian): chemostratigraphy, biostratigraphy, sequence stratigraphy and temperature history. – *In:* LINDSKOG A. & MEHLQUIST K. (Eds.): *Proceedings of the 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*: 229–231. Lund.

MLEJNEK O., NOVÁK J. & *LISÁ L.* (2013): Výzkum životního prostředí v okolí paleolitického sídliště Želeč na základě antrakologických a mikromorfologických analýz. – *9. konference environmentální archeologie 2013, Homo climaticus. Klimatické změny, příroda a společnost České Budějovice, 28th – 30th of January, 2013, Book of Abstracts*: 50. České Budějovice.

MÜLLER A., SNOOK B., IHLEN M.P., BEURLEN H. & *BREITER K.* (2013) Diversity of the quartz chemistry of NYF- and LCT-type pegmatites and its economic implications. – *Mineral deposit research for a high-tech world. Proceedings of the 12th Biennial SGA Meeting, Vol. 4, 12-15 August 2013, Uppsala, Sweden*: 1774–1776. Uppsala.

MUNDL A., NTAFLOS T., BJERG E.A., *ACKERMAN L.* & HAUZENBERGER C.A. (2013): Lithospheric mantle heterogeneities beneath Southern Patagonia. – *Mineralogical Magazine*, 77, 5: 1808. Twickenham.

NAEMURA K., HIRAJIMA T., WEI C.J. & *SVOJTKA M.* (2013): Subduction history of some garnet lherzolites in the Moldanubian Zone of the Bohemian Massif. – *10th International Eclogite Conference, University of Torino, Courmayeur, Italy, September 2–10. Abstract volume*: 92. Courmayeur.

NAEMURA K., SHIMIZU I., HIRAJIMA T. & *SVOJTKA M.* (2013): In-situ finding of micro-diamond in chromite from the spinel-garnet peridotite, Moldanubian Zone of the Bohemian Massif. – *10th International Eclogite Conference, University of Torino, Courmayeur, Italy, September 2 – 10. Abstract volume*: 93. Courmayeur.

NAKAMURA D., SHIMOBAYASHI N., USUKI T., HIRAJIMA T. & *SVOJTKA M.* (2013): Garnet zonings created under open-system environments and short-lived heating of Nové Dvory UHP-UHT eclogite. – *10th International Eclogite Conference, University of Torino, Courmayeur, Italy, September 2 – 10. Abstract volume*: 95. Courmayeur.

NAVRÁTIL T., ROHOVEC J., MATOUŠKOVÁ Š., MYŠKA O., KRÁM P. & TESAŘ M. (2013): Mercury in selected catchments within Czech Republic. – *11th International Conference on Mercury as a Global Pollutant, Jul 28-Aug 2, 2013. Abstract online: http://www.mercury2013.com/full-program/*: M69. Edinburgh.

NERUDOVÁ Z., NERUDA P., *LISÁ L.*, NÝVLTOVÁ-FIŠÁKOVÁ M. & PETR L. (2013): Výsledky grantového projektu chronostratigrafické revize jeskyně Kůlny (Moravský kras). – *19th Quaternary Conference 2013, Brno, 29th of November, 2013, Book of Abstracts*: 44. Brno.

NERUDOVÁ Z., NERUDA P., *LISÁ L.*, ROBLÍČKOVÁ M., NOVÁK J., JUŘÍČKOVÁ L. (2013): Glaciálnímu maximu navzdory. – *9. konference environmentální archeologie 2013, Homo climaticus. Klimatické změny, příroda a společnost, České Budějovice, 28th –30th of January, 2013, Book of Abstracts*: 23. České Budějovice

NIKODEM A., KODESOVA R., JAKSIK O., JIRKU V., FER M., KLEMENT A. & *ZIGOVA A.* (2013): Soil hydraulic properties of topsoil along two elevation transects affected by soil erosion. – *EGU General Assembly 2013, Vienna, April 7-12, 2013, Geophysical Research Abstracts, 15*: EGU2013-7924, Vienna.

ORVOŠOVÁ M., VLČEK L. & *ŽÁK K.* (2013): New localities of coarsely crystalline cryogenic cave carbonates in Slovakia. – *Proceedinds of 16th International Congress of Speleology, 21.–28. 7. 2013, Brno, Volume 3*: 490–495. Praha.

PALUSKA A., RAPPRICH V., *CAJZ V., ULRYCH J.*, PÉCSKAY Z., VESELÝ P. & RUTŠEK J. (2013): Age and time mode of ultramafic and associated dyke rocks in northern Bohemia. – *In*: BÜCHNER J., RAPPRICH V. (Eds.): *Basalt 2013 Cenozoic Magmatism in Central Europe 24th to 28th April, Görlitz / Germany. Abstracts & Excursions Guides*: 230–231. Praha.

PALUSKA A., SUHR P., *ULRYCH J.,* FEDIUK F. & RAPPRICH V. (2013): Karl Hermann Scheumann, a geologist and petrologist in the area of the Czech – German border. – *In*: BÜCHNER J., RAPPRICH V. (Eds.): *Basalt 2013 Cenozoic Magmatism in Central Europe 24th to 28th April, Görlitz / Germany. Abstracts & Excursions Guides*: 234–235. Praha.

PETRUŽÁLEK M., *LOKAJÍČEK T.* & *SVITEK T.* (2013): The anisotropy of ultrasonic waves velocity and attenuation uniaxially loading of migmatite samples. – *Proceedings of the 47th US Rock Mechanics/Geomechanics Symposium. 2013. 23-26 June 2013, San Francisco*: ARMA 13-541. San Francisco.

PETRUŽÁLEK M., LOKAJÍČEK T. & *SVITEK T.* (2013): The influence of mutual orientation between foliation and loading direction on fracturing process of migmatite samples. – *Proceedings of the 19th International conference "Deformation mechanisms, rheology & tectonics" Programme and Abstracts, 2013. 16-18 September 2013, Leuven*: 83. Leuven.

PRUNER P., *SCHNABL P.*, *ČÍŽKOVÁ K.*, *VENHODOVÁ D.* & *ŠLECHTA S.* (2013): Palaeotectonic rotation and amalgamation of blocks, with special reference to the palaeomagnetic and magnetostratigraphic investigations. – *Geological evolution of the Western Carpathians: new Ideas in the field of inter-regional correlations, Smolenice, Slovakia, October 16-19, 2013, GEEWEC 2013, Abstract Book*: 70-71. Bratislava.

PŘIKRYL T., KRZEMIŃKI W. & KANIA I. (2013): "Non-adult" fish fauna of the Hermanowa locality (Oligocene; Outer Carpathian; Poland) – preliminary review. – *In:* BAK M., KOWAL-KASPRZYK J., WAŚKOWSKA A. & KAMINSKI M.A. (Eds.): *14th Czech-Slovak-Polish Paleontological Conference and 9th Micropalaeontological Workshop, November 14-15, 2013, Kraków, Poland, Grzybowski Foundation Special Publication, Abstract Volume 19*: 45–46. Kraków.

RACEK M., LEXA O., JEŘÁBEK P. & *SVOJTKA M.* (2013): Metamorphic record of high temperature interaction between mantle rocks and felsic granulites. – *11th Meeting of the Central European Tectonic Studies Group, Geological and Geophysical Institute of Hungary, Várgesztes, May 24–27. Occasional Papers of the Geological and Geophysical Institute of Hungary*: 57–58. Várgesztes.

ROHOVEC J., *NAVRÁTIL T.*, *HOJDOVÁ M.*, CORNS W. & CHEN B. (2013) Towards Sensitivity Improvement in MeHg Quantification By Cold Vapour Atomic Fluorescence Spectrometry. – *11th International Conference on Mercury as a Global Pollutant, Jul 28-Aug 2, 2013. Abstract online: http://www.mercury2013.com/full-program/*: W13. Edinburgh.

SCHNABL P., CAJZ V., TIETZ O., BUECHNER J., SUHR P., PECSKAY Z. & *CIZKOVA K.* (2013): Paleomagnetic results from Cenozoic volcanics of Lusatia, NW Bohemian Massif. – *AGU Meeting of the Americas, Cancun, Mexico, May 14–17, 2013, Abstracts:* GP33A-03. Cancún.

SCHNABL P., *PRUNER P.*, *CAJZ V.*, *ČÍŽKOVÁ K.*, TASÁRYOVÁ Z. & *KLETETSCHKA G.* (2013): Comparison of Cenozoic and Silurian basalts in magnetomineralogic properties and implication for Silurian Paleogeography. – *In*: BÜCHNER J., RAPPRICH V. & TIETZ O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 198–199. Prague–Görlitz.

SCHNABL P., *PRUNER P.*, CAJZ V., *ČÍŽKOVÁ K.*, TASÁRYOVÁ Z. & *KLETETSCHKA G.* (2013): Similarites between Silurian and Cenozoic basalts in rock-magnetic properties and its implication for Silurian. – *AGU Meeting of the Americas, Cancun, Mexico, May 14–17, 2013, Abstract*: GP43B-01. Cancún.

ŠKRDLA P., NEJMAN L., RYCHTAŘÍKOVÁ T., NIKOLAJEV P. & *LISÁ L.* (2013): Želešice-Hoynerhügel. Nové poznatky o szeletienu na Moravě. – *19th Quaternary Conference 2013, Brno, 29th of November, 2013, Book of Abstracts*: 63. Brno.

SLAVÍK L. (2013): Late Silurian and Early Devonian Conodont Stratigraphy in the Prague Synform and correlation of bioevents. – *In:* ALBANESI G. & ORTEGA G. (Eds.): *Conodonts from the Andes - 3rd International Conodont Symposium, July 15-19, 2013, Mendoza, Argentina, Publicación Especial No. 13, Abstracts*: 149. Buenos Aires.

SLAVÍK L., HLADIL J., KOPTÍKOVÁ L. & *ČEJCHAN P.* (2013): Subdivision of the "Original Pragian" – new data from the type area. – *In:* EL HASSANI A., BECKER R.T. & TAHIRI A. (Eds.): *International Field Symposium "The Devonian and Lower Carboniferous of northern Gondwana", Erfoud, Morocco, March 22-29, 2013, Abstract book. Document de l'Institut Scientifique, Rabat*, 26: 117–118. Rabat.

SLAVÍK L., *ŠTORCH P.* & MANDA Š. (2013): Ludlow Series in the Prague Synform – a progress in biostratigraphic correlation. – *In:* LINDSKOG A. & MEHLQUIST K. (Eds.): *Proceedings of the 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*: 297–298. Lund.

SLAVÍK L., VALENZUELA-RÍOS J.I., HUŠKOVÁ A., CALVO H., LIAO J-C. & *KOPTÍKOVÁ L.* (2013): Hi-res correlation and dating of Mid-Palaeozoic sedimentary sequences of Peri-Gondwana using integrated biostratigraphy and chemophysical methods - an insight to the Lochkovian. – *In:* BAK M., KOWAL-KASPRZYK J., WAŚKOWSKA A. & KAMINSKI M.A. (Eds.): *14th Czech-Slovak-Polish Paleontological Conference and 9th Micropalaeontological Workshop, November 14-15, 2013, Kraków, Poland, Grzybowski Foundation Special Publication, Abstract Volume 19*: 52–53. Kraków.

ŠPAČEK P., *ACKERMAN L.*, HABLER G., ABART R. & *ULRYCH J.* (2013): Garnet breakdown in basanite-hosted peridodite xenoliths from southern Eger Rift (Zinst, Bavaria). –

In: BÜCHNER J., RAPPRICH V. & TIETZ O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/ Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 33–34. Prague–Görlitz.

ŠTORCH P., MANDA Š. & FRÝDA J. (2013): Candidate sections for new international boundary stratotypes of the lower Silurian Aeronian and Homerian stages in the Prague Synform, Czech Republic. – *In:* LINDSKOG A. & MEHLQUIST K. (Eds.): *Proceedings of the 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*: 307–308. Lund.

STUDYNKA J., *CHADIMA M.,* HROUDA F. & SUZA P. (2013): Separation of field-independent and field-dependent susceptibility tensors using a sequence of fully automated AMS measurements. – *AGU Fall Meeting, San Francisco, USA, December 9–13, 2013, Abstract Book:* 1814884. San Francisco.

ŠVECOVÁ K., LEICHMANN J. & *BREITER K.* (2013): Cathodoluminescence of quartz and trace elements – is there any connection? – *4th International Students Geological Conference, April 19-21, 2013, Brno. Conference Proceedings*: 140. Brno.

SVITEK T., LOKAJÍČEK T. & PETRUŽÁLEK M. (2013): Determination of elastic anisotropy from P- and S-waves based on ultrasonic sounding on spherical samples. – *Proceedings of the 19th International conference "Deformation mechanisms, rheology & tectonics" Programme and Abstracts, 2013. 16-18 September 2013, Leuven*: 103. Leuven.

TASÁRYOVÁ Z., *SCHNABL P., ČÍŽKOVÁ K., PRUNER P., ŠTORCH P.,* MANDA Š., JANOUŠEK V., RAPPRICH V. & FRÝDA J. (2013): Gorstian palaeoposition and geotectonic setting of Suchomasty volcanic centre (Prague Synform, Bohemia). – *In:* LINDSKOG A. & MEHLQUIST K. (Eds.): *Proceedings of the 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*: 314–315. Lund.

TASÁRYOVÁ Z., *SCHNABL P.,* JANOUŠEK V., *PRUNER P., ŠTORCH P.*, *KLETETSCHKA G., ČÍŽKOVÁ K., ŠLECHTA S.*, MANDA Š., ERBAN V. & FRÝDA J. (2013): Palaeogeography of Prague Synform times (Wenlock-Luidlow): Insights from palaeomagnetism, basalt geochemistry and biostratigraphy. – *Crustal evolution and geodynamic processes in Central Europe. Proceedings of the Joint conference of the Czech and German geological societes held in Plzeň (Pilsen). September 16–19, 2013*, *SDGG (Schriftenreihe der Deutschen Gesellschaft für Geowissenschaften)*, 82: 105. Stuttgart.

ULRYCH J. & KRMÍČEK L. (2013): Recent views on lamprophyric melilitic rocks (polzenites) of the Bohemian Massif. – *Mineralogical Magazine*, 77, 5: 2376. Twickenham.

ULRYCH J., ADAMOVIČ J., PALUSKA A., KRMÍČEK L. & BALOGH K. (2013): Ultramafic pre-rift volcanism of the Osečná Complex, northern Bohemia. – *In*: BÜCHNER J., RAPPRICH V. & TIETZ O. (Eds.): *Basalt 2013, Cenozoic magmatism in central Europe, Görlitz/Germany, 24th–28th April, 2013; Abstracts & Excursion Guides*: 232–233. Prague–Görlitz.

VALENTOVÁ D. & *LISÁ L.* (2013): Od makra k mikru aneb rozdílná informační hodnota metodických přístupů v archeologii. – *2. Geologicko-Paleontologicko-Archeologická Diskusia 2013: Paleoekológia: spôsoby interakcie medzi človekom a ekosystémom v paleolite. Nitra, 25th of April, 2013, Book of Abstracts*: 4. Nitra.

VALENZUELA-RÍOS J.I., *SLAVÍK L.*, CALVO H., HUŠKOVÁ A., LIAO J-C. & *KOPTÍKOVÁ L.* (2013): Correlation of the middle Lochkovian (Lower Devonian) conodont successions in peri-Gondwana key localities. – *In:* EL HASSANI A., BECKER R.T. & TAHIRI A. (Eds.): *International Field Symposium "The Devonian and Lower Carboniferous of northern Gondwana", Erfoud, Morocco, March 22-29, 2013, Abstract book. Document de l'Institut Scientifique, Rabat*, 26: 123–124. Rabat.

VALENZUELA-RÍOS J.I., *SLAVÍK L.*, CALVO H., HUŠKOVÁ A., LIAO J-C. & *KOPTÍKOVÁ L.* (2013): What conodonts can tell about the Spanish-Czech connection during Lochkovian times? – *In:* ALBANESI G. & ORTEGA G. (Eds.): *Conodonts from the Andes - 3rd International Conodont Symposium, July 15-19, 2013, Mendoza, Argentina, Publicación Especial No. 13, Abstracts*: 152. Buenos Aires.

VALENZUELA-RÍOS J.I., *SLAVÍK L.*, CALVO H., HUŠKOVÁ A., LIAO J-C. & *KOPTÍKOVÁ L.* (2013): Conodontos del Lochkoviense (Devónico Inferior) en los Pirineos Centrales Españoles y su correlación con las secuencias de Bohemia (República Checa). – *In*: ÁLVAREZ-VÁZQUEZ C. & LÓPEZ-RODRÍGUEZ I. (Eds.): *XXIX Jornadas de la Sociedad Española de Paleontología y Simposio del Proyecto PICG 596, October 2-5, 2013, Córdoba, Spain: Libro de Resúmenes*: 83. Córdoba.

WANG J., *ŠTORCH P.*, WANG X., ZHANG J., MENG Y., FU L.P. & LI R. (2013): Preliminary study of upper Llandovery and lower Wenlock graptolite fauna of Ziyang and Langao sections, Shaanxi Province, China. – *In:* LINDSKOG A. & MEHLQUIST K. (Eds.): *Proceedings of the 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*: 332–333. Lund.

YASUMOTO A., HIRAJIMA T., NAKAMURA D. & *SVOJTKA M.* (2013): Variation and significance of chemical zoning patterns of garnet in Nove Dvory eclogite, Moldanubian Zone of the Bohemian Massif. – *10th International Eclogite Conference, University of Torino, Courmayeur, Italy, September 2 – 10. Abstract volume*: 125. Courmayeur.

ŽIGOVÁ A. & *ŠŤASTNÝ M.* (2013): Vliv změny využívání půdy na vlastnosti pseudoglejů. – *16. Pedologické dny 2013 na téma „Časové změny půdních vlastností a jejich predikce. Milovy, 4-6.9.2013, Sborník abstraktů*: 85. Brno.

ZUPAN HAJNA N., MIHEVC A., *PRUNER P.* & *BOSÁK P.* (2013): Age of karst and caves in Slovenia. – *Geomorfologický sborník*, 11: 54. Ostrava–Brno.

5e. Lectures and poster presentations

ACKERMAN L., ŠPAČEK P. & *ULRYCH J.*: Petrology and geochemistry of mantle xenoliths from České Středohoří Mts. and Lusatia, Bohemian Massif. *Lecture. Basalt 2013 conference, Cenozoic magmatism of Central Europe, April 24–28, 2013.* Görlitz.

ACKERMAN L., KOCHERGINA Y., ŠPAČEK P. & MAGNA T.: Highly siderophile element geochemistry of upper mantle xenoliths from NE Bavaria. *Lecture*. *Goldschmidt 2013, August 25-30, 2013*. Florence.

BEK J., PŠENIČKA J., LABANDEIRA C.C. & WANG J.: Two examples of insect-plant interactions from the Pennsylvanian of the Czech Republic and China. *Lecture. 22nd International Workshop on Plant Taphonomy in Pilsen and Radnice, March 21-24, 2013*. Plzeň.

BERAN V., HAJNALOVÁ M., KOS P., *LISÁ L.* & PARMA D.: Raně středověká kovárna z Modřic u Brna. *Poster. 45. mezinárodní konference archeologie středověku na téma "Zdroje a zpracování surovin v archeologii středověku", September 16–19, 2013*. Kutná Hora.

Bosák P. & Bella P.: Ascending speleogenesis along deep regional faults (selected case studies of from selected caves in the Czech and Slovak republics). *Lecture*. *Stav geomorfologických výzkumů v roce 2013, Mikulov, April 24–26, 2013*. Mikulov.

BOSÁK P. & BELLA P.: Ascending Speleogenesis in the Czech Republic and Slovakia. *Invited Lecture*. *21st International Karstological School – Classical Karst: Hypogene speleogenesis, June 10–14, 2013*. Postojna.

BOSÁK P., BELLA P., GAÁL Ľ., ŠUCHA V. & KODĚRA P.: Hydrotermálna speleogenéza v Západných Karpatoch – v odlišných geologických podmienkach a dobách [Hydrothermal speleogenesis inthe Western Carpathians – in different contitions and ages]. *Lecture. Odborný seminář. 100. výročí objevení Zbrašovských aragonitových jeskyní, Teplice nad Bečvou, April, 9–10, 2013*. Teplice nad Bečvou.

BOSÁK P., PRUNER P., ŠLECHTA S., ČÍŽKOVÁ K. & BELLA P.: Paleomagnetizmus travertínov pri Bešeňovej, Liptovských Sliačov a Ludrovej (Liptovská kotlina) – predbežné výsledky [Paleomagnetism of tufas at Bešeňová, Liptovské Sliače and Ludrová, Liptovská kotlina Basin – preliminary results]. *Lecture*. *Výskum, využívanie a ochrana jaskýň, 9. vedecká konferencia, September 23–26, 2013*. Liptovská Sielnica.

BOSÁK P.: Nové speleogenetické a stratigrafické poznatky ze zpřístupněných jeskyní ČR [New speleogenetic and stratigraphic data from show caves of the Czech Republic]. *Lecture*. *Odborný seminář. 100. výročí objevení Zbrašovských aragonitových jeskyní, Teplice nad Bečvou, April 9–10, 2013*. Teplice nad Bečvou.

CAJZ V., SCHNABL P., BÜCHNER J., TIETZ O., SUHR P., PÉCSKAY Z., ČÍŽKOVÁ K. & *ŠLECHTA S.*: First paleomagnetic results from Cenozoic volcanics of Lusatian region, Saxony/Bohemia. *Poster*. *Basalt 2013 conference, Cenozoic magmatism of Central Europe, April 24–28, 2013.* Görlitz.

CHADIMA M. & STUDYNKA J: Fully automated measurement of field-dependent AMS using MFK1-FA Kappabridge equipped with 3D rotator. *Lecture*. *EGU General Assembly 2013, April 7–13, 2013.* Vienna.

CHADIMA M., HROUDA F. & *KADLEC J.*: Out-of-phase susceptibility and time-dependent acquisition of viscous magnetization: two intercorrelating magnetic proxies in magnetic granulometry of sediments and soils. *Lecture*. *IAGA 12th Scientific Assembly, August 26–31, 2013.* Merida.

CHADIMA M., HROUDA F., STUDYNKA J. & SUZA P.: Separation of field-independent and field-dependent susceptibility tensors using a sequence of fully automated AMS measurements. *Invited Lecture. IAGA 12th Scientific Assembly, August 26–31, 2013.* Merida.

CHADIMA M.: Continuous measurement of viscous magnetization decay: an alternative tool in magnetic granulometry of sediments and soils. *Poster. AGU Fall Meeting, December 9–13, 2013.* San Francisco.

CHADIMA M.: Magnetic anisotropy of rocks. *Lecture*. *IAGA 12th Scientific Assembly, 1st IAGA Summer School, August 26–31, 2013.* Merida.

CHADIMOVÁ L. (KOPTÍKOVÁ), *HLADIL J.* & *SLAVÍK L.*: Studium prachu a jeho význam v geologickém záznamu – příklady z paleozoika a recentu – identifikace prachových částic a jejich původ. *Lecture. Seminář ze sedimentární geologie, Přírodovědecká fakulta UK, December 2, 2013*. Praha.

CHADIMOVÁ L. (KOPTÍKOVÁ), VACEK F., SOBIEŃ L. & *SLAVÍK* L.: Petrophysical and sedimentological record of the Late Silurian Lau event in the shallow water carbonate facies (Prague Synform, Czech Republic). *Lecture. Joint meeting IGCP-580 & IGCP-596: Geophysical and Geochemical Techniques: A Window on the Palaeozoic World, Calgary, Canada, 27.8. – 1.9. 2013.* Calgary.

ČUDA J., FILIP J., TUCEK J., *KOHOUT T.*, SKÁLA R., BRITT D., BRADLEY T. & ZBOŘIL R.: Space weathering simulations through laboratory production of iron nanoparticles on mineral grains. *Poster. 44th Lunar and Planetary Science Conference(2013), March 18–22, 2013.* Woodlands.

DAGSSON-WALDHAUSEROVA P., ARNALDS O., OLAFSSON H., ŠKRABALOVÁ L., SIGURDARDOTTIR G.M., *HLADIL J.*, *SKÁLA R.*, *NAVRÁTIL T.*, *CHADIMOVÁ L.*, VON LOWIS OF MENAR S. & THORSTEINSSON T.: Dust storm events in Iceland: physical properties of Icelandic dust. *Lecture. 7th International Workshop on Sand/Duststorms and Associated Dustfall, 2.–4. 12. 2013.* Frascati.

DRAGOUN J., *ŽÁK K.*, VEJLUPEK J., *FILIPPI M.*, NOVOTNÝ J. & DOBEŠ P.: Na Javorce Cave – a new discovery in the Bohemian Karst (Czech Republic): Unique example of relationships between hydrothermal and common karstification. *Poster*. *16th International Congress of Speleology, July 21–28, 2013*. Brno.

FILIPPI M., BRUTHANS M., JAGER O., ZARE M. & ASADÍ N.: Project NAMAK: Some of the most spectacular findings in the Iranian salt karst. – *Lecture*. *16th International Congress of Speleology, July 21–28, 2013*. Brno.

GRITSEVICH M., *KOHOUT T.,* GROKHOVSKY V., YAKOVLEV G., LYYTINEN., VINNIKOV V., HALODA J., HALODOVA P., MICHALLIK R., PENTTILÄ A., MUINONEN K., PELTONIEMI J., LUPOVKA V. & DMITRIEV V.: Comprehensive Study of Chelyabinsk Meteorite: Physical, Mineralogical, Spectral Properties and Solar System Orbit. *Poster. 45th Annual meeting of the Division for Planetary Sciences of the American Astronomical Society, October 6–11, 2013.* Denver.

GRITSEVICH M., LYYTINEN E., GROKHOVSKY V., VINNIKOV V., *KOHOUT T.* & LUPOVKA V.: Orbit, Trajectory,

and Recovery of Chelyabinsk Meteorite. *Poster. 76th Annual Meeting of the Meteoritical Society, July 29 – August 2, 2013.* Edmonton.

GRITSEVICH M., LYYTINEN E., GROKHOVSKY V.I., VINNIKOV V., *KOHOUT T.*, LUPOVKA V. & DMITRIEV V.: The Chelyabinsk Meteorite Orbit, Trajectory and Recovery. *Poster. European Planetary Science Congress 2013, September 8–13, 2013.* London.

GRYGAR T.M., MACH K., LAURIN J. & *SCHNABL P.*: Lacustrine rekord of early stage of Miocene Climatic Optimum in Central Europe: Most Basin, Ohře (Eger) Graben, Czech Republic. *Lecture. Crustal evolution and geodynamic processes in Central Europe. Proceedings of the Joint conference of the Czech and German geological societes held in Plzeň (Pilsen), September 16–19, 2013*. Plzeň.

JIRKU V., KODESOVA R., NIKODEM A., MUHLHANSELOVA M. & *ZIGOVA A.* (2013): Temporal variability of selected chemical and physical properties of topsoil of three soil types. *Poster. European Geosciences Union, General Assembly 2013, April 7-12, 2013*. Vienna.

KADLEC J. & *CHADIMA M.*: Magnetická susceptibilita – jak se měří a k čemu slouží? *Lecture. CTU Faculty of Electrical Engineering, Department of Measurement, March 14, 2013.* Praha.

KADLEC J., BELLA P., *ČÍŽKOVÁ K*., GRANGER D.E., HERCMAN H., HOLÚBEK P., *CHADIMA M*., ORVOŠOVÁ M., *PRUNER P., SCHNABL P.* & *ŠLECHTA S.*: Valley incision in the Nízké Tatry Mts. (Slovakia) estimated based on paleomagnetic and radiometric cave sediments datings. *Lecture. 16th International Congress of Speleology, July 21-28, 2013*. Brno.

KADLEC J., HERCMAN H., *CHADIMA M., LISÁ L.*, OBERHÄNSLI H. & OSINTSEV A.: Magnetic fabric and mineralogy of cave deposits in Botovskaya Cave (Eastern Siberia, Russian Federation). *Lecture. 16th International Congress of Speleology, July 21-28, 2013*. Brno.

KADLEC J., HERCMAN H., *ŽÁK K.* & *ŠLECHTA S.*: Sedimentary archives opened in the Holštejnská Cave, Moravian Karst (Czech Republic). *Lecture. Crustal evolution and geodynamic processes in Central Europe. Proceedings of the Joint conference of the Czech and German geological societes held in Plzeň (Pilsen), September 16–19, 2013.* Plzeň.

KADLEC J., KOCUREK G., MOHRING D., STEHLÍK F., SINGHVI A.K., SVOBODOVÁ-SVITAVSKÁ H., BENEŠ V., SVĚTLÍK I. & RYBNÍČEK M.: Lower Moravian Basin – late glacial and Holocene lake, fluvial and eolian processes. *Lecture. Proceedings and excursion guide of the conference State of geomorphological research in the year 2013, April 24–26, 2013.* Mikulov.

KADLEC J., STEHLÍK F., KALICKI T., KRUPA J., SVITAVSKÁ-SVOBODOVÁ H., BENEŠ V., SVĚTLÍK I. & RYBNÍČEK M.: Late Holocene human impacts to the Morava River floodplain development. *Lecture. Geoarchaeology of river valleys. May 13–15, 2013*. Kielce.

KADLEC J., STEHLÍK F., KALICKI T., SVITAVSKÁ-SVOBODOVÁ H., SVĚTLÍK I. & RYBNÍČEK M.: Vliv vegetace na vývoj říční nivy Moravy na Strážnickém Pomoraví. *Lecture. Konference České botanické společnosti: Historie flóry a vegetace v pozdním glaciálu a holocénu ve světle aktuálních poznatků, November 23–24, 2013.* Praha.

KADLEC J., SVITAVSKÁ-SVOBODOVÁ H. & *ČÍŽKOVÁ K.* (2013): Environmentální záznam v sedimentech Vracovského jezera v Dolnomoravském úvalu. *Lecture. 19. Kvartér, Brno, November 29, 2013*. Brno.

KADLEC J.: Klimatické změny v geologické minulosti a současnosti. *Lecture. 9. konference environmentální archeologie, KEA 2013, January 28–30, 2013.* České Budějovice.

KADLEC J.: Late Late Holocene human impacts on the Morava River floodplain development: sedimentological and magnetic evidence. *Lecture. Aluvial geoarcheology, November 7–8, 2013.* Mikulčice.

KAŠTOVSKÝ J., BERRENDERO E., *HLADIL J.* & JOHANSEN J.R.: A new cyanobacterial genus from Karlovy Vary, Czech Republic, plus some notices about new cyanobacterial genera. *Lecture. 54th Conference of Czech Phycological Society, September 16–18, 2013.* Třeboň.

KAŠTOVSKÝ J., BERRENDERO E., *HLADIL J.* & JOHANSEN J.R.: A new cyanobacterium from the thermal springs of Karlovy Vary, Czech Republic. *Lecture. 19th Symposium of the International Association for Cyanophyte Research (IAC2013), July 28 – August 2, 2013*. Cleveland.

KIDO E., SUTTNER T., PONDRELLI M., CORRADINI C., CORRIGA M.G., SIMONETTO L., VODRÁŽKOVÁ S., JOACHIMSKI M. & *KOPTÍKOVÁ L.*: EIFELIAN – Givetian crisis: Evidence from lithological, geochemical and geophysical records of the Carnic Alps. *Poster. Pre-Cenozoic climates international workshop, Toulouse, June 17–19, 2013.* Toulouse.

KLETETSCHKA G., ZILA V. & KLIMOVA L.: Efficiency of cellular division whwn creating when creating small pockets of electric current along the walls of cells. *Lecture. SENS 6, September 3–10, 2013.* Cambridge.

KOBAYASHI T., HARLEY SIMONL., HIROI Y., HIRAJIMA T. & *SVOJTKA M.*: High-pressure melting and rapid exhumation of Grt-rich gneiss at Ktiš in the Lhenice shear zone (Moldanubian Zone of the southern Bohemian Massif). *Poster. 10th International Eclogite Conference, September 2–10, 2013.* Courmayeur.

KOHOUT T., CUDA J., BRADLEY T., BRITT D., FILIP J., TUCEK J., MALINA O., KASLIK J., SISKOVA K., *KLETETSCHKA G.* & ZBORIL R.: Space Weathering Evolution on Airless Bodies – Laboratory Simulations with Olivine. *Poster. 45th Annual meeting of the Division for Planetary Sciences of the American Astronomical Society, October 6–11, 2013.* Denver.

KOHOUT T., GRITSEVICH M., GROKHOVSKY V. & YAKOVLEV G.: Physical properties of Chelyabinsk meteorites – implications on parent body. *Lecture. European Week of Astronomy and Space Science 2013, July 8–13, 2013.* Turku.

KOHOUT T., GRITSEVICH M., GROKHOVSKY V.I. & YAKOVLEV G.A.: Physical properties of the Chelyabinsk meteorite fragments. *Lecture. 76th Annual Meeting of the Meteoritical Society, July 29– August 2, 2013.* Edmonton.

KOHOUT T., GRITSEVICH M., GROKHOVSKY V.I. & YAKOVLEV G.A.: Physical properties of the Chelyabinsk meteorite fragments. *Poster. European Planetary Science Congress 2013, September 8–13, 2013.* London.

KOHOUT T., KALLONEN A., SUURONEN J.P., ROCHETTE P., HUTZLER A., GATTACCECA J., BADJUKOV D.D., *SKÁLA R.* & ČUDA J.: Changes to meteoroid shape, porosity and internal structure during high velocity atmospheric entry. *Poster. 44th Lunar and Planetary Science Conference, March 18–22, 2013.* Woodlands.

KOMAR M. & *BOSÁK P.*: Palynological contents of speleothems in the Belianska Cave as a reflexion of the paleoenvironment in its vicinity. *Poster*. *Palaeoecological reconstructions – lacustrine, peat and cave sediments" Białka Tatrzańska (Poland), May 22–24, 2013*. Białka Tatrzańska.

KONOPÁSEK J., KOŠLER J., *SLÁMA J.* & JANOUŠEK V.: Neoproterozoic sedimentation along the SW margin of the Congo Craton (Kaoko Belt, NW Namibia). *Lecture*. *Goldschmidt 2013 Conference, August 25–30, 2013*. Florence.

KOPTÍKOVÁ L., VACEK F., SOBIEN K. & *SLAVÍK L.*: Petrophysical and sedimentological record of the Late Silurian Lau event in the shallow water carbonate facies (Prague Synform, Czech Republic). *Lecture. Meeting of the IGCP 580 and 596, Geophysical and Geochemical Techniques: A Window on the Paleozoic World, August 27 – September 1, 2013*. Calgary.

KOŘÍNKOVÁ D., *ADAMOVIČ J.*, *SVOJTKA M.* & *FILIP J.*: Reconstruction of low time-temperature history of the crystalline blocks and sedimentary rocks along Lusatian Faul, Bohemian Massif. *Poster. 11th Meeting of the Central European Tectonic Studies Group, May 24–27, 2013.* Várgesztes.

KULAVIAK L., *HLADIL J.* & RŮŽIČKA M.C.: Arching structures in granular sedimentary deposits. *Poster. The workshop Smart and Green Interfaces, European Cooperation in Science and Technology, Materials, Physical and Nanosciences, COST action MP1106, March 21–22, 2013*. Praha.

LISÁ L.: Horse stable in Medieval Central Europe; reconstruction of Medieval maintenance practice. *Lecture*. *25th International Soil Micromorphology Workshop, Cambridge, 9 – 11. 5. 2013.* Cambridge.

LISÁ L.: Role abiotických faktorů na ekologické strategie Gravettienských lovců-sběračů na Moravě. *Lecture. 2. Geologicko-Paleontologicko-Archeologická Diskusia 2013: Paleoekológia: spôsoby interakcie medzi človekom a ekosystémom v paleolite. Nitra, April 25, 2013.* Nitra.

LISÁ L., DEJMAL D., PARMA D. & BERAN V.: Medieval horse husbandry; case studies based on micromorphological approach. *Poster. Developing International Geoarchaeology Conference 2013 and International Workshop on Archaeological Soil Micromorphology, September 2-6, 2013*. Basel.

LISÁ L., DEJMAL M., NÝVLTOVÁ-FIŠÁKOVÁ M., BAJER A. PETR L., KOČÁR P., KOČÁROVÁ R., RYBNÍČEK M., CULP R. & VAVRČÍK H.: Středověká stáj ve světle moderních environmentálních metod. *Lecture. 9. konference environmentální archeologie 2013, January 28–30, 2013*. České Budějovice.

LISÁ L., FIŠÁKOVÁ-NÝVLTOVÁ M. & PETR L.: Horse stable in Medieval Central Europe; reconstruction of Medieval maintenance practices. *Lecture. Geoarchaeology of river valleys conference, Suchedniow, May 13–15, 2013*. Suchedniow.

LISÁ L., NERUDA P., NERUDOVÁ Z. & BAJER A.: Geoarcheologický záznam středního a mladého paleolitu v jeskyni Kůlně, Moravský kras. *Lecture*. *19th Quaternary Conference, November 29, 2013.* Brno.

LISÁ L., NERUDOVÁ Z., NERUDA P. & BAYER A.: Význam a možnosti interpretace jeskynních sedimentů v archeologickém kontextu, příkladová studie jeskyně Kůlna, Moravský kras. *Lecture. 9. konference environmentální archeologie 2013, January 28–30, 2013.* České Budějovice.

LISA L. & PETR L.: Recognition of agricultural practices in Nile slag water deposits: the case study from Jebel Sabaloka, 6th Nile Cataract, northern Sudan. *Lecture. Geoarchaeology of river valleys conference, Suchedniow, May 13–15, 2013*. Suchedniow.

LOKAJÍČEK T.: Laboratory approach to the study of elastic anisotropy on spheres by simultaneous longitudinal and transversal sounding under confining pressure. *Lecture*. *Deformation mechanisms, rheology & tectonics 2013, September 16-18, 2013*. LEUVEN.

MAGNA T., *ACKERMAN L.* & ŠPAČEK P.: Lithium isotope evidence for pervasive metasomatism of subcontinental lithospheric mantle. *Lecture*. *Goldschmidt 2013, August 25-30, 2013*. Florence.

MAGNA T., *ACKERMAN L.* & ŠPAČEK P.: Lithium isotope evidence for pervasive metasomatism of subcontinental lithospheric mantle in peridotitic xenoliths from the Upper Palatinate, Germany. *Lecture*. *Basalt 2013 conference, Cenozoic magmatism of Central Europe, April 24-28, 2013*. Görlitz.

MARGIELEWSKI W., URBAN J., *ŻAK K.* & ZERNITSKAYA V.: Dated speleothems of the non-karst caves in the Polish Flysch Carpathians and their relation to climatic changes during the Late Glacial-Holocene. – *Lecture*. *11th International Conference "Methods of absolute chronology", May 15–18, 2013*. Podlesice.

MAVRINSKAYA T. & *SLAVÍK L.*: Lochkovian conodont biostratigraphy in the South Urals. *Poster. International Field Symposium The Devonian and Lower Carboniferous of northern Gondwana, March 22-29, 2013*. Erfoud.

MEDARIS L.G., MICHELS Z.D., TOY V.G., BENFORD B., TIKOFF B., *ACKERMAN L.* & JELÍNEK E. (2013): Chemical and physical properties of central European lithospheric mantle from the Moho to a depth of 83 km: evidence from Kozákov spinel peridotite xenoliths. *Lecture*. *Basalt 2013 conference, Cenozoic magmatism of Central Europe, April 24-28, 2013*. Görlitz.

MELCHIN M.J., MITCHELL C.E., HOLMDEN C., *ŠTORCH P.* & GOLDMAN D.: Changing plankton community structure in the late Katian-early Hirnantian: evidence from graptolites and nitrogen isotopes. *Lecture*. *Geological Society of America, 125th Anniversary Annual Meeting, October 27-30, 2013*. Denver, Colorado.

MIHEVC A., HORÁČEK I., *PRUNER P.*, ZUPAN HAJNA N., *ČERMÁK S.*, *WAGNER J.* & *BOSÁK P.*: Miocene – Pliocene age of cave Snežna jama na Raduhi, Southern Alps, Slovenia. *Lecture. 16th International Congress of Speleology, Brno, July 21–28, 2013.* Brno.

MIKULÁŠ R. & *HLADIL J.*: Ichnofabric of nodular limestones (Devonian, Czech Republic). *Lecture. XII. International Ichnofabric Workshop, June 30 – July 5, 2013*. Canakkale–Dardanelles.

MIKULÁŠ R.: Stopy po činnosti hmyzu v archeologickém kontextu starověkého Egypta. *Lecture*. *Paleontologický seminář, PřF UK Praha, March 20, 2013*. Praha.

MITCHELL C.E., MELCHIN M.J., HOLMDEN C., FINNEY S.C. & *ŠTORCH P.*: An alternative international correlation of the latest Ordovician (late Katian & Hirnantian) chemostratigraphy, biostratigraphy, sequence stratigraphy and temperature history. *Poster. 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*. Lund.

MLEJNEK O., NOVÁK J. & *LISÁ L.*: Výzkum životního prostředí v okolí paleolitického sídliště Želeč na základě antrakologických a mikromorfologických analýz. *Lecture. 9. konference environmentální archeologie 2013, January 28–30, 2013.* České Budějovice.

MUNDL A., NTAFLOS T., BJERG E.A., *ACKERMAN L.* & HAUZENBERGER C.A.: Lithospheric mantle heterogeneities beneath Southern Patagonia. *Poster*. *Goldschmidt 2013, August 25-30, 2013*. Florence.

NAEMURA K., HIRAJIMA T., WEI C.J. & *SVOJTKA M.*: Subduction history of some garnet lherzolites in the Moldanubian Zone of the Bohemian Massif. *Lecture. 10th International Eclogite Conference, September 2–10, 2013.* Courmayeur.

NAEMURA K., SHIMIZU I., HIRAJIMA T. & *SVOJTKA M.*: In-situ finding of micro-diamond in chromite from the spinel-garnet peridotite, Moldanubian Zone of the Bohemian Massif. *Poster. 10th International Eclogite Conference, September 2–10, 2013.* Courmayeur.

NAKAMURA D., SHIMOBAYASHI N., USUKI T., HIRAJIMA T. & *SVOJTKA M.*: Garnet zonings created under open-system environments and short-lived heating of Nové Dvory UHP-UHT eclogite. *Poster. 10th International Eclogite Conference, September 2–10, 2013.* Courmayeur.

NAVRÁTIL T., ROHOVEC J., MATOUŠKOVÁ Š., MYŠKA O., KRÁM P. & TESAŘ M.: Mercury in selected catchments within Czech Republic. *Poster. 11th International Conference on Mercury as a Global Pollutant, July 28 – August 2, 2013.* Edinburgh.

NAVRÁTIL T.: Biogeochemistry of mercury in the environement. *Lecture. Geochemical Seminar, Department of Mineralogy Geochemistry and Natural Resources, Faculty of Science, Charles University, March 5, 2013.* Prague.

NERUDOVÁ Z., NERUDA P., *LISÁ L.*, NÝVLTOVÁ-FIŠÁKOVÁ M. & PETR L.: Výsledky grantového projektu chronostratigrafické revize jeskyně Kůlny (Moravský kras). *Lecture*. *19th Quaternary Conference, November 29, 2013.* Brno.

NIKODEM A., KODESOVA R., JAKSIK O., JIRKU V., FER M., KLEMENT A. & *ZIGOVA A.* (2013): Soil hydraulic properties of topsoil along two elevation transects affected by soil erosion. *Poster. European Geosciences Union, General Assembly 2013, April 7-12, 2013*. Vienna.

ORVOŠOVÁ M., VLČEK L. & *ŽÁK K.* (2013): New localities of coarsely crystalline cryogenic cave carbonates in Slovakia. *Poster. 16th International Congress of Speleology, July 21–28, 2013.* Brno.

PALUSKA A., RAPPRICH V., *CAJZ V., ULRYCH J.*, PÉCSKAY Z., VESELÝ P. & RUTŠEK J.: Age and time mode of ultramafic and associated dyke rocks in northern Bohemia. *Poster*. *Basalt 2013 conference, Cenozoic magmatism of Central Europe, April 24-28, 2013.* Görlitz.

PETRUŽÁLEK M., LOKAJÍČEK T. & *SVITEK T.*: The anisotropy of ultrasonic waves velocity and attenuation uniaxially loading of migmatite samples. *Lecture. Geomechanics Symposium 2013, June 23-26, 2013.* San Francisco.

PETRUŽÁLEK M., LOKAJÍČEK T. & *SVITEK T.*: The influence of mutual orientation between foliation and loading direction on fracturing process of migmatite samples. *Poster. International conference "Deformation mechanisms, rheology & tectonics" 2013, September 16-18, 2013.* Leuven.

PETRUŽÁLEK M., LOKAJÍČEK T., HOKR M. & *SVITEK T.*: Using of ultrasonic wave velocity measurement to characterize pore space of granitoid rocks. *Lecture. OVA'13 – New Knowledge and Measurements in Seismology, Engineering Geophysics and Geotechnical Engineering, April 9–11, 2013.* Ostrava.

PETRUŽÁLEK M., LOKAJÍČEK T., HOKR M. & *SVITEK T.*: Using of ultrasonic wave velocity measurement to characterize pore space of granitoid rocks. *Lecture. Project workshop – Research of intergranular porosity influence on deep geological disposal into geological formations and methodology and measuring apparatus development, April 22-25, 2013.* Třešť.

PRUNER P., SCHNABL P., *ČÍŽKOVÁ K.*, *VENHODOVÁ D.* & *ŠLECHTA S.*: Palaeotectonic rotation and amalgamation of blocks, with special reference to the palaeomagnetic and magnetostratigraphic investigations. *Lecture. International konference Geological evolution of the Western Carpathians: new Ideas in the field of inter-regional correlations, October 16–19, 2013.* Smolenice.

PRUNER P.: Magnetostratigrafický výzkum jury a křídy. *Lecture. CTU Faculty of Electrical Engineering, Department of Measurement, April 4, 2013.* Praha**.**

PRUNER P.: MAVACS – přístroj pro kompenzaci zemského magnetického pole Země. *Lecture. CTU Faculty of Electrical Engineering, Department of Measurement, April 4, 2013.* Praha.

PŘIKRYL T., KRZEMIŃKI W. & KANIA I. (2013): "Non-adult" fish fauna of the Hermanowa locality (Oligocene; Outer Carpathian; Poland) – preliminary review. *Poster. 14th Czech-Slovak-Polish Paleontological Conference and 9th Micropalaeontological Workshop, November 14-15, 2013*. Kraków.

RACEK M., LEXA O., JEŘÁBEK P. & *SVOJTKA M.*: Metamorphic record of high temperature interaction between mantle rocks and felsic granulites. *Lecture. 11th Meeting of the Central European Tectonic Studies Group, May 24–27, 2013.* Várgesztes.

REKOVETS L.I., *ČERMÁK S.*, MAUL L.C. & KOVALCHUK A.N.: New localities with theriofauna from the Neogene and Pleistocene of Southern Ukraine. *Lecture*. *All-Russian conference with international participation" Systematics, phylogeny and Paleontology of small mammals" dedicated to the 100th anniversary of Professor Igor Mikhailovich Gromov (1913–2013), St. Petersburg, November 11–14, 2013.* St. Petersburg.

ROHOVEC J., NAVRÁTIL T., HOJDOVÁ M., CORNS W. & CHEN B.: Towards Sensitivity Improvement in MeHg

Quantification By Cold Vapour Atomic Fluorescence Spectrometry. *Poster. 11th International Conference on Mercury as a Global Pollutant, July 28 – August 2, 2013.* Edinburgh.

SCHNABL P., CAJZ V., TIETZ O., BUECHNER J., SUHR P., PÉCSKAY Z. & *ČÍŽKOVÁ K.*: Paleomagnetic results from Cenozoic volcanics of Lusatia, NW Bohemian Massif. *Poster. AGU Meeting of the Americas, May 14–17, 2013.* Cancun.

SCHNABL P., *PRUNER P., CAJZ V.*, *ČÍŽKOVÁ K.,* TASÁRYOVÁ Z. & *KLETETSCHKA G.*: Comparison of cenozoic and Silurian basalts in magnetomineralogic properties and implication for Silurian Paleogeography. *Poster. Basalt 2013, Cenozoic magmatism in central Europe, April 24–28, 2013.* Görlitz.

SCHNABL P., PRUNER P., CAJZ V., TASÁRYOVÁ Z., *ČÍŽKOVÁ K.*, *KLETETSCHKA G.*: Similarities between Silurian and Cenozoic basalts in rock-magnetic properties and its implication for Silurian paleogeography. *Poster. American Geophysical Union Meeting of the Americas, May 14–17, 2013.* Cancun.

SCHNABL P., PRUNER P., ČÍŽKOVA K., ŠLECHTA S. & WIMBLEDON W.: First results from magnetostratigraphic investigation on J/K boundary in Durlstone Bay. *Lecture. 9th Berriasian Working Group Meeting, May 27–29, 2013.* Perugia.

SCHNABL P.: Co se zkoumá v Paleomagnetické laboratoři Geologického ústavu AV ČR, v.v.i. *Lecture. CTU Faculty of Electrical Engineering, Department of Measurement, March 14, 2013.* Praha.

SCHNABL P.: Magnetostratigraphy of the J/K boundary sections part II: Duriston Bay (England), Les Combes (Vocontian Trough, France), beni Lkeb (Tunisia). *Lecture. 10th Meeting of the Berriasian Working Group, October 9–12, 2013.* Warsaw.

SCHNABL P.: Paleomagnetismus a magnetomineralogie vulkanických hornin Českého masivu. *Lecture. CTU Faculty of Electrical Engineering, Department of Measurement, April 4, 2013*. Praha.

ŠKRDLA P., NEJMAN L., RYCHTAŘÍKOVÁ T., NIKOLAJEV P. & *LISÁ L.*: Želešice-Hoynerhügel. Nové poznatky o szeletienu na Moravě: *Lecture*. *19th Quaternary Conference, November 29, 2013.* Brno.

SLAVÍK L., HLADIL J., KOPTÍKOVÁ L. & *ČEJCHAN P.*: Subdivision of the "Original Pragian" – new data from the type area. *Lecture. International Field Symposium The Devonian and Lower Carboniferous of northern Gondwana, March 22-29, 2013*. Erfoud.

SLAVÍK L., *ŠTORCH P.* & MANDA Š.: Ludlow Series in the Prague Synform – a progress in biostratigraphic correlation. *Lecture. 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*. Lund.

SLAVÍK L., VALENZUELA-RÍOS J.I., HUŠKOVÁ A., CALVO H., LIAO J-C. & *KOPTÍKOVÁ L.*: Hi-res correlation and dating of Mid-Palaeozoic sedimentary sequences of Peri-Gondwana using integrated biostratigraphy and chemo-physical methods – an insight to the Lochkovian. *Poster. 14th Czech-Slovak-Polish Paleontological Conference and 9th Micropalaeontological Workshop, November 14-15, 2013*. Kraków.

SLAVÍK L.: Late Silurian and Early Devonian Conodont Stratigraphy in the Prague Synform and correlation of bioevents. *Lecture. Conodonts from the Andes - 3rd International Conodont Symposium, July 15-19, 2013.* Mendoza.

SLAVÍK L.: Stále enigmatičtí konodonti? Paleobiologie a aplikace. *Lecture*. *Paleontologický seminář, Přírodovědecká fakulta UK, December 4, 2013*. Praha.

SOBIEN K., *SCHNABL P.*, SZTYRAK T., *ČÍŽKOVÁ K.* & *PRUNER P.*: Perspective sites of Jurassic – Cretaceous boundary sections in Europe. *Poster. 10th Meeting of the Berriasian Working Group, October 9–12, 2013.* Warsaw.

ŠPAČEK P., *ACKERMAN L.*, HABLER G., ABART R. & *ULRYCH J.*: Garnet breakdown in basanite-hosted peridodite xenoliths from southern Eger Rift (Zinst, Bavaria). *Lecture*. *Basalt 2013 conference, Cenozoic magmatism of Central Europe, April 24-28, 2013*. Görlitz.

ŠTORCH P., MANDA Š. & FRÝDA J.: Candidate sections for new international boundary stratotypes of the lower Silurian Aeronian and Homerian stages in the Prague Synform, Czech Republic. *Lecture. 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*. Lund.

STUDYNKA J., *CHADIMA M.,* HROUDA F. & SUZA P.: Separation of field-independent and field-dependent susceptibility tensors using a sequence of fully automated AMS measurements. *Poster. AGU Fall Meeting, December 9–13, 2013.* San Francisco.

SVITEK T., LOKAJÍČEK T. & *PETRUŽÁLEK M.*: Determination of elastic anisotropy from P- and S-waves based on ultrasonic sounding on spherical samples. *Lecture. Deformation mechanisms, rheology & tectonics 2013. September 16-18, 2013.* Leuven.

SVITEK T., LOKAJÍČEK T. & *PETRUŽÁLEK M.*: Elastic parameters determination from detailed P and S wave velocity measurements. *Lecture. OVA'13 – New Knowledge and Measurements in Seismology, Engineering Geophysics and Geotechnical Engineering, April 9–11, 2013*. Ostrava.

SVITEK T., LOKAJÍČEK T. & *PETRUŽÁLEK M.*: Spatial interpretation of seismic modules from P and S waves based on ultrasonic sounding on spherical samples. *Lecture. Project workshop – Research of intergranular porosity influence on deep geological disposal into geological formations and methodology and measuring apparatus development, April 22-25, 2013.* Třešť.

TASÁRYOVÁ Z., *SCHNABL P., ČÍŽKOVÁ K., PRUNER P., ŠTORCH P.,* MANDA Š., JANOUŠEK V., RAPPRICH V. & FRÝDA J.: Gorstian palaeoposition and geotectonic setting of Suchomasty volcanic centre (Prague Synform, Bohemia). *Lecture. 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*. Lund.

TASÁRYOVÁ Z., *SCHNABL P.,* JANOUŠEK V., *PRUNER P., ŠTORCH P.*, *KLETETSCHKA G., ČÍŽKOVÁ K., ŠLECHTA S.,* MANDA Š., ERBAN V. & FRÝDA J.: Palaeogeography of Prague Synform times (Wenlock-Luidlow): Insights from palaeomagnetism, basalt geochemistry and biostratigraphy. *Poster. Crustal evolution and geodynamic processes in Central Europe. Proceedings of the Joint conference of the Czech and German geological societes held in Plzeň (Pilsen). September 16–19, 2013*. Plzeň.

VALENTOVÁ D. & *LISÁ L.* (2013): Od makra k mikru aneb rozdílná informační hodnota metodických přístupů v archeologii. *Lecture. 2. Geologicko-Paleontologicko-Archeologická Diskusia 2013: Paleoekológia: spôsoby interakcie medzi človekom a ekosystémom v paleolite. April 25, 2013*. Nitra.

VALENZUELA-RÍOS J.I., *SLAVÍK L.*, CALVO H., HUŠKOVÁ A., LIAO J-C. & *KOPTÍKOVÁ L.*: Correlation of the middle Lochkovian (Lower Devonian) conodont successions in peri-Gondwana key localities. *Lecture. International Field Symposium The Devonian and Lower Carboniferous of northern Gondwana, March 22-29, 2013*. Erfoud.

VALENZUELA-RÍOS J.I., *SLAVÍK L.*, CALVO H., HUŠKOVÁ A., LIAO J-C. & *KOPTÍKOVÁ L.* What conodonts can tell about the Spanish-Czech connection during Lochkovian times? *Lecture. Conodonts from the Andes - 3rd International Conodont Symposium, July 15-19, 2013*. Mendoza.

VALENZUELA-RÍOS J.I., *SLAVÍK L.*, CALVO H., HUŠKOVÁ A., LIAO J-C. & *KOPTÍKOVÁ L.*: Conodontos del Lochkoviense (Devónico Inferior) en los Pirineos Centrales Españoles y su correlación con las secuencias de Bohemia (República Checa). *Lecture. XXIX Jornadas de la Sociedad Española de Paleontología y Simposio del Proyecto PICG 596, October 2-5, 2013*. Córdoba, Spain.

WANG J., *ŠTORCH P.*, WANG X., ZHANG J., MENG Y., FU L.P. & LI R.: Preliminary study of upper Llandovery and lower Wenlock graptolite fauna of Ziyang and Langao sections, Shaanxi Province, China. *Lecture. 3rd IGCP 591 Annual Meeting, Lund, Sweden, June 9-19, 2013*. Lund.

YASUMOTO A., HIRAJIMA T., NAKAMURA D. & *SVOJTKA M.*: Variation and significance of chemical zoning patterns of garnet in Nove Dvory eclogite, Moldanubian Zone of the Bohemian Massif. *Poster. 10th International Eclogite Conference, September 2 – 10, 2013.* Courmayeur.

ŽIGOVÁ A. & *ŠŤASTNÝ M.*: Vliv změny využívání půdy na vlastnosti pseudoglejů. *Poster. 16. Pedologické dny 2013 na téma „Časové změny půdních vlastností a jejich predikce, September 4-6, 2013*. Milovy.

ZUPAN HAJNA N., MIHEVC A., *PRUNER P.* & *BOSÁK P.*: Age of karst and caves in Slovenia. *Lecture. Proceedings and excursion guide of the conference State of geomorphological research in the year 2013, April 24–26, 2013.* Mikulov.

ZUPAN HAJNA N., MIHEVC A., *PRUNER P.* & *BOSÁK P.*: Jama pod Babjim zobom. *Lecture. 21th International Karstological School "Classical Karst", Hypogene Speleogenesis (between Theory and Reality), Excursion C, June 10–14, 2013*. Postojna.

5f. Popular science

Magazines, journals, newspapers, books

ADAMOVIČ J. (2013): Nesnesitelná lehkost žití pod převisem. – *Tomík*, 87: 18–19. Roztoky.

BRUTHANS J. & *FILIPPI M.* (2013): Tajemné solné hory a jeskyně v Íránu. – *Přírodovědci.cz*, 04: 10–13. Praha.

CÍLEK V. (2013): Genius loci ve vinicích. *In*: *Réva a krajina*: 27–34. Ekocentrum Trmanka. Velké Pavlovice.

CÍLEK V. (2013): Arktické jaro. – *Respekt*, 6: 63–65. Praha.

CÍLEK V. (2013): Cítime prichádzať zmenu. Rozhovor s Janem Markošem. – *Týždeň, March 1, 2013*: 25–26. Bratislava.

CÍLEK V. (2013): Dobrý život v těžké době. – *Respekt*, 11: 70–71. Praha.

CÍLEK V. (2013): *Krajiny domova*. – Albatros: 1–240. Praha.

CÍLEK V. (2013): Lom jako komunitní centrum. – *Veronika*, XXVII, 5–6: 28–29. Brno.

CÍLEK V. (2013): Návrat feudálů. – *Lidové noviny, Orientace, November 30, 2013*: V5. Praha.

CÍLEK V. (2013): Nové počasí. – *Respekt*, 31: 63–65. Praha.

CÍLEK V. (2013): Přijdou větší povodně, vypusťme jednu přehradu. Rozhovor s P. Honzejkem. – *Hospodářské noviny, June 7, 2013*: 14. Praha.

CÍLEK V. (2013): Přívalový déšť ve sprašové rokli v Zeměchách. – *Vesmír*, 92: 4. Praha.

CÍLEK V. (2013): Ropná horečka. – *Respekt*, 25: 62–63. Praha.

CÍLEK V. (2013): Technická kultura země. – *Vesmír*, 92, 2: 69. Praha.

CÍLEK V. (2013): To breath with Birds. – *The Hudson Review*, 65, 1: 97–112. New York.

CÍLEK V. (2013): V přírodě zjistíte, kdo jste a co chcete. Rozhovor s Klárou Mandausovou. – *Marianne*, 6: 69–73. Praha.

Cílek V. (2013): Vítejte v Extrémově. – *Lidové noviny, Orientace, June 8, 2013*: 1–2. Praha.

CÍLEK V. (2013): O kráse severočeské krajiny a její budoucnost. – *MF Dnes – Severní Čechy, May 5, 2013*: B3. Ústí nad Labem.

CÍLEK V. (2013): Využití dálkového snímkování České republiky při protipovodňové ochraně. – *Vesmír*, 92, 11: 606. Praha.

CÍLEK V. (2013): Zemětřesení a zvířata. – *Vesmír*, 92, 12: 688–690. Praha.

CÍLEK V. (2013): Zoologická zahrada, povodně a klimatické plánování města. – *Vesmír*, 92, 9: 490–496. Praha.

CÍLEK V. & SUKOVÁ L. (2013): Vodní hospodářství v zaniklé vesnici Wad-el-Hadždž v Súdánu. – *Vesmír*, 92, 7: 412–414. Praha.

HLAVÁČ J. (2013): Závornatka černavá – skvost mezi měkkýši Českého lesa. – *Český les – příroda a historie*, 12: 48–50. Přimda.

KLETETSCHKA G. (2013): Po stopách meteoritu u Jezera Čebarkul. – *Lidové noviny, March 20, 2013*: 20. Praha.

MIKULÁŠ R. (2013): Hlavně ať mi nikdo nerozumí. – *Lidové noviny, March 2, 2013*: 23. Praha.

MIKULÁŠ R. (2013): Život na dně výsypky. – *Lidové noviny, October 5, 2013*: 23. Praha.

MIKULÁŠ R. (2013): O kráse monokultur. – *Lidové noviny, April 27, 2013*: 23. Praha.

MIKULÁŠ R. (2013): Strategie lži. – *Lidové noviny, January 12, 2013:* 23. Praha.

PŘIBÍK J. & *MIKULÁŠ R.* (2013): Chuť bahna – Rozhovor. – *Orientační běh: časopis orientačních sportů*, 2013: 1. Praha.

PŘIKRYL T. (2013): Lalokoploutvé ryby. – *Živa*, 61, 6: 254–257. Praha.

ROČEK Z. (2013): *Kronika zoologického poznávání*. – Academia: 1–796. Praha.

Television, film and radio broadcasting

CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 25. 1. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 27. 3. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 10. 4. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 22. 5. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 25. 6. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 4. 9. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 2. 10. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 12. 11. 2013*. Praha.
CÍLEK V.: Jak to vidí. *Český Rozhlas Praha, 4. 12. 2013*. Praha.
CÍLEK V.: Klima a krajina. *Český Rozhlas Leonardo, 3. 12. 2013*. Praha.
CÍLEK V.: Klimatické katastrofy. *Česká televize, ČT 24, Mázory a komentáře, 24. 4. 2013*. Praha.
CÍLEK V.: Klimatické oscilace. *Český rozhlas Praha, 1. 2. 2013*. Praha.
CÍLEK V.: Klima a krajina. *Český Rozhlas Leonardo, 19. 6. 2013*. Praha.
CÍLEK V.: Posvátná krajina. *Český Rozhlas Leonardo, 30. 7. 2013*. Praha.
CÍLEK V.: Sváteční slovo. *Česká televize, ČT2, 6. 6. 2013*. Praha.
KADLEC J., JANÁČ M. & BŘEZINOVÁ K.: Řeky a povodně ve čtvrtohorách. *Český Rozhlas 2 and Leonardo – Meteor, 8. 6. 2013*. Praha.
KLETETSCHKA G. & JANÁČ M.: Lidstvo zřejmě nedávno přežilo pád obřího meteoritu. *Český Rozhlas 2 and Leonardo – Meteor, 1. 6. 2013*. Praha.
MIKULÁŠ R. & BURDA J.: Co všechno mohou prozradit zkamenělé stopy. *Český Rozhlas Leonardo, 21. 3. 2013*. Praha.
ROČEK Z.: Lovci záhad: Proč žáby skáčou. *Česká televize, ČT :D, 3. 10. 2013*. Praha.
SLAVÍK L.: Lovci záhad: Velké vymírání, díl. 1. *Česká televize, ČT :D, 5. 9. 2013*. Praha.
ŠTORCH P.: Lovci záhad: Velké vymírání, díl. 1. *Česká televize, ČT :D, 5. 9. 2013*. Praha.
ZAJÍC J.: Lovci záhad: Čelisti. *Česká televize, ČT :D, 24. 11. 2013*. Praha.

Other media and blogs

ADAMOVIČ J. (2013): Kokořínsko jsou hlavně pískovce. Průřez geologickým vývojem. – *PDF file on a webpage.* http://www.kokorin.info/kokorinsko/neco-navic/
MIKULÁŠ R. & BLATSKÁ D. (2013): RNDr. Radek Mikuláš, CSc. – paleoichnolog. – *interview as a part of "Best of..." project http://www.ibestof.cz/veda-a-vyzkum/rndr.-radek-mikulas-csc.-%E2%80%93-paleoichnolog.html*
DAŇKOVÁ J. & *KLETETSCHKA G.* (2013): Český vědec chce najít čeljabinský meteorit. Věří, že ukrývá jedinečné informace. – *Zpravy. ihned.cz, 29. 3. 2013.* http://zprávy.ihned.cz/cesko/c1-59597750-cesky-vedec-chce-najít-celjabinsky-
FILIPPI M. & BRUTHANS J. (2013): NAMAK – Czech-Iranian Geological Project (Research of the salt karst in Iran). – *web presentation. http://home.gli.cas.cz/namak/*
ŽÁK K. (2013, as a specialist-advisor): Historie zakletá v kupě netopýřího guana [History hidden in a heap of bat guano]. – *YOU Tube film by The Biology Centre CAS, v.v.i., České Budějovice. http://www.youtube.com/watch?v=c_wSgn2jtwQ*

Lectures for popular audience

ADAMOVIČ J. & PODROUŽEK K.: Vznik, současná krása a zánik pískovců. *Lecture. Science café, Café Nobel Ústí nad Labem, September 26, 2013*. Ústí nad Labem.
BREITER K.: 115 let místní dráhy Rakovník-Žlutice-Bečov nad Teplou. *Lecture. Muzejník spolek Žlutice, May 16, 2013*. Žlutice.
CHADIMOVÁ L. (KOPTÍKOVÁ): Co vše obnáší vědní obor jménem geologie, co nám vše může říci a jaký význam má pro každého z nás v současnosti? *Lecture. Otevřená věda III – popularizace přírodovědných a technických oborů a komunikace výzkumu a vývoje ve společnosti (CZ.1.07/2.3.00/35.0023) v rámci Operačního programu Vzdělávání pro konkurenceschopnost a státního rozpočtu České republiky. November 15, 2013*. Třešť.
CÍLEK V.: Adaptace a nepřizpůsobivost. *Lecture. Divadlo na zábradlí, January 20, 2013*. Praha.
CÍLEK V.: Beton a svět. *Lecture. Svaz betonářů, Amfora, November 21, 2013*. Praha.
CÍLEK V.: Cesta k Navahům. *Lecture. Mezioborový seminář Západočeské univerzity v Plzni, January 15, 2013*. Plzeň.
CÍLEK V.: Co se děje se světem? *Lecture. Dobrá trafika, Újezd, March 12, 2013*. Újezd.
CÍLEK V.: Co se děje se světem? *Lecture. Sokratov inštitút, November 6, 2013*. Bratislava.
CÍLEK V.: Co se děje se světem? *Lecture. Unie pro materiály, February 6, 2013*. Bratislava
CÍLEK V.: Den země. *Lecture. Správa NP Podyjí, April 22, 2013*. Děčín
CÍLEK V.: Exkurze Tetín v rámci konference o V. Hájkovi z Libočan. *Lecture. Ústav pro českou literaturu, November, 15, 2013.* Beroun-Tetín-Srbsko.
CÍLEK V.: Gas shales. *Lecture. Energetický klub, October 3, 2013.* Praha.
CÍLEK V.: Katastrofy. *Lecture. Knihovna AV ČR, November 1, 2013*. Praha.
CÍLEK V.: Klima a proměna světa. *Lecture. Knihovna Náchod, September 30, 2013*. Náchod.
CÍLEK V.: Klima a proměna světa. *Lecture. Univerzita ve Zvoleně, November 7, 2013*. Zvolen.
CÍLEK V.: Klimatická změna. *Lecture. Hvězdárna České Budějovice, January 22, 2013*. České Budějovice.
CÍLEK V.: Klimatická změna. *Lecture. Knihovna Litvínov, February 26, 2013*. Litvínov.
CÍLEK V.: Klimatická změna. *Lecture. Knihovna Slivenec, December 10, 2013*. Slivenec.
CÍLEK V.: Kolapsy civilizací. *Lecture. Sněmovna ČR, April 29, 2013*. Praha.
CÍLEK V.: Konference Česko v roce 2113. *Lecture. Knihovna Václava Havla, May 24, 2013*. Praha.
CÍLEK V.: Magická místa. *Lecture. Černá labuť, June 12, 2013*. Praha.
CÍLEK V.: Podnikatel a klimatická změna. *Lecture. SAMBA, April 25, 2013*. Brno
CÍLEK V.: Posvátná krajina a její ochrana. *Lecture. Magistrát Hradec Králové, December 16, 2013*. Hradec Králové.
CÍLEK V.: Povodně a energetika. *Lecture. Energetický klub, June 19, 2013*. Praha

CÍLEK V.: Příroda a poutnictví. *Lecture. Ackerman Gemeinde, January 27, 2013*. Praha.
CÍLEK V.: Příroda a vzdělávání. *Lecture. Zámeček Plzeň, October 25, 2013*. Plzeň.
CÍLEK V.: Protipovodňová ochrana. *Lecture. Městský úřad Srbsko, October 27, 2013*. Srbsko.
CÍLEK V.: Rekultivace. *Lecture. AV ČR, Vesmír a KAV, February 20, 2013*. Praha.
CÍLEK V.: Réva a krajina. *Lecture. Vinařský svaz Modré Hory, Velké Pavlovice, May 17, 2013*. Velké Pavlovice.
CÍLEK V.: Svět a jeho proměny. *Lecture. Klub pro seniory "Život 90", March 25, 2013*. Praha.
CÍLEK V.: Tvary skal. *Lecture. DIVUS, December 8, 2013*. Praha.
CÍLEK V.: Vyšehrad. *Lecture. Národní památkový ústav, pracoviště Vyšehrad, December 10, 2013*. Praha.
CÍLEK V.: Zobrazování přírody. *Lecture. Ústav makromolekulární chemie AV ČR, June 3, 2013*. Praha.
CÍLEK V. &BARTUŠKA V.: Energetické perspektivy. *Lecture. Ministry of foreign affairs of the Czech Republic, January 28, 2013*. Praha.
HLAVÁČ J.: Měkkýši Českého lesa. *Lecture. Muzeum Českého lesa v Tachově, October 24, 2013.* Tachov.
KADLEC J.: Dolnomoravský úval a jeho proměny v geologickém čase. *Lecture. Vzdělávací a informační středisko Bílé Karpaty, o.p.s., February 7, 2013.* Veselí nad Moravou.
MIKULÁŠ R.: Geologie Kunratického lesa očima dr. Vladimíra Havlíčka. *Lecture and excursion. Otvírání studánek, MÚMČ Praha-Kunratice, April 27, 2013*. Praha.
MIKULÁŠ R.: Hromadná vymírání v geologické historii Země. *Lecture. Hvězdárna Valašské Meziříčí, April 20. 2013*. Valašské Meziříčí.
MIKULÁŠ R.: Nerostné suroviny v ČR – co udělat pro jejich využití. *Moderation. AV ČR a Poslanecká sněmovna ČR, May 30, 2013*. Praha.
MIKULÁŠ R.: Nová divočina – Historické hodnoty krajiny. *Lecture. Fakulta architektury ČVUT, April 24, 2013*. Praha.
SCHNABL P. & RAPPRICH V.: Sopečná historie východní části Salvadoru. *Lecture. Prázdniny s geoinformatikou, August 15, 2013.* Albrechtice
SCHNABL P., STEHLÍK F.: Mapování dna řeky a laguny v Libérii. *Lecture. Prázdniny s geoinformatikou, August 15, 2013.* Albrechtice
SCHNABL P.: Použití stále osazených GPS přístrojů při určování pohybů horninových mas Západních Čechách. *Lecture. Prázdniny s geoinformatikou, August 16, 2013.* Albrechtice
SCHNABL P.: Sledování postupu těžby ve velkolomu Bílina. *Lecture. Prázdniny s geoinformatikou, August 16, 2013.* Albrechtice
SCHNABL P.: Pohyby horninových mas v Jeseníkách. *Lecture. Prázdniny s geoinformatikou, August 17, 2013.* Albrechtice
SCHNABL P. & STEHLÍK F. (2013): Historie povodní na řece Moravě. *Lecture. Prázdniny s geoinformatikou, August 15, 2013.* Albrechtice
SCHNABL P. & *KLETETSCHKA G.*: Čeljabinský / čebarkulský meteorit – únor 2013. *Lecture. Prázdniny s geoinformatikou, August 17, 2013.* Albrechtice
SCHNABL P.: Využití LEOWorksu v mikrosvětě. *Lecture. Prázdniny s geoinformatikou, August 17, 2013.* Albrechtice
SLAVÍK L.: Praha v Maroku, Lochkov v Austrálii – aneb O záznamu geologického času v mořských usazeninách. *Lecture. Celorepublikový projekt "Science Café", Občanské sdružení Otevíráme a Město Nové Strašecí, November 19, 2013.* Nové Strašecí.

Exhibitions

SVOBODOVÁ M. & *SIBLÍK M.* in MANDL et al.: Exhibition to 200th Birth Anniversary of Prof. Fridrich Simony. *Museum Hallstatt, September 2013*. Hallstatt.

5h. Unpublished reports 2013

BOSÁK P. (2013): *Postup těžebních stěn Velkolomu Čertovy schody–západ. Akce sanace a rekultivace severní stěny. Posudek. Období: leden až prosinec 2012*. – Inst. Geol. CAS, v. v. i. for Velkolom Čertovy schody, a. s.: 1–23 + 1–161. Praha.
BOSÁK P., PRUNER P. & BELLA P. (Eds., 2013): *Výzkum vybraných travertinů na Slovensku. Etapová zpráva č. 2 – Liptov*. – Inst. Geol. CAS, v. v. i. for Katolická univerzita v Ružomberoku: 1 – 28. Praha.
ČERMÁK S. (2013): *Odborně znalecký posudek na část sbírek p. Zdeňka Dvořáka nabízených k odprodeji Národnímu muzeu.* – Inst. of Geology of the Czech Academy of Sciences, v. v. i. for National Museum: 1–3. Praha.
CÍLEK V. (2013): *Lom svatá Anna, k. ú. Měšice – návrh úprav a managementu území*. – Inst. of Geology of the Czech Academy of Sciences, v. v. i. for NGO Svatá Anna: 1–5. Tábor.
CÍLEK V. (2013): *Naučná stezka Úsilné-Rudolfov. Návrh tabulí*. – Inst. of Geology of the CAS, v. v. i. for Místní úřad Úsilné u Českých Budějovic: 1–9 stran. Úsilné u Českých Budějovic.
CÍLEK V. (2013): *Sanace, rekultivace a revitalizace vrchu Tlustec. Poznámky a připomínky k navrženému plánu Sanace a rekultivace DP Luhov (GET 2013).* – Inst. of Geology of the Czech Academy of Sciences, v. v. i. for GET-Provoz Brniště: 1–10. Praha.
CÍLEK V. (2013): *Zoologická zahrada – klimatický výhled na příštích padesát let. Doporučení k ochraně a rozvoji.* – Inst. of Geology CAS, v. v. i. for Zoologická zahrada, Praha: 1–6. Praha.
CÍLEK V, ADAMOVIČ J., BREITER K., PROKOP BROKEŠOVÁ J., KUCHOVSKÝ T. & *MIKULÁŠ R.* (2013): *Předběžná hodnotící zpráva k Zadávací bezpečnostní zprávě pro nový jaderný zdroj v lokalitě Temelín*. – Inst. of Geology of the CAS, v. v. i. for Státní ústav pro jadernou bezpečnost: 1–26. Praha.
KADLEC J. & *ČÍŽKOVÁ K.* (2013): *Geologický průzkum PP Lom Skalka u Sepekova, Paleomagnetické studium sedimentů odkrytých v PP Lom Skalka.* – Inst. of Geology of the CAS, v. v. i. for Jihočeský kraj, České Budějovice: 1–12. Praha.
KADLEC J. & *ČÍŽKOVÁ K.* (2013): *Magnetická stavba sedimentů na vybraných archeologických lokalitách v Praze a okolí.* – Inst. of Geology of the CAS, v. v. i. for Česká společnost archeologická, o.p.s., Zruč n. Sázavou: 1–20. Praha.
LISÁ L. (2013): *Litomyšl – posouzení formačních procesů v kontextu prostory kláštera (dolní nádvoří)*. – Inst. of Geology of the CAS, v. v. i. for FF MU, Brno: 1–20. Praha.

LISÁ L. (2013): *Mikromorfologický posudek výplně slovanského objektu na lokalitě Chotěbuz*. – Inst. of Geology of the CAS, v. v. i. for ARU AV ČR v Brně, v. v. i.: 1–14. Praha.

LISÁ L. (2013): *Mikromorfologický posudek vzorku z velkomoravské rotundy na Pohansku*. – Inst. of Geology of the CAS, v. v. i. for FF MU, Brno: 1–14. Praha.

LISÁ L. (2013): *Mikromorfologický posudek vzorků z lokality Chrudim*. – Inst. of Geology of the Czech Academy of Sciences, v. v. i. for ARUP AV ČR, v. v. i.: 1–27. Praha.

LISÁ L. (2013): *Report on micromorphological analysis from Twin Barrow A from Pebblebeds Research of Prof. Tilley*. – Inst. of Geology of the Czech Academy of Sciences, v. v. i. for UCL, Department of Anthropology: 1–13. Praha.

LISÁ L., LISÝ P., BAJER A. & KUBÁLEK P. (2013): *Geoarcheologický posudek sedimentů jeskyně Kůlna, Moravský kras*. – Inst. of Geology of the CAS, v. v. i. for MZM, Brno: 1–41. Praha.

PETRUŽÁLEK M., LOKAJÍČEK T., SVITEK T., FILLER V., ERDINGEROVÁ J. & NEMEJOVSKÝ V. (2013): *Stanovení statického defromačního modulu, přednostní orientace mikrotrhlin a dynamických elastických moludů na vzorku tonalitu z lokality Mokrsko-západ, rozrážka SP-47*. – Inst. of Geology of the CAS, v. v. i. for Czech Geological Survey: 1–17. Praha.

SCHNABL P., PRUNER P., ČÍŽKOVÁ K. & PETRÁČEK J. (2013): *Měření paleomagnetických vlastností hornin libkovických vrstev: zpráva za rok 2013*. – Inst. of Geology of the CAS, v. v. i. for Severočeské doly, a. s., Bílina: 1–17. Praha.

SCHNABL P., ROHOVEC J. & ŠLECHTA S. (2013): *Měření úspor zemního plynu při úpravě magnetickým polem. Závěrečná zpráva.* – Inst. of Geology of the Czech Academy of Sciences, v. v. i. for TPCA Czech, s.r.o., Kolín: 1– 11. Praha.

SKÁLA R. (2013): *Verification of Asbestos Content in Rocks of Quarry at Želešice. Final Report*. – Inst. of Geology of the CAS, v. v. i. for RNDr. Bohuslav Svoboda, CSc.: 1–63. Praha.

SKÁLA R. (2013): *Verification of Asbestos Content in Rocks of Quarry at Zbraslav. Final Report*. – Inst. of Geology of the CAS, v. v. i. for RNDr. Bohuslav Svoboda, CSc.: 1–108. Praha.

6. Organization of conferences and scientific meetings

International Congress: **16th International Congress of Speleology, July 21–28, 2013, Brno**. Organized by the Czech Speleological Society and Speleo2013 on behalf of the International Union of Speleology (UIS). The Institute of Geology of the CAS, v. v. i. served as the Congress Partner. Organizing committee: *Pavel Bosák* (Congress President), Zdeněk Motyčka (Speleo2013; Chairman of the Organization Committee), *Michal Filippi* (Scientific Secretary) & 12 other committee members (Speleo2013).

The 16th International Congress of Speleology (ICS) was hosted by the Trade Fairs Brno – BVV (the Brno Exhibition Centre). The ICS was organized under the auspices of the Ministry of Environment of the Czech Republic, of the Governor of South Moravia – Mr. Michal Hašek and Mayor of Brno City – Mr. Roman Onderka. Fourteen domestic institutions were partners of the congress. Eleven domestic and foreign companies supported the congress as sponsors. The congress revenue totaled ca 11.2 mio CZK (income from participation fees, donations from partners, sponsorship, revenues from vendor stands and sales of congress materials). The expenses of the 16th International Congress of Speleology totaled ca 10.9 mio CZK (especially the rental of the congress facilities, organization of excursions, accommodation of participants, printing of congress materials and the acquisition of other congress materials). Surplus will be donated to the Czech Speleological Society.

The motto of the congress was "*where history meets future*" was inspired by a number of significant anniversaries which were commemorated during the year of the congress; especially the 40th anniversary of the 6th International Congress of Speleology held in Czechoslovakia (Olomouc 1973).

The congress was attended by 1,007 participants from 53 countries, and from all continents. The largest groups were from the United States (147), Czech Republic (114), Germany (75), United Kingdom (58), and Italy (51). Totally 35 exhibitions and vendor stands were located in the SpeleoVillage, where individual caving associations and clubs presented their activities, and offered wide range of speleological literature and materials.

The Scientific program started on Monday July 22 morning with three invited plenary lectures: Assoc. Prof. Dr. Martin Oliva (Moravian Museum): *The Moravian Karst in the anthropological perspective*, Prof. Dr. Derek C. Ford (McMaster University, Hamilton, Canada): *From Olomouc 1973 to Brno 2013: a review of progress in physical Speleology during the past 40 years*, and Prof. Dr. Annette Summers Engel (University of Tennessee, Knoxville, USA): *The caves that microbes built – the frontier of caves and karst science*. The ICS scientific program was divided into 11 main and 4 special sections. Peer-reviewed written contributions were thematically summarized in three volumes of the Congress Proceedings, with a total of 1,459 pages (extended abstracts of 240 lectures and 74 posters; Filippi & Bosák 2013a–c).

The variety of competitions were organized traditionally during the ICS, such as photographic exhibition (Photo Salon; 880 photos from 28 authors, in 5 categories), presentation of maps (Cartography Salon; 43 submissions in 6 categories) and art (Art Salon) related to caves and caving, the best film competition (SpeleMedia; 20 authors with 25 entries), and sport competition (SpeleoOlympics; 145 persons competed in 6 categories).

Two UIS General Assemblies were held (July 21 and July 28) with the presence of 37 national delegates, the complete UIS Bureau and many guests attended. General Assemblies approved some principal UIS documents and elected new UIS Bureau for 2013–2017. Totally 19 UIS Departments, Commissions and Working Groups organized their meeting(s) and eventually also elections of officers. Special Round Table discussion about the current state of knowledge and consequences of the White Nose Syndrome was also held during. It was organized in the cooperation with the Institute of Vertebrate Biology CAS, v. v. i. and ČESON (Czech Bat Conversation Trust). The FEALC (South American Speleological Association) and ISCA (International Show Caves Association) organized their meetings during the ICS. The traditional UIS Prizes were announced during the final ICS banquet in following categories: France HABE prize 2013; Exploration Awards; Scientific Posters Awards, and Special Books Awards.

The ICS offered a wide variety of excursions organized also by speleological associations and clubs from Slovakia, Hungary, Germany, Austria, Slovenia, Romania and Ukraine. Special excursion guides were printed for each excursion. Pre-Congress excursions were 10 with 160 participants (B1CZ, Show caves and UNESCO monuments in the Czech Republic, 23 persons; B2CZ, Caving in the Moravian Karst, 59; B3CZ, The most interesting karstological phenomena of Moravia, 5 persons; *B5CZ, Bohemian Karst, 13, organized by the GLI CAS, v. v. i.; Karel Žák*, Žák et al. (2013); B1A, Ice caves of Austria, 7; B1H, Budapest hydrothermal caves, 13; B2D, Caves and castles between Munich and Brno, 17; B1RO, Caves and karst in Apuseni Nature Park, 6; B1SL, Speleological excursion to the Dinaric Karst of Slovenia, 10; B2SL, Sport caving in the Caves of the Dinaric Karst of Slovenia, 6). Post-Congress excursions were 8 with 111 participants (A2CZ, Caving in the Moravian Karst, 29; A3CZ The most interesting karstological phenomena of Moravia, 9; A7CZ, Cave diving Camp, 8; A1SK, Show caves in Slovakia, 19; A2SK, Karst, caves and caving in Slovakia, 7; A3SK, Excavation in the caves of Slovakia, 7; A2H, Aggtelek Karst, 18; A1UA, Gypsum karst in Podolie, 15). Wednesday excursions were 2 with 576 participants (Excursion to the Punkevní Caves and Macocha Abyss, 398; Excursion tot the Sloupsko-Šošůvské Caves and Macocha Abyss, 178). Five one-day non-caving excursions ("ladies program") were participated by 255 persons (The most attractive tourist places in the Moravian Karst, 37; Lednice-Valtice Cultural Landscape – a UNESCO World Cultural and Natural Heritage Site, 44; The Pálava – a UNESCO biospheric reserve, 45; The Kroměříž Chateau and Gardens – a UNESCO World Cultural and Natural Heritage Site, 45; Hranice Karst – a unique hydrothermal karst with the deepest abyss in the Czech Republic, 84), and 7 nigh caving excursions by 85 persons (4 times Rudické propadání Cave, 33; 3 times Býčí skála Cave, 52). One specialized guide-book was edited by *J. Adamovič*.

ADAMOVIČ J., MIGOŃ P., GOŁĄB Z., KOPECKÝ J., JENKA O., MERTLÍK J., PEŠA V., HAVRÁNEK P., KUKLA J. & KOMAŠKO A. (2013): *16th International Congress of Speleology, July 21–28, Brno. Sandstone Caves and Rock Cities of Bohemia*. – Czech Speleological Society: 1–56. Praha.

FILIPPI M. & BOSÁK P. (Eds., 2013a): *Proceedings of the 16th International Congress of Speleology, July 21–28, Brno,* Vol. 1. – Czech Speleological Society: 1–453. Praha.

FILIPPI M. & BOSÁK P. (Eds., 2013b): *Proceedings of the 16th International Congress of Speleology, July 21–28, Brno*, Vol. 2. – Czech Speleological Society: 1–507. Praha.

FILIPPI M. & BOSÁK P. (Eds., 2013c): *Proceedings of the 16th International Congress of Speleology, July 21–28, Brno*, Vol. 3. – Czech Speleological Society: 1–499. Praha.

ŽÁK K., KOMAŠKO A., BLÁHA V. & FALTEISEK L. (2013): *16th International Congress of Speleology, July 21–28, Brno. Excursion Guide B5CZ: Bohemian Karst*. – Czech Speleological Society: 1–90. Praha.

Field Trip of International Conference: **16th International Congress of Speleology, Brno. Pre-congress field trip B5CZ Bohemian Karst, July 15–20, 2013.** Organized by Institute of Geology CAS, v. v. i.: *K. Žák & S. Šlechta*.

The field trip with duration of six days was organized for 13 participants from six different countries (Australia, France, Israel, Germany, Switzerland, USA). The scientific guides originated from Institute of Geology CAS, Faculty of Science of the Charles University in Prague and National Museum in Prague. The main theme of the field trip was karsologic evolution of the Bohemian Karst from the Cretaceous to the present. Each field trip day had its special topic. Explanation of basic principles of local geology and of the karst evolution present on Monday, July 15 evening, was followed by a field trip to Koněprusy area on Tuesday, July 16. The topic of this day was pre-Quaternary speleogenesis and importance of hydrothermal processes during the early karst evolution. Besides the visit to the Koněpruské jeskyně Cave, a surface hiking trip to the Kotýz area was also organized, with presentation of prehistoric fortified settlement and archaeological cave localities. Genetic and hydrogeological relationships between the Berounka River and the caves were the main topics of the following day. Caves important for Quaternary vertebrate paleontology were visited as well. Deep phreatic caves of the Čeřinka Quarry and history of limestone quarrying in the area of Amerika Quarries, including underground visit in the main adit of the Amerika-West part, were the main topics on Thursday, July 18. Hiking trip along paleokarst features of the upper level of Solvay's Quarries terminated by a descent to Svatý Jan pod Skalou completed the program of this day. The Nad Kačákem Cave and unfinished adits of German World War II underground production plant in the Alkazar Quarry were visited on Friday, July 19. The most enthusiastic cavers could visit the most difficult cave of the area in the Javorka Hill in the afternoon of this day, while the others explored the beauties of the medieval Karlštejn Castle. The morning of Saturday, July 20, was focused on recent karst hydrogeology and accumulations of the Holocene calcareous tufa (and caves in them). Besides the Svatý Jan pod Skalou tufa body and the St. Ivan's Cave developed in this tufa body, the tufa cascades in the Císařská Gorge near Srbsko village were also visited. The participants received a printed field trip guide, which was also distributed to the main geoscientific libraries of the Czech Republic:

ŽÁK K., KOMAŠKO A., BLÁHA V. & FALTEISEK L. (2013): *16th International Congress of Speleology, July 21–28, Brno. Excursion Guide B5CZ Bohemian Karst*. – Czech Speleological Society: 1–82. Praha.

International workshop: **Workshop of alluvial geoarchaeology. Pasohlávky, November 7–8, 2013**. Organised by Mendel University, Institute of Geology of the CAS, v. v. i. and Czech Geological Survey, Pasohlávky, Czech Republic. Organising Committee: Bajer A. & *Lisá L.*

Workshop of alluvial geoarchaeology is the first of this type organized in the Czech Republic. The program was divided into two parts: the problems of general Pleistocene questions of alluvial geoarchaeology were discussed during the morning and Holocene geoarchaeological questions were discussed during the afternoon session. The keynote speaker of the morning session, Prof. Jef Vandenberghe of Amsterdam University opened the workshop with the lecture concerned to river terraces; processes development, sedimentary characteristics, response to climatic forcing and preferred sites for human occupation. The afternoon session was opened by keynote speaker Tomasz Kalicki of Kilece University with his paper on Structure and evo-

lution of the floodplain of Central European River valleys. The workshop was attended by 60 persons from 3 countries. Ten speakers contributed with some of their present studies on fluvial and alluvial geoarchaeology. The second day, a fieldtrip was organized during which the Morava River floodplain and the Mikulčice archaeological site were presented.

7. Undergraduate and Graduate Education

7a. Undergraduate and Graduate Courses at Universities given by Staff Members of the Institute of Geology of the Czech Academy of Sciences, v. v. i.

ACKERMAN L.: *Geochemistry of endogenic processes* (MG431P02). Undergraduate (obligatory) Course, Faculty of Science, Charles University, Praha.

BREITER K., BURIÁNEK D., NOVÁK M.: *Magmatic and metamorphic processes* (G9801). Undergraduate and graduate course, Faculty of Science, Masaryk University, Brno.

CHADIMOVÁ L.: *Carbonate sedimentology* (MG421P16). Graduate (optional) and Undergraduate Course, Faculty of Science, Charles University in Prague, Praha.

CÍLEK V.: *City environment*. 5-day excursion in Prague, Vienna, Budapest and Bratislava, USAC Praha.

CÍLEK V.: *Landscape and history*. Undergraduate Course, Collegium Hieronymi Pragense, Praha.

CÍLEK V.: *Landscape, society and architecture*. Undergraduate and Graduate Seminary, School of Architecture of Academy of Fine Arts in Prague (AVU), Praha.

DRESLEROVÁ D., *LISÁ L.,* KOČÁR P., POKORNÝ P., RENÉ P. & ŠEFRNA L.: *Environmental archaeology (lecture on Quaternary geology and geoarchaeology)* (KAR_ENV). Undergraduate (optional) Course, Faculty of Philosophy, University of West Bohemia, Pilsen.

HOJDOVÁ M.: *Fundamentals of geology* (APA35E). Undergraduate Couse, Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences, Praha.

KADLEC J.: *Causes and consequences of Quaternary climatic features* (MG421P15). Graduate and Postgraduate Course, Faculty of Science, Charles University, Praha.

KADLEC J.: *Geology of Quaternary period* (MG421P18G). Undergraduate Course, Faculty of Science, Charles University, Praha.

KLETETSCHKA G.: *Physics of the Earth* (MG452P04G). Graduate and Postgraduate Course, Faculty of Science, Charles University, Praha.

KLETETSCHKA G.: *Satellite magnetometry* (MG452P82) Undergraduate, Graduate and Postgraduate Course, Faculty of Science, Charles University, Praha.

KOHOUT T.: *Laboratory Exercises in Solid Earth Geophysics* (535020). Undergraduate and Graduate Course, Faculty of Science, University of Helsinki, Helsinki.

KOHOUT T.: *Planetary geophysics* (535021). Undergraduate and Graduate Course, Faculty of Science, University of Helsinki, Helsinki.

KOHOUT T.: Semiar on *Geophysics* (50304). Undergraduate and Graduate Course, Faculty of Science, University of Helsinki, Helsinki.

LISÁ L.: *Geoarchaeology* (AEB_133). Graduate (optional) Course, Faculty of Philosophy, Masaryk University, Brno.

LISÁ L.: *Geoarchaeology* (KAR_GEOA). Graduate (optional) Course, Faculty of Philosophy, University of West Bohemia, Pilsen.

LISÁ L.: *Geoarchaeology* (NGEARCH). Graduate (optional) Course, Faculty of Philosophy, University of Hradec Králové, Hradec Králové.

MATULA S. & *HOJDOVÁ M.*: *Fundamentals of geology and hydrogeology* (AIA17E). Undergraduate Couse, Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences, Praha.

MIKULÁŠ R. in FATKA O. et al.: *Systematic paleontology* (MG 422P012). Undergraduate (optional) Course, Faculty of Science, Charles University, Praha.

MIKULÁŠ R. in HOLCOVÁ K. et al.: *Principles of paleobiology I* (MG422P02). Undergraduate (optional) Course, Faculty of Science, Charles University, Praha.

MIKULÁŠ R.: *Trace fossils and ichnofabric of sedimentary rocks* (MG421P40). Undergraduate and Postgraduate (optional) Course, Faculty of Science, Charles University, Praha.

NAVRÁTIL T. & *HOJDOVÁ M.*: *Heavy metals in the environment* (MG431P92). Undergraduate (optional) Course, Faculty of Science, Charles University, Praha.

PŘIKRYL T. in HOLCOVÁ K. et al.: *Principles of paleobiology I* (MG422P02). Undergraduate (optional) Course, Faculty of Science, Charles University, Praha.

PŘIKRYL T. in KOŠŤÁK M. et al.: *Paleoecology* (MG422P51). Undergraduate (optional) Course, Faculty of Science, Charles University, Praha.

PŘIKRYL T.: *Comparative anatomy of vertebrates* (MB170P47). Undergraduate (optional) Course and Practical Study, Faculty of Science, Charles University, Praha.

PRUNER P.: *Paleomagnetism in plate tectonics* (MG440P61). Undergraduate and Graduate Course, Faculty of Science, Charles University, Praha.

ROČEK Z.: *Developmental morphology of animals* (Bi3130 modulu CZ.1.07/2.2.00/15.0204). Undergraduate (optional) Course, Faculty of Science, Masaryk University, Brno.

ROČEK Z.: Zoology of extinct vertebrates (KZO 375). Undergraduate (optional) Course, Faculty of Science, University of South Bohemia, České Budějovice.

SKÁLA R.: *Advanced methods in processing of diffraction data* (MG431P70). Undergraduate and Graduate (optional) course, Faculty of Science, Charles University, Praha.

SKÁLA R.: *Chemical crystallography* (MG431P64). Undergraduate and Graduate (optional) course, Faculty of Science, Charles University, Praha.

SKÁLA R.: *Introduction to systematic mineralogy* (MG431P48). Undergraduate course, Faculty of Science, Charles University, Praha.

SKÁLA R.: *Meteorites, their origin and composition* (MG431P40). Undergraduate and Graduate (optional) course, Faculty of Science, Charles University, Praha.

SKÁLA R.: *Principles of mineralogy* (MG431P52/ MG431P52U). Undergraduate course, Faculty of Science, Charles University, Praha.

ULRYCH J.: Systematic mineralogy (D 108003). Graduate (optional) Course, Faculty of Chemical Technology, University of Chemical Technology, Praha.

7b. Supervision in Undergraduate Studies

Open Science

JANEBOVÁ R. Střední odborná škola veterinární, Hradec Králové, Czech Republic (*supervisor R. Mikuláš / P. Štorch, since 2013*)

TAISLOVA I. Gymnázium Karla Čapka, Dobříš, Czech Republic (*supervisor P. Schnabl, since 2013*)

BC. Theses

BARTÁŠKOVÁ L., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

FIKAR L., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2012*)

HAISLOVÁ R., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

HLADÍKOVÁ E., Czech University of Life Sciences, Praha (*supervisor P. Schnabl, since 2013*)

HUŠKOVÁ A., Faculty of Science, Charles University, Praha (*supervisor L. Slavík, since 2013*)

MAZANEC M., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

MÉSZÁROSOVÁ N., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2012*)

MOLNÁR G., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2011*)

NÁBĚLEK L., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

TAKÁČ M., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

MSc. Theses

CHMELOVÁ K., Faculty of Science, Charles University, Praha (*supervisor T. Přikryl, since 2013*)

GREŇOVÁ I., Faculty of Environmental Sciences, Czech University of Life Sciences, Praha (*supervisor J. Borovička, since 2012*)

HALUZOVÁ E., Faculty of Science, Charles University, Praha (*supervisor L. Ackerman, since 2012*)

HRUBÁ J., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

JANKO J., Faculty of Science, Charles University, Praha (*supervisor T. Navrátil, co-supervisor/advisor J. Rohovec since 2013*)

KUČEROVÁ CHARVÁTOVÁ K., Faculty of Science, Masaryk University, Brno (*supervisor J. Hladil, defended in 2013*)

MÁLKOVÁ M., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)

MARKOVÁ A., Faculty of Science, Charles University, Praha (*supervisor I. Horáček, co-supervisor/advisor J. Wagner, since 2011*)

MÉSZÁROSOVÁ N., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2013*)

NEPOMUCKÁ Z., Faculty of Science, Charles University, Praha (*supervisor T. Navrátil, co-supervisor/advisor J. Rohovec since 2013*)

OBERSTEINOVÁ T., Faculty of Science, Charles University, Praha (*advisor J. Kadlec, since 2011*)

ŠNELLEROVÁ Z., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2012*)

VALA V., Faculty of Science, Charles University, Praha (*supervisor T. Přikryl, since 2013*)

7c. Supervision in Graduate Studies

Ph.D. Theses

BUCHTOVÁ J., Faculty of Science, Charles University, Praha (*supervisor T. Navrátil, since 2011*)

DRÁBKOVÁ J., Faculty of Science, Charles University, Praha (*co-supervisor/advisor J. Bek, since 2005*)

DZIKOVÁ L., Faculty of Science, Masaryk University, Brno (*supervisor R. Skála, since 2007*)

HERICHOVÁ I., Faculty of Arts, Charles University, Praha (*supervisor V. Cílek, since 2010*)

HOŠEK J., Faculty of Science, Charles University, Praha (*supervisor L. Lisá, since 2010*)

KALLISTOVÁ A., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2010*)

KOŘÍNKOVÁ D., Faculty of Science, Charles University, Praha (*supervisor M. Svojtka, since 2011*)

KUBROVÁ J., Faculty of Science, Charles University, Praha (*supervisor J. Borovička, since 2011*)

KULAVIAK L., Faculty of Chemical Engineering, Institute of Chemical Technology, Praha (*supervisor M. Růžička, co-supervisor/advisor J. Hladil, defended in 2013*)

PETRUŽÁLEK M., Faculty of Science, Charles University, Praha (*co-supervisor T. Lokajíček, since 2006*)

SIDORINOVÁ T., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2009*)

SOUMAR J., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2011*)

STEHLÍK F., Faculty of Science, Charles University, Praha (*advisor J. Kadlec, since 2008*)

SVITEK T., Faculty of Science, Charles University, Praha (*supervisor T. Lokajíček, since 2008*)

URBÁNKOVÁ A., Faculty of Science, Charles University, Praha (*co-supervisor L. Slavík, since 2013*)

VAŠKANINOVÁ V., Faculty of Science, Charles University, Praha (*co-supervisor J. Zajíc, since 2010*)

VEJROSTOVÁ L., Faculty of Science, Charles University, Praha (*supervisor L. Lisá, since 2013*)

7d. Membership in scientific and academic boards

ACKERMAN L.

Member, Committee for Finals of Doctoral Students in Geology, Faculty of Science, Charles University, Praha

BOROVIČKA J.

Member, Presidium, Scientific Secretary, Czech Mycological Society, Praha

Member, Committee for Finals of Doctoral Students in Botany, Faculty of Science, Charles University, Praha

BOSÁK P.

Member of the Executive Board of Institute of Geology of the Czech Academy of Sciences, v. v. i., Praha

Member, Academic Assembly of the Czech Academy of Sciences, Praha

Member, the International Advisory Board, Research Potential Programme of the EU FP7-REGPOT-2011-1 Action towards laboratories enhancement and know-how exchange for advanced research on geosystem – ATLAB (Institute of Geological Sciences PAS, Warszawa, Poland; October 2011–March 2015)

Member, Interdepartamental Evaluation Committee for Evaluation of Proposals and Results of Research Plans from the Field of Physics, Mathematics and Earth Sciences, Ministry of Education, Youths and Sports of the Czech Republic, Praha

Chairman, Committee for degree of Doctor of Sciences (DSc.) in geological sciences at Czech Academy of Sciences, Praha

Member, Academic Assembly of the Czech Academy of Sciences, Praha

Member, Board of Graduate Studies in Geology (4 years), Faculty of Science, Charles University, Praha

Member, Committee for Interdisciplinary study of Quaternary at the Board of Graduate Studies in Geology, Faculty of Science, Masaryk University, Brno

Supervisor for Ph.D. studies, Faculty of Science, Masaryk University, Brno

Member, Committee for State Doctoral Examinations for Interdisciplinary study of Quaternary at the Board of Graduate Studies in Geology, Faculty of Science, Masaryk University, Brno

Member, Committee for State Doctoral Examinations, Ph.D. Study Program of Applied Geology, Faculty of Science, Charles University, Praha

Member, Committee for Defenses of Dissertations, Ph.D. Study Program of Applied Geology, Faculty of Science, Charles University, Praha

Member, Committee for Defenses of Dissertations, Ph.D. Study Program of Physical Geography and Geoecology, Faculty of Science, Charles University, Praha

Member, Committee for State Doctoral Examinations, Ph.D. Study Program of Physical Geography and Geoecology, Faculty of Science, Charles University, Praha

Member, Committee for State Rigorosum Examinations in Geology (general geology), Faculty of Science, Charles University, Praha

FILIPPI M.

Vice-Chairman, Executive Board of the Institute of Geology of the Czech Academy of Sciences, v. v. i.

HLADIL J.

Member, Committee for Degree of Doctor of Sciences (DSc.) in Geological Sciences at Czech Academy of Sciences, Praha.

Member, Executive Board of the Institute of Geology CAS, v. v. i.

Member, Board of Graduate Studies in Geology, Faculty of Science, Charles University, Praha.

Member, Board of Graduate Studies in Geology, Faculty of Science, Masaryk University, Brno.

Member, Czech Commission on Stratigraphy, Praha

KADLEC J.

Member, Czech Commission on Stratigraphy

Member, International Geosphere-Biosphere Programme – National Committee

Member, Board of the Doctoral Studies in Applied Geology, Faculty of Science, Charles University, Praha

Member, Committee for Finals of Doctoral Students in Applied Geology, Faculty of Science, Charles University, Praha

Member, Committee for Finals of Graduate Students in Geology, Faculty of Science, Charles University, Praha

Member, RNDr. Doctoral Examination Committee in Geology, Faculty of Science, Charles University, Praha

KLETETSCHKA G.

Member, Board "Rada pro kosmické aktivity AV ČR" (Council for Space Activities CAS), Praha

LOKAJÍČEK T.

Member, Board of Graduate Studies in Applied Geology, Faculty of Science, Charles University, Praha

MIKULÁŠ R.

Vice-Chairman, Advisory Board of the Institute of Geology of the Czech Academy of Sciences, v. v. i.

Alternating Member of the Doctoral Examination Committee in Geology, Faculty of Science, Charles University, Praha

Secretary, Czech National Geologic Committee, Praha

Member, Editorial Board of the Czech Academy of Sciences, Praha

Member, Academy of Sciences – Chamber of Deputies, Parliament of the Czech Republic Co-operation Committee, Praha

Chair, IGCP-UNESCO National Committee, Praha

NAVRÁTIL T.

Member of the Committee for Finals of Doctoral Students in Applied Geology, Faculty of Science, Charles University, Praha

Member of the Committee for Doctoral Thesis Defense in Applied Geology, Faculty of Science, Charles University, Praha

External Member, State Magisterium and Rigorosa Examinations in Geology, Faculty of Scienc, Charles University, Praha

PRUNER P.

Member of the Permanent Working Group of Geosciences Accreditation Commission, Czech Republic

Member of the Executive Board of the Institute of Geology of the Czech Academy of Sciences, v. v. i.

Member of the Board of the Graduate Studies in Geophysics, Faculty of Science, Charles University, Praha
Member of the Commitee for degree of Doctor of Sciences (DSc.) in geological sciences at Czech Academy of Sciences, Praha

ROČEK Z.
Member, Committee for degree of Doctor of Sciences (DSc.) in zoological sciences at Czech Academy of Sciences, Praha

SKÁLA R.
Chairman, Committee for Finals of Undergraduate Students in Geology, specialization Mineralogy and Crystallography, Faculty of Science, Charles University, Praha
Member, Committee for Finals of Undergraduate Students in Geology, specialization Geochemistry, Faculty of Science, Charles University, Praha

SLAVÍK L.
Alternating Member of the Doctoral Examination Committee in Geology, Faculty of Science, Charles University, Praha
Member, Academic Assembly of the Czech Academy of Sciences, Praha
Member, Executive Board of the Institute of Geology CAS, v. v. i.

ŠTORCH P.
Chairman, Executive Board of the Institute of Geology CAS, v. v. i.
Alternating Member, Committee for Degree of Doctor of Sciences in Geological Sciences, Czech Academy of Sciences, Praha
Vice-chair / Secretary, Czech Commission on Stratigraphy, Praha
Member, Earth Science Panel (geophysics, geochemistry, geology, mineralogy and hydrogeology) of Czech Science Foundation, Praha (till March 2013)

SVOJTKA M.
Member, Committee for Finals of Undergraduate and Doctoral Students in Geology, Faculty of Science, Charles University, Praha
Member, Committee for Finals of Doctoral Thesis Defense in Geology, Faculty of Science, Charles University, Praha

ULRYCH J.
Member, Commitee for degree of Doctor of Sciences (DrSc.) in geological sciences at Slovak Academy of Science, Bratislava
Member, Commitee for degree of Doctor of Sciences (DSc.) in geological sciences at the Czech Academy of Sciences, Praha
Member, Board of Graduate Studies in Geology, Faculty of Science, Charles University, Praha
Member, Committee for Finals of Undergraduate Students in Geochemistry, Faculty of Science, Charles University, Faculty of Science, Praha
Member, Committee for Finals of Undergraduate Students in Mineralogy, Faculty of Science, Charles University, Faculty of Science, Praha
Member, Examination Committee for Degree of Doctor of Natural Sciences (RNDr.) in Gechemistry and Mineralogy, Charles University, Faculty of Science, Praha

ZAJÍC J.
Alternating Member, Committee for the Ph.D. Examination and Defence of Theses in Geology, Faculty of Science, Charles University, Praha
Alternating Member, Committee for the Master's and RNDr. Doctoral Examination in Paleontology, Faculty of Science, Charles University, Praha

ŽIGOVÁ A.
Member of the Committee of Soil Science and Soil Conservation of Scientific Council of Research Institute for Soil and Water Conservation, v.v.i., Praha.
Member of the Committee of the Czech Society of Soil Science, Praha.
Member of the Board of the Doctoral Examination Committee in Physical Geography and Geoecology, Faculty of Science, Charles University, Praha.
Member, Board of the Committee of Soil Science of the Czech Academy of Agricultural Science, Praha

ŽÍTT J.
Alternating Member of the Doctoral Examination Committee in Geology, Faculty of Science, Charles University, Praha

7e. Membership in Foreign Academies

BOSÁK P.: Foreign Member, Polish Academy of Arts and Sciences (election approved by the Polish President in 2007)

BOSÁK P.: Corresponding Member, Slovenian Academy of Sciences and Arts (elected 2005)

7f. Degrees obtained by the staff of the Institute of Geology CAS

Ph.D.

ĎURIŠOVÁ J. (2013): *Metal separation using a combination of electrochemical and ion-exchange methods*. – Ph.D. Thesis, Department of Power Engineering, Institute of Chemical Technology: 1–114. Praha (defended on April 26, 2013).

Doc. (Assoc. Prof.)

NAVRÁTIL T. (2013): *The dynamics of mercury in the environment*. – Habilitation Thesis, Department of Mineralogy Geochemistry and Natural Resources, Faculty of Science, Charles University: 1–20. Praha (defended on February 14, 2013).

DSc.

MIKULÁŠ R. (2013): *Fossil behaviour related to specific substrates: a review of the Phanerozoic fossil record*. DSc. Thesis, Czech Academy of Sciences: 1–227. Praha (defended on May 22, 2013)

7g. Awards

ACKERMAN L.: Otto Wichterle Award, Czech Academy of Sciences, Praha, award for the best young scientists (2012–2014)

BOROVIČKA J.: Otto Wichterle Award, Czech Academy of Sciences, Praha; award for young scientist with outstanding results (2011–2013)

BOSÁK P.: Medal of Academician Bohuslav Cambel for the support and development of the Geological Institute of the Slovak Academy of Sciences (awarded by the Scientific Board, October 16, 2013); the first foreign recipient

CÍLEK V.: Čestné uznání za přínos inteligenci národa, propagaci duševní kultury a šíření dobrého jména České republiky ve světě, MENSA, Hradec Králové.

CÍLEK V.: Média na pomoc památkám. Mimořádné uznání za celoživotní přínos, Syndikát novinářů ČR, Praha *Institute of Geology CAS, v. v. i.*: Memorial medal at 60th Anniversary of establishment of the Geological Institute, Slovak Academy of Sciences (awarded by the Director, GLI SAS, October 13, 2013)

7h. Institute staff on Fellowships and Stages

KLETETSKA G.: Lawrence Berkeley National Laboratory, Nuclear Science [NSIP28], Affiliate of Dr. Basunia and Dr. R. Firestone, Guest researcher

KLETETSKA G.: Aug 2011-Nov 2013: NIST, Gaithersburg, MD, Magnetic group led by Bob Shull, Guest researcher

8. Positions in Editorial Boards and International Organizations

8a. Editorial Boards

ADAMOVIČ J.

Příroda, Member of Editorial Board, Agency for Nature Conservation and Landscape Protection CR, Praha (since 2007).

BOROVIČKA J.

Mykologický sborník, Editor-In-Chief, Czech Mycological Society, Praha (since 2007).

BOSÁK P.

Acta Carsologica, Member of Executive Board (since 2007), International journal, published by Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia; (Member of Advisory Committee 2004–2007).

Aragonit; Member of Editorial Board, published by the Administration of Slovak Caves, Liptovský Mikuláš, Slovakia (since 2008).

Geologica Carpathica, (Co-editor 2001–2005 and since 2012; Member of the Executive Committee 2005–2012), Official journal of the Carpathian-Balkan Geological Association, Bratislava, Slovak Republic.

Geologos, Member of Editorial Board, Scientific journal published by Faculty of Geology, Adam Mickiewicz University, Poznań, Poland (since 2000).

International Journal of Speleology, Member of Advisory Board, Official international journal of the Union Internationale de Spéléologie and Societá Speleologica Italiana, Bologna, Italy (since 1994).

Theoretical and Applied Karstology, Member of editorial board, Scientific journal published by Speleological Institute "Emil Rakovița", Bucuresti – Cluj, Romania (since 2000).

Český kras, Co-editor (since 1998), Regional journal published by the Museum of the Czech Karst in Beroun, Czech Republic (Member of Editorial Board since 1976).

Research Reports of the Institute of Geology, Co-editor, Czech Academy of Sciences (since 2007).

Speleo (Praha), Member of Editorial Board, Society bulletin published by the Czech Speleological Society, Praha, Czech Republic (since 1990).

Speleofórum; Co-editor, published by the Czech Speleological Society, Praha, Czech Republic (since 2000).

CÍLEK V.

Slovenský kras, Member of Editorial Board, Slovak Museum of Speleology, Liptovský Mikuláš, Slovak Republic (since 2004).

Vesmír, Member of Editorial Board, Vesmír Ltd, Praha (since 1998).

HLADIL J.

Geological Quarterly, Member of Editorial Team – Consulting Editor, Polish Geological Institute – National Research Institute, Warsaw, Poland (since 2004).

Geologica Carpathica, Member of Editorial Board – Executive Committee, Geological Institute of the Slovak Academy of Sciences, Bratislava, Slovakia (since 2001).

Bulletin of Geosciences, Member of Editorial Board – Co-editor, Czech Geological Survey, Praha (since 2006).

HLAVÁČ J.

Malacologica Bohemoslovaca, Member of Editorial Board, Institute of Zoology, Slovak Academy of Sciences, Bratislava, Slovak Republic (since 2006).

KADLEC J.

Geolines, Member of Editorial Board, Institute of Geology of the Czech Academy of Sciences, v. v. i., Praha (since 1999)

LISÁ L.

Geologica Carpatica, Member of Editorial Board, Geological Institute of the Slovak Academy of Sciences, Bratislava, Slovakia (since 2013).

Journal Interdisciplinaria archaeologica – Natural Sciences in Archaeology, Member of Editorial Board, Archaeological Centre Olomouc, Government Funded Organisation (since 2010).

MIKULÁŠ R.

Geolines, Member of Editorial Board, Institute of Geology CAS, v. v. i., Praha (since 1998).

Acta Musei Nationalis Pragae, Series B, Historia Naturalis, Member of Editorial Board, National Museum, Praha (since 2008).

NAVRÁTIL T.
Journal of Geology & Geosciences, Member of Editorial Board, OMICS Publishing Group, Los Angeles (since 2013).

PRUNER P.
Geolines, Member of Editorial Board, Institute of Geology of the Czech Academy of Sciences, v. v. i., Praha (since 1997).
Research Journal of Earth Sciences, Member of Editorial Board, IDOSI Publications, Dubai, UAE (since 2009).
Journal of Hydrocarbons Mines and Environmental Research, Member of Editorial Advisory Board, Rennes, France (since 2010).

PŘIKRYL T.
Research Reports of the Institute of Geology, Editor, Czech Academy of Sciences (since 2009).

ROČEK Z.
Palaeodiversity & Palaeoenvironments, Member of Editorial Board, Senckenberg Gesellschaft für Naturforschung, Frankfurt a. M. (since 2010).

SKÁLA R.
Journal of Geosciences, Member of the Editorial Board, Czech Geological Society, Praha (since 2006).

SLAVÍK L.
Bulletin of Geosciences, Member of Editorial Board, Czech Geological Survey, Praha (since 2013).

SVOJTKA M.
Geolines, Editor-in-chief, Institute of Geology of the Czech Academy of Sciences, v. v. i., Praha (since 1996).

ŠŤASTNÝ M.
Acta geodynamica et geomateralia, Member of Editorial Board, Institute of Rock Structure and Mechanics of the CAS, v. v. i., Praha (since 1998)
Informátor, Editor, Česká společnost pro výzkum a využití jílů, Praha (since 1995)

ŠTORCH P.
Bulletin of Geosciences, Co-editor, Czech Geological Survey, Praha (since 2011)
Geolines, Member of Editorial Board, Institute of Geology CAS, v. v. i., Praha (since 1995)
*Paleontological Contribution*s, Member of Editorial Board, Electronic Journal, University of Kansas, Lawrence (since 2008)
Northwestern Geology, Member of Editorial Board, Xi'an Centre of Geological Survey, China Geological Survey, Xian (since 2012)

WAGNER J.
Bulletin of Geosciences, Member of Editorial Board, Czech Geological Survey, Praha (since 2011)

ZAJÍC J.
Bulletin of Geosciences, Member of Editorial Board, Czech Geological Survey, Praha (since 2001)

ŽÁK K.
Bulletin of Geosciences, Co-editor, Czech Geological Survey, Praha (since 2006, until July 2013)
Český kras, Member of the Editorial Board (since 2007), Co-editor (since 2008), regional journal published by the Museum of the Czech Karst, Beroun.

8b. Positions in International Organizations

BOSÁK P.
Honorary Member, the UIS Bureau, the International Union of Speleology (UIS; elected in 2009)
Member, Advisory Committee, the International Union of Speleology (UIS; elected in 2009)

CHADIMOVÁ L.
Secretary, International Geoscience Programme of the UNESCO and IUGS – Czech National Committee for IGCP (since 2013).
Committee Member and Secretary, International Geoscience Programme of the UNESCO and IUGS – Czech National Committee for IGCP (since 2010).
Corresponding Member, Subcommission on Devonian Stratigraphy of the ICS and IUGS (since 2012).

HLADIL J.
Committee Member and Web Site Administrator, International Geoscience Programme of the UNESCO and IUGS – Czech National Committee for IGCP (since 1994).
Corresponding Member, Subcommission on Devonian Stratigraphy of the ICS and IUGS (renewed, since 2013).

KADLEC J.
Co-ordinator for the Czech Republic, IGBP - PAGES Project (since 1998).

SLAVÍK L.
Corresponding Member, Subcommission on Silurian Stratigraphy of the IUGS (since 2011).
Secretary and Titular Member, Subcommission on Devonian Stratigraphy of the IUGS (since 2012).

ŠTORCH P.
Titular Member, Subcommission on Silurian Stratigraphy of the IUGS (since 2004).

ZAJÍC J.
Committee Member, International Geoscience Programme of the UNESCO and IUGS – Czech National Committee for IGCP (since 2003).

9. Institute structure and staff

9a. Organization units

The research potential of the Institute is divided into 6 units:

1. *Department of Geological Processes* extends the knowledge of temperature, pressure and time conditions of different stages of magmatic process in crustal and upper mantle settings as well as of the set of hydrothermal, low- and high-grade metamorphic processes. The evolution of sedimentary basins is studied with special reference to processes affecting the character of sedimentation and diagenesis, and to tectonic deformation of basin fills. Besides the employment of a classical set of geological, petrographic and geochemical meth-

ods, new, progressive laboratory approaches have been developed.

2. *Department of Paleobiology and Paleoecology* develops in four principal directions. These comprise the study of living conditions and biostratigraphy of invertebrate fossil groups (conodonts, corals, brachiopods, echinoderms and graptolites), evolution of vertebrate groups (fishes, amphibians and mammmals), palynology of Carboniferous and Cretaceous sediments, and paleoichnology in a broad stratigraphic range from the Ordovician to the Recent.
3. *Department of Environmental Geochemistry and Geology* integrates the studies of chemical elements dynamics in the environment with the geological processes, as they are recorded in sediments and soils formed during the Tertiary and Quaternary. Basic attention is given to the study of complicated interactions between biotic and abiotic components of the nature, climatic oscillations and environmental changes in the past, and anthropogenic impact on the present natural processes.
4. *Department of Paleomagnetism* deals with paleomagnetism, magnetostratigraphy, mineral magnetism, geological interpretation of obtained data, and development of new laboratory techniques. Research is focused on the determination of basic magnetic and paleomagnetic characteristics of Phanerozoic terrestrial and extraterrestrial materials including high-resolution magnetostratigraphy, and environmental magnetism. Data interpretations encompass geotectonic, stratigraphic and paleogeographic synthesis including paleoclimatic and human-impact reconstructions.
5. *Laboratory of Physical Properties of Rocks* concentrates on the study of strain response of ultrabasic rocks to a dual regime of loading and the analysis of changes of acoustic emission and ultrasound permeability during sample loading. Ultrasonic sounding of rocks and changes in their elastic anisotropy under high pressure are also investigated.
6. *Laboratory of Physical Methods* represents a service analytical unit.

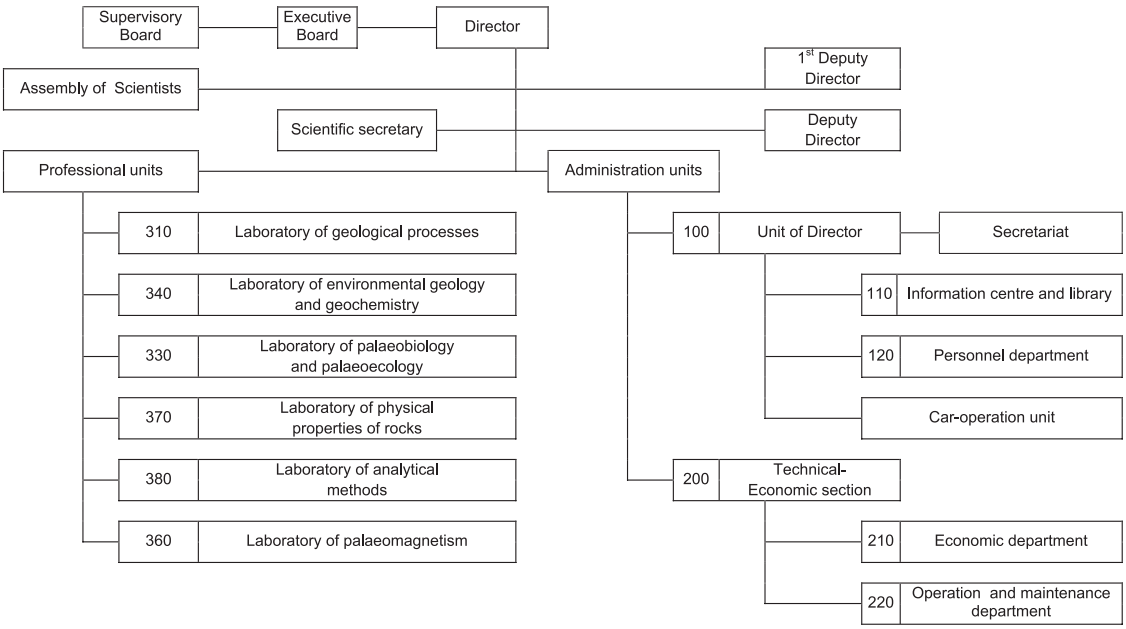
Specialized laboratories

Laboratories of the Institute are not independent units. They are incorporated within the structure of scientific and service departments. The following specialized laboratories have been set up:

1. Paleomagnetic laboratory (Head: ing. Petr Pruner, DrSc.).
2. Micropaleontological laboratory (Heads: RNDr. Ladislav Slavík, CSc. & Pavel Lisý).
3. X-ray powder diffraction laboratory (Head: RNDr. Roman Skála, Ph.D.).
4. Scanning electron microscope and electron microprobe laboratory (Supervised by RNDr. Roman Skála, Ph.D.).
5. Laboratory of rock processing and mineral separation (Head: RNDr. Martin Šťastný, CSc.).
6. Laboratory for thin and polished sections (Head: RNDr. Roman Skála, Ph.D.).
7. Laboratory of microscopy (Head: Mgr. Michal Filippi, Ph.D.).
8. Sedimentary laboratory (Head: RNDr. Anna Žigová, CSc.).
9. Fission track laboratory (Head: Mgr. Jiří Filip, CSc.).
10. Laboratory of liquid and solid samples (Head: RNDr. Jan Rohovec, Ph.D.).
11. Mercury analysis laboratory (Head: RNDr. Tomáš Navrátil, Ph.D.).
12. LA-ICP-MS Laboratory (Supervised by Mgr. Martin Svojtka, Ph.D. & Mgr. Jan Rohovec, Ph.D.)
13. Clean Chemistry Laboratory (Supervised by Mgr. Lukáš Ackerman, Ph.D.)
14. Laboratory of rock behavior under high pressure (Head: Ing. Tomáš Lokajíček, CSc.).
15. Laboratory of rock elastic anisotropy (Head: ing. Tomáš Lokajíček, CSc.).

The scientific concept of the Institute and the evaluation of its results lie within the responsibility of the Executive Board that includes both the internal and external members. Besides research, staff members of the Institute are involved in lecturing at universities and in the postgraduate education system. Special attention is also given to the presentation of the most important scientific results in the public media.

Organization chart



9b. Contact information

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** emeritus employee - institutional

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9c. Staff (as of December 31, 2013)

Advisory Board

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RNDr. Radek Mikuláš, CSc. . . . . Vice-Chairman
Prof. Ing. Jiří Čtyroký, DrSc. (Scientific Council of the CAS), ... Member

Prof. Jiří Pešek, DrSc. (Faculty of Science, Charles University, Praha) . . . . . Member
Doc. Ing. Richard Šňupárek, CSc. (Institute of Geonics of the CAS, v. v. i. Ostrava) . . . . . Member

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Mgr. Michal Filippi, Ph.D. . . . . Vice-Chairman
Prof. RNDr. Pavel Bosák, DrSc. . . . . Member
Doc. RNDr. Jindřich Hladil, DrSc. . . . . Member
Ing. Petr Pruner, DrSc. . . . . Member
RNDr. Ladislav Slavík, CSc. . . . . Member
Doc. RNDr. Emil Jelínek, CSc. (Charles University, Praha) . . . . . Member
Doc. RNDr. Stanislav Opluštil, Ph.D. (Charles University, Praha) . . . . . Member
RNDr. Jan Pašava, CSc. (Czech Geological Survey) . . . . . Member

Management

Prof. RNDr. Pavel Bosák, DrSc. . . . . Director of the Institute (CEO)
Mgr. Michal Filippi, Ph.D. . . . . 1st Deputy Director

Administration units

Unit of Director

Secretariat
Michaela Uldrychová (assistant to the Director)

Information Centre and Library
Bc. Jana Štarmanová – Head (librarian)
Mgr. Václava Škvorová – deputy head (librarian)
Bc. Sabina Bielská (librarian)

Personnel Department
Věra Štěrbová (human resources)

Car Operation Unit
Karel Jeřábek (garage attendant, driver, storeman, janitor)

Technical-Economic Section
Mgr. Farid Momado – Head
Ing. Ottomar Gottstein, CSc. – Deputy Head

Economic Department
Klára Juskovičová (accountant)
Alena Kocová (phone operator, mail service)
Alena Chadrabová (accountant)
Eva Petráčková (accountant)

Operation and Maintenance Department
Ing. Ottomar Gottstein, CSc. – Head
Jaroslav Kratochvíl (technical service)

Scientific laboratories

Laboratory of Geological Processes

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Mgr. Jiří Adamovič, CSc. – Head (basin analysis, tectonics)
RNDr. Leona Koptíková–Chadimová, Ph.D. – Deputy Head (sedimentary petrology, metasediments, magnetic susceptibility)
Mgr. Lukáš Ackerman, Ph.D. (geochemistry, mantle petrology)
RNDr. Karel Breiter, Ph.D. (petrology, mineralogy)
RNDr. Vladimír Cajz, CSc. (volcanology)
RNDr. Miroslav Coubal, CSc. (structural geology, tectonics)
Ing. Jiří Fiala, CSc. (petrology and structure of lithosphere)
Doc. RNDr. Jindřich Hladil, DrSc. (Devonian environments, experimental sedimentology, dust deposition)
Mgr. Tomáš Hrstka, Ph.D. (petrology)
Mgr. Lenka Lisá, Ph.D. (Quaternary sedimentology)
Mgr. Jiří Sláma (metamorphic petrology, isotope dating)
Mgr. Martin Svojtka, Ph.D. (petrology of deep crustal rocks, fission track methods, geochronology, geochemistry)
Doc. RNDr. Jaromír Ulrych, DrSc. (igneous petrology, geochemistry)

Technical Staff:
ing. Jana Ďurišová, Ph.D. (analyst, mass spectrometry)
Mgr. Jiří Filip, CSc. (technician, fission track dating)
Bc. Haluzová Eva (analyst, mass spectrometry)
Mgr. Dagmar Kořínková (Ph.D. student, fission track methods)
Mgr. Šárka Matoušková, Ph.D. (analyst, mass spectrometry)
Ing. Jaroslava Pavková (secretary, technician)
Jana Rajlichová (technician)
RNDr. Martin Šťastný, CSc. (technician, chemical analyst)

Laboratory of Paleobiology and Paleoecology

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RNDr. Ladislav Slavík, CSc. – Head (Silurian–Devonian stratigraphy, conodont biostratigraphy, sedimentary sequences, paleogeography)
RNDr. Marcela Svobodová, CSc. – Deputy Head (Cretaceous palynology)
RNDr. Jiří Bek, CSc. (Devonian and Carboniferous spores)

RNDr. Stanislav Čermák, Ph.D. (Cenozoic vertebrate paleontology, small mammals)
RNDr. Radek Mikuláš, CSc. (ichnofossils)
RNDr. Tomáš Přikryl, Ph.D. (vertebrate paleontology, fishes)
Prof. RNDr. Zbyněk Roček, DrSc. (origin and evolution of the Amphibia, Tertiary Anura and Sauria)
RNDr. Petr Štorch, DrSc. (graptolite stratigraphy, stratigraphy in general, sedimentary sequences, paleogeography)
Mgr. Jan Wagner (Cenozoic vertebrate paleontology, large mammals)
RNDr. Jaroslav Zajíc, CSc. (Carboniferous and Permian vertebrates and stratigraphy, acanthodians)
RNDr. Jiří Žítt, CSc. (Cretaceous and Tertiary paleoecology and sedimentology, echinoids and crinoids)

Technical Staff:
RNDr. Petr Čejchan, CSc. (paleoecology, Radiolaria, mazuelloids
Pavel Lisý (technician)

Laboratory of Environmental Geology and Geochemistry

Scientific Staff:
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RNDr. Jan Rohovec, Ph.D. – Deputy Head (analytical chemistry, ICP analyses)
RNDr. Jan Borovička Ph.D.(biogeochemistry)
Prof. RNDr. Pavel Bosák, DrSc. (karstology, geomorphology, sedimentology)
RNDr. Václav Cílek, CSc. (Quaternary and environmental geology)
Mgr. Petr Drahota (environmental geochemistry)
Mgr. Michal Filippi, Ph.D. (mineralogy, environmental geochemistry)
Mgr. Jaroslav Hlaváč, Ph.D. (Quaternary geology, malacozoology)
RNDr. Maria Hojdová (environmental geochemistry)
Ing. Petra Sychová – Kubínová (biogeochemistry)
RNDr. Karel Žák, CSc. (Quaternary geology, environmental geochemistry)
RNDr. Anna Žigová, CSc. (pedology, paleopedology)

Technical Staff:
Ing. Irena Dobešová (environmental monitoring)
Světlana Hubičková (technician)
Michaela Uldrychová (secretary)

Laboratory of Paleomagnetism

Scientific Staff:
Ing. Petr Pruner, DrSc. – Head (geophysics, paleomagnetism)
Mgr. Petr Schnabl (geophysics)
Mgr. Martin Chadima, Ph.D. (geophysics, paleomagnetism)
RNDr. Jaroslav Kadlec, Dr. (environmental magnetism)
RNDr. Günter Kletetschka, Ph.D. (paleomagnetism, geophysics)
Mgr. Tomáš Kohout, Ph.D. (physical properties of meteorites)

Technical Staff:
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Mgr. Kristýna Šifnerová – Čížková (geophysics)
Jiří Petráček (technician)
Bc. Nábělek Ladislav (geophysics)

Laboratory of Analytical Methods and Physical Properties of Rocks

RNDr. Roman Skála, Ph.D. – Head (X-ray powder diffraction)
RNDr. Zuzana Korbelová – Deputy Head (microprobe and scanning microscope analyst)
Ing. Tomáš Lokajíček, CSc. – Deputy Head (rock elastic anisotropy)
Ing. Vlasta Böhmová – Mocová, Ph.D. (microprobe and scanning microscope analyst)
Mgr. Anna Kallistová (X-ray powder diffraction analyst)
Ing. Jonášová Šárka (microprobe and scanning microscope analyst)
Mgr. Fridrichová Michaela, Ph.D. (microprobe and scanning microscope analyst)
Mgr. Matěj Petružálek (geophysics, acoustic emission analysis)
Mgr. Tomáš Svitek (geophysics)
Doc. RNDr. Jan Vilhelm, CSc. (geophysics)
Julie Erdingerová (technician)
Vlastimil Filler (technician, electrician)
Jaroslava Jabůrková (technician, grinding, preparation of thin/polished sections)
Vlastimil Nemejovský (mechanic, technician, rock cutter)

Foreign consultants

Prof. György Buda (Department of Mineralogy, L. Eötvös University, Budapest, Hungary)
Dr. Pavel Čepek (Burgwedel, Germany)
Prof. Petr Černý (Department of Earth Sciences, University of Manitoba, Winnipeg, Canada)
Prof. Jaroslav Dostal (Department of Geology, Saint Mary's University, Halifax, Canada)
Prof. Peter E. Isaacson (Department of Geology, College of Mines and Earth Resources, University of Idaho, Moscow, USA)
Dr. Horst Kämpf (GeoForschungsZentrum, Potsdam, Germany)
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Prof. Ronald Parsley (Department of Geology, Tulane University, New Orleans, USA)
Prof. Dr. Franz Pertlik (Institut für Mineralogie und Kristallografie, Universität Wien, Geozentrum, Austria)
Prof. Henning Sørensen (Geological Institute, University of Kobenhagen, Denmark)
Prof. John A. Winchester (Department of Geology, University of Keele, Great Britain)

Note: Czech scientific and pedagogical degrees are equivalents of:

Czech degree	**Equivalent**
Bc.	BSc, BA
prom. geol., prom. fyz., Mgr.	MSc, MA
RNDr., PhDr.	no equiv.
CSc.	Ph.D.
DrSc.	DSc
Doc.	Assoc. Prof.
Ing.	Dipl.-Ing.

Staff News

Left the Institute:

Buchtová Jana	April 30
Cajz Vladimír	December 31
Čechmanová Alena	May 31
Drahota Petr	December 31
Chadrabová Alena	December 31
Kiššová Veronika	June 14
Langrová Anna	June 30
Pavková Jaroslava	December 31

Joined the Institute:

Fridrichová Michaela	November 1
Haluzová Eva	February 1
Jonášová Šárka	October 1
Kocová Alena	August 12
Kratochvíl Jaroslav	January 1
Nábělek Ladislav	November 1
Petráčková Eva	February 11

9d. Laboratories

The chapter summarizes the list of the most important laboratory equipment.

Paleomagnetic laboratory (Head: Ing. Petr Pruner, DrSc.)

The Magnetic Vacuum Control System (MAVACS) (1984) is a self-contained automatic system creating a limited space with the magnetic field eliminated, i.e. a non-magnetic environment or magnetic vacuum. The operation of MAVACS is based on the feedback loop principle. The Earth's magnetic field is compensated for by the triaxial Helmholz Induction Coil System HELICOS. The resulting field difference is continually measured in each of its three axes by the Rotating Coil Magnetometer ROCOMA, which has its sensors installed inside the HELICOS. The output of the ROCOMA controls the Iduction Coil Control Unit ICCON, which supplies the HELICOS generating the compensating magnetic field. In this way the feedback loop is closed in all the three axes, thus securing a variation-free magnetic vacuum. The above mentioned factors formed the basis for the development of a system which creates a magnetic vacuum in a space of about 5 litres below a value of ± 2nT, the typical offset of the magnetic field sensor being smaller than ± 0.1nT. Multi-component analysis of the structure of the remanent magnetization and reproduction of the paleomagnetic directions even in rocks whose magnitude of secondary magnetization represents 97 to 99 % of the magnitude of natural remanent magnetization, can be achieved accurately with this system.

The *JR-6A* and two *JR-5A Spinner Magnetometers* (2002, 1997, 2003) – the most sensitive and accurate instruments for measurement of remanent magnetization of rocks. All functions are microprocessor-controlled.

The *KLY-4S Kappabridge*, *CS-23* and *CS-L Furnance Apparatus* (2000) – sensitive, commercially available laboratory instrument for measuring anisotropy of magnetic susceptibility (AMS) as well as bulk susceptibility and for measuring the temperature variation of susceptibility (from –190 to 700 °C).

Two *LDA -3 AF Demagnetizer* (2000, 2002) – the process is microprocessor-controlled and automated.

The *MMPM 10 PULSE MAGNETISER* (2006) and the magnetizing coil serves for the induction of the isothermal remanent magnetization.

The *AMU-1A Anhysteretic Magnetizer* (2003) is an option to the LDA-3 AF demagnetizer. This equipment permits the deliberate, controlled anhysteretic magnetization of a specimen.

The *KLF-4 magnetic susceptibility meter* (2004) is designed for rapid and precise laboratory measurement of magnetic susceptibility of rocks, soils, and materials investigated in environmental studies in weak magnetic fields ranging in their intensity from 5 A/m to 300 A/m.

755 SRM for Discrete Samples with Automatic Sample Handler and AF Degausser (2007).

Liquid helium-free Superconducting Rock Magnetometer (SRM), type 755 4K SRM (2007) – the set includes a measurement system, alternating field demagnetizer, three-layer permalloy degauss shield, automatic sample holder, electronic unit and software. Sensitivity of the dipole moment is lower than 1×10^{-12} Am^2 RMS for aperture size (sample size) of 4.2 cm. A system is including an automatic sample holder, permitting remanent magnetization measurement in three axes. Possibility of remanent magnetization measurement is without sample rotation.

Micropaleontological laboratory (Heads: RNDr. Ladislav Slavík, CSc. & Pavel Lisý)

The laboratory of micropaleontology disposes of room for sample preparation with standard equipment and chemicals and laboratory of sample processing with renovated laboratory hoods and other usual equipment.

3D scanner (Head: RNDr. Jaroslav Zajíc, CSc.)

Two devices enable to collect and evaluate 3D data (as spatial data clouds) of the real geologic or paleontological objects. The utility software allows many ways of measurements. With help of the additional software solution is subsequently possible to model the virtual surfaces, virtual closed objects and any cross-sections. All virtual objects can be visualised and rotated with help of 3D modeling programs.

The *MicroScribe® MX* is a portable measurements system with metrology-level accuracy in six degrees of freedom. This system enables the 3D data collection efficiency of coordinate measurement systems at an affordable price. The

counter-balanced and intuitive articulation of the arm allows to quickly position the stylus into even tight spaces. The arm can reach up to 63 cm and the work sphere diameter is 1.27 m. The device works with precision up to 0.0508 mm and its weight is 5.4 kg.
MicroScribe Utility Software (MUS) allows data acquisition for some applications that do not provide native support.
The *Kreon Skiron* is a very compact, light and ergonomic 3D laser scanner. Fully integrated on the MicroScribe® desktop digitizer (MX series), this laser scanner dramatically reduces digitizing time. Laser of the class II can scan at speed up to 45000 points/second with accuracy of 50 µm. Maximum laser line is 75 mm, the measuring field is 65 mm, and stand-off distance is 50 mm. The line resolution is 83 µm and vertical resolution (sub-pixel) is 16 µm. Dimensions of the device are 112 × 61 × 76 mm and its weight is only 260 g.
Scantools 3D software gives access to the functionalities of the Skiron scanner. This easy to use software allows data collection in a very short time as well as processing them. The data processing is solved with help of the *3D NURBS modeling software Rhinoceros®*. Two plug-ins are applied with the Rhinoceros: the *Flamingo* to raytrace rendering and the *Bongo* to animation creation.

X-ray powder diffraction laboratory (Head: RNDr. Roman Skála, PhD.)

PHILIPS X'Pert APD is an X-ray powder diffractometer used for routine jobs, mainly phase analysis. The diffractometer is of θ-2θ type. It is equipped with fixed divergence and receiving optics, secondary graphite monochromator and a point proportional counter.
X-ray powder diffractometer Bruker D-8 DISCOVER is a multipurpose diffractometer designed to study powdered samples or solid polycrystalline blocks (polished (thin)sections, rock chips etc.). Diffractometer is of the θ-2θ design and allows studying materials in both reflection and transmission geometry. Optional focusing primary asymmetric monochromator of Johansson type produces pure Kα1 radiation. With unmounted monochromator the diffractometer may be operated in the classical parafocusing Bragg-Brentano arrangement with Ni-filter to remove part of continuous radiation and Kβ spectral line. Diffracted radiation is collected with a position sensitive 1D silicon strip detector Lynx-Eye. For data collection in reflecting geometry, the sample is placed either in a cavity of a PMMA sample holder or atop of a zero-background silicon holder. In transmission geometry, the powdered sample can be loaded either between two kapton foils or in a capillary positioned in a goniometric head. Next to these standard arrangements also various sections or irregular chips of polycrystalline materials can be studied in microdiffraction setup.

To carry out phase analysis, the International Center for Diffraction Data Powder Diffraction File (ICDD PDF-2) database is available. Data manipulation and processing is realized through proprietary software products of individual diffractometer producers.

Scanning electron microscope and electron microprobe laboratory (Head: RNDr. Roman Skála, PhD.)

Electron microprobe [Electron probe microanalyzer (EPMA)] CAMECA 100 is used mainly for local chemical analysis of solid geological materials. The microprobe is equipped by four crystal spectrometers and detectors for imaging in secondary and back-scattered electrons. The instrument is capable of analyzing elements in the range from B to U from (thin-) sectioned and polished solid-state samples.
Scanning electron microscope (SEM) TESCAN VEGA3XMU is of a variable pressure construction and allows observation and analysis of not only carbon-coated or gold-sputtered materials but also of uncoated specimens including biological materials. It is equipped with detectors of secondary and back-scatted electrons as well as *energy-dispersive spectrometer Bruker QUANTAX 200*. Elements from B to Am can be detected and quantified from the collected spectra. Also available are a low vacuum secondary electron (LVSTD) and a color cathodoluminescence (detection range 350–850 nm) detectors.
Available accessory devices for preparation of samples for SEM and/or EPMA analyses/imaging include carbon coater and gold sputtering machine.

Laboratory of rock processing and mineral separation (Head: RNDr. Martin Šťastný, CSc.)

Electromagnetic separator SIM-I (1968)
Electromagnetic separator (1969)
Laboratory table WILFLEY 13 B (1990)
Vibration processor VT 750 (1992)
*Crusher CD 160*90* (1991)
Laboratory mill RETSCH (1970)
Crusher ŽELBA D 160/3 (1999)
Mill SIEBTECHNIK (1995)
Muffle oven LAC LMH 11/12 (2011)
Hydraulic slab cutter 4H HYDROTRONK MONTOLIT (2011)

Laboratory for thin and polished sections (Head: RNDr. Roman Skála, PhD.)

To prepare the samples for optical microscopic, SEM and/or EPMA studies a suite *of cutting, grinding, lapping and polishing machines* to manufacture polished sections or thin sections is available.

Laboratory of Microscopy (Head: Mgr. Michal Filippi, PhD.)

Laboratory of microscopy is used for the first identification of the studied samples and for a detailed preparation for other more sophisticated methods. The equipment of the laboratory enables a photographic documentation of samples and also basic image analyses (for example in case of the thin sections).

Polarization microscope OLYMPUS BX51 with digital camera OLYMPUS DP70 equipped by X-ray fluorescence with wavelength filters;
QuickPHOTO MICRO 2.2 software (2006)
Binocular microscope OLYMPUS SZX16 with digital camera OLYMPUS SP 350;
software Deep Focus 3.0 (2007)
Binocular microscope OLYMPUS SZ51 (2007)
Microscope NIKON ALPHAHOT 2/HP (1995)

Sedimentary laboratory (Head: RNDr. Anna Žigová, CSc.).

The laboratory is equipped with apparatus for preparing of samples and measuring of pH:

Analytical balance SETRA EL - 2000S (1999)
Muffle furnace VEB ELEKTRO BAD FRANKENHAUSEN (1984)
Laboratory dryer WST 5010 (1991)
Planetary mill FRITSCH (1986)
pHmeter pH 330 / SET (2000)
Ultrasonic cleaner TESLA (1985)

Fisson track laboratory (Head: Mgr. Jiří Filip, CSc.)

The laboratory develops fission-track dating analysis for determining the age and time-temperature evolution of minerals and rocks.

Analytical system for fisson track:

– Microscope *AXIOPLAN ZEISS* and Trackscan system *452110 AUTOSCAN* (1999)
– Microscope *ZEISS IMAGER M1m* and computer-controlled microscope stage *AUTOSCAN* (2008)

Polishing and grinding machine *MTH APX 010* (2003)

Laboratory of liquid and solid samples (Head: RNDr. Jan Rohovec, PhD.)

ICP-EOS spectrometer Thermo Iris Intrepid XSP (2004)
HPLC system (Knauer 2010): anion analysis in aqueous samples using ion-exchanging column and conductivity detector.
Microwave digestion unit Mars (2009) – with 8 fully equipped PTFE digestion vessels.
Microwave digestion unit Milestone mls 1200 mega (2009) – with 6 fully equipped PTFE digestion vessels.
UV-VIS Spectrometer CINTRA 303
AAS Spectrometer VARIAN SpectrAA 300 (1991) lamps As, Be, Cd, Cu, Cr, Fe, Mn, Ni, Co, Pb, Sr, Zn, Rb, Ba+GTA96+VEA76
Analytical weights SARTORIUS Basic analytical (1992)
Filtration blocks B-2A Epi/FL (1996)
Analytical weights Mettler-Toledo (2011)
Analytical weights BALANCE 2000G (1999)

Mercury analysis laboratory (Head: RNDr. Tomáš Navrátil, PhD.)

Mercury analyser AMA 254 (2008) – mercury analysis in solid and liquid samples on CV-AAS principle.
PSA Millennium Merlin (2009) – ultra low mercury analysis in liquid samples on CV-AFS principle. Extension of this analytical procedure with a single-purpose HPLC enables mercury species separation and analysis.
DOC/TOC analyzer Shimadzu (2010): Dissolved organic carbon content, total organic carbon content, inorganic carbon in aqueous samples.

LA ICP-MS laboratory (Supervised by ing. Jana Ďurišová, Ph.D. & Mgr. Šárka Matoušková, Ph.D.)

The laboratory is equipped with high-resolution magnetic sector *ICP-MS* (2009; inductively coupled plasma – mass spectrometer) *ELEMENT 2* (ThermoFisher Scientific). An instrument has high mass resolution to access spectrally interfered isotopes and is used for: (1) multielement analysis (trace and major elements) across the periodic table covering a $mg.l^{-1}$ to sub $pg.l^{-1}$ concentration range, and (2) measuring of high-precision isotope ratios.

Element 2 is coupled with New Wave *UP213 LASER ABLATION SYSTEM* (2009) for analyzing solid samples and backup power system *UPS PW9355 POWERWARE* (Eaton).

Clean chemistry laboratory (Supervised by Mgr. Lukáš Ackerman, PhD.)

Laboratories for processing of samples destined for (ultra)-trace and isotopic analyses. Both labs are supplied with HEPA filtered air. One lab (class-100000 filtered air) is using for sample decomposition and labware cleaning. It contains 1 x fume-hood designed for the work with strong acids. The other lab (class-10000 filtered air) is using for a clean chemistry (e.g. ion exchange chromatography separation, special chemical procedures for separation of certain elements) and final preparation of the samples for mass spectrometry (HR-ICP-MS, MC-ICP-MS, TIMS). It contains 2 x originally designed laminar flow hoods (class-100 filtered air), 1 x open laminar flow work space (class-100 filtered air), 1 x analytical weight (0.0000X g), 1 x device for the preparation of clean water (Millipore Elix 3 + Millipore Milli-Q Element) and 1 x centrifuge (2009).

Laboratory of rock behaviour under high pressure and **Laboratory of rock elastic anisotropy** (Head: ing. Tomáš Lokajíček, CSc.)

The research of the laboratory was focused on grant projects solving, on projects of international cooperation, training of undergraduate and graduate students and solving of special practical problems in terms of the industrial projects in 2009.

The new methods are developed for assessment of stability mechanically loaded rocks, for multichannel monitoring of seismoacoustic signals occurring during various loading regime. The special software programs are created for automatic preprocessing of acoustic signals and for processing of acoustic series. Processing of acoustic series is based on the correlation and fractal analysis.

Special unique apparatus for investigation of elastic anisotropy enables to measure in 132 independent directions. Obtained results are processed by form of isolines of P-wave velocities in the dependence on confining stress.

MTS 815 – PC controlled servo hydraulic rock testing system with high stiffness for compressive loading up to 4,500 kN (2004).
High pressure chamber for elastic anisotropy measurement under hydrostatic pressure up to 700 MPa (2000).
Electronically controlled high pressure generator *PG-HY-700-1270* (700 MPa; 2007)
Hydraulic press for uniaxial compressive loading up to 3,000 kN (1958) with conventional triaxial cell for confining pressure up to 150 MPa (1990).
Hydraulic press for uniaxial compressive loading up to 300 kN (1960).
Hydraulic press for uniaxial compressive loading up to 100 kN (1965).
Rheological weight press for uniaxial compressive loading up to 500 kN (1974).

Rheological mechanical presses for uniaxial compressive loading up to 80 kN (1969).
Rheological weight presses for tensile loading up to 3 kN (1974).
Vallen AMSY-5 – multichannel acoustic emission system (2003).
Digital strain meters Hottinger (Centipede-100, UPM-40, UPM-60; 2003).
Permeability apparatus for measurement of permeable and low permeable materials under constant hydraulic incline (2006).
Piezo-ceramics sensors for monitoring P and S waves in the wide frequency band.

Equipment for sample preparation (stone saw machines, drilling machines, grinding and milling machines) allows preparation of test samples (specimens) of various shapes (cubic, prismatic, cylindrical, spherical).

10. Financial Report

In thousands of Czech Crowns (CZK)

A. INCOMES		
1.	From the annual budget of the CAS	35 908
2.	From the Grant Agency of the CAS (accepted research projects)	492
3.	From the Czech Science Foundation (accepted research projects)	7 998
4.	From the Technological Agency CR (accepted research projects)	760
4.	From the internal research projects of the CAS	727
5.	From other public sources	1 311
6.	Applied research	3 527
7.	Investment (instruments)	5 457
8.	Investment (constructions)	0
TOTAL INCOMES		56 180

B. EXPENSES		
1.	Scientific staff (wages, insurances)	32 364
2.	Research and scientific activities	9 404
3.	Administration and technical staff (wages, insurances)	5 711
4.	General expenses (postage shipping, maintenance of buildings, energies, transport, office supplies, miscellaneous, etc.)	2 873
5.	Library	311
6.	Editorial activities	61
7.	Investment (instruments)	5 457
8.	Investment (constructions)	0
TOTAL EXPENSES		56 180

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