2012

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,
Academy of Sciences of the Czech Republic, v. v. i.

Contents

Introduction

The traditional editorial to the Research Reports of our Institute is usually a quite easy task: the life is passing, articles have been submitted, new equipment has been installed, and financial support is being cut more and more year after year. Nevertheless, a substantial change appears every 5 yers – the tender for a new director and elections of the new Executive Board. The new Executive Board was elected by the Assembly of Scientists during autumn 2011; the function period (5 years) started on January 4, 2012. The function period of RNDr. Václav Cílek, CSc. (director from 2007 to 2012) finished on May 31, 2012. The new director was selected by the tender committee established according to the Academy rules and regulations in spring 2012 for the period of June 1, 2012 to May 31, 2017. Moreover, there were personal changes in the technical-economic section of the Institute which started in spring 2012 and continued until autumn 2012, including the internal audit of accounting operations from the previous period. One department (Laboratory of Physical Properties of Rocks) was cancelled in accordance to the results of previous Institute evaluation. Some of its staff members were transferred to the Laboratory of Analytical Methods. The new system of personnel evaluation was adopted, and all scientists/researchers were evaluated according to the new method in November 2012. This helped the management to better evaluate the scientific efficiency and productivity of the respective personnel.

Pavel Bosák

2. General Information

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The Institute of Geology of the ASCR, v. v. i., is a research institute belonging to the Academy of Sciences of the Czech Republic (ASCR). 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, the methods of its activity 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 scale; 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 ASCR, v. v. i., is a wide-spectrum institute developing essential 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 period of 1957 to 1961. During the period, several independent laboratories originated: Laboratory of Paleontology, Laboratory of Engineering Geology, Laboratory of 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 into Geological Institute of the ČSAV on 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, successor of the 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 Academy of Sciences of the Czech Republic was established by the transformation from the ČSAV, and the Geological Institute became a part of the ASCR. The Institute belongs to the I. Department of Mathematics, Physics and Earth Sciences and to the 3rd Section of Earth Sciences. On January 1, 2007 the Institute became the public research institution (v. v. i.) by the change of legislation on research and development.

The economic and scientific concept of the Institute of Geology of the ASCR, 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. Institutional Research Plans are evaluated by the Committee for Evaluation of Institutional Research Plans of ASCR Institutes at the AS CR. 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 ASCR, 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 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 2012 year.

Since 2000, the Institute of Geology of the ASCR, 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 and J. Hladil).

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 2012, six issues (1 to 6) of Volume 63 were published with 38 scientific papers and short communications. For the contents and abstracts see www.geologicacarpathica.sk.

Address of the editorial office: Geological Institute, Slovak Academy of Sciences, Dúbravská cesta 9, P. O. BOX 106, 840 05 Bratislava 45, Slovak Republic, Phone: +421 2 3229 3209, Fax: +421 2 5477 7097, www.geol.sav.sk
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Since 2012, the Institute of Geology of the ASCR,v. v. i., has become a co-publisher of the international journal **Bulletin of Geosciences** (http://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 2012 is 1.141.

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 2012, four issues (1 to 4) of Volume 87 were published with 53 scientific papers and short communications. For the contents and abstracts 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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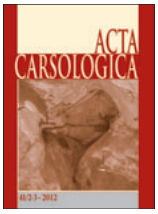


In 2012, the Institute of Geology of the ASCR, v. v. i., supported the print of one issue of **Acta Carsologica** (http://ojs.zrc-sazu.si/carsologica), an international journal registered by the Thomson Reuters WoS database (IF 2012 = 0.542).

3b. Monographs, proceedings, etc.

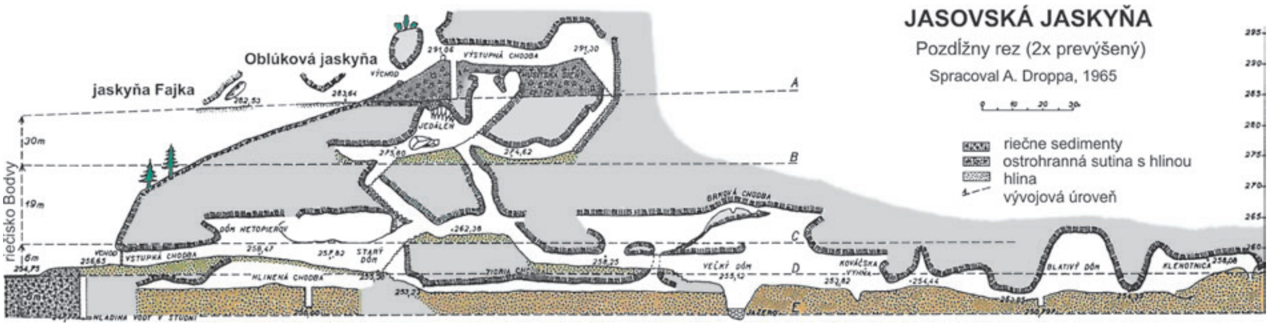
PŘIKRYL T. & BOSÁK P., (Eds., 2012): Research Reports 2011. – Institute of Geology of the ASCR, v. v. i.: 1–116.

4. Research Reports

4a. Foreign Grants, Joint Projects and International Programs

Bilateral co-operation between Institute of Geology of the ASCR, v. v. i., and State Nature Conservation – Slovak Caves Administration, Liptovský Mikuláš, Slovakia: **Dating of karst sediments – application to geomorphological analyses: case study from the Jasovská Cave** (P. Bella, State Nature Conservation – Slovak Caves Administration, Liptovský Mikuláš and Catholic Universtity in Ružomberok, Slovakia, *P. Bosák*, *P. Pruner* & *S. Šlechta*; since 1997)

The Jasovská Cave is located in the Medzevská Hill Land in the western part of Košická Basin at the contact with the eastern edge of the Jasovská Plateau, Slovak Karst. The western part of Medzevská Hill Land presents the tectonically dissected territory between the Slovak Karst and the western part of the Košická Basin. Karst surface on limestone blocks subsided in the respect to the rest of the eastern segment of the Jasovská Plateau are exhumed along the Bodva River. The Jasovská Cave developed along fault margins of limestone block (Middle Triassic limestones of the Silica Nappe). The cave morphology is characterized by specific phreatic and epiphreatic speleogens (ceiling cupolas and chimneys, large scallops showed a vertical direction of water flow, feeders, upward scalloped channels, irregular spongework cavities, flat solution ceilings and water-table notches in different altitudes, etc.) differing in morphology in respective vertical cave segments. Cupolas and cupola- and chimney-shaped hol-



■ **Fig. 1.** Jasovská Cave, longitudinal section (compiled by A. Droppa 1965; from Bella et al. 2012 with permission).

lows are developed in the lower and middle cave segments. Middle and upper cave segments are characterized by ceiling channels originated by intensively flowing water in smaller or larger domes (Bella & Bosák 2012). Passages of the lower cave segment are filled by fine-grained sediments (younger than 780 ka), in many places completely up to flat ceilings. They deposited from very slow water flows and/or floods (slackwater facies). Coarse-grained fluvial sediments are absent in the cave. The lower part of the cave is still flooded by oscillating groundwater level; floods are not related to changes of the Bodva River level. The lowest lake level is situated 7 m below the river. The river bed was originally in lower position but aggraded recently. The evolution of original phreatic cave morphology can be explained by ascending water flow. Upper Pliocene and Quaternary evolution phases re-modelled the original phreatic morphology in epiphreatic conditions with the origin of cave levels (Fig. 1) in relation to evolution of the Bodva Valley and stabilization of the groundwater table (within phases of valley incision as a consequence of tectonic uplift of the Medzevská Hill Land, probably also within phases of fluvial aggradation of the valley and following multiple-phased evacuation of fluvial sediments; Bella et al. 2012).

BELLA P. & BOSÁK P. (2012): Speleogenesis along deep regional faults by ascending waters: case studies from Slovakia and Czech Republic. – *Acta Carsologica*, 41, 2–3: 169–192.

BELLA P., BOSÁK P. & ZACHAROV M. (2012): Morfologické indikátory výstupného prúdenia vody vo vzťahu ku genéze Jasovskej jaskyne. – *Slovenský kras (Acta Carsologica Slovaka)*, 50, 2: 83–95.

Bilateral co-operation between Institute of Geology of the ASCR, 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, Romani, *P. Pruner* & *P. Bosák*; since 1997)

Three sites of relic caves from the Classical Karst of Slovenia (Trhlovca, Račiška pečina, and a cave in Črnotiče Quarry, Classical Karst, SW Slovenia; see Zupan Hajna et al. 2008) provided first evidence of Pliocene/Pleistocene invertebrate remains in continental clastic sediments belonging to the interior cave facies in temperate regions (Moldovan et al. 2011). Finds of fossil remains clearly indicate that the cave sediments can preserve another proxy for the assessment of paleoclimatic and paleoenvironmental conditions. The new proxy may be important for a number of reasons: (i) the scarcity of vertebrate fossils in pre-Quaternary cave deposits; (ii) the need for cross-validation of inferred paleoenvironmental settings in the case of incomplete or ambiguous coeval proxies; (iii) the cave conditions that are prone to a better preservation of old chitinous invertebrates when compared to surface settings; (iv) the addedvalue offering additional information on speleogenesis and evolution of karst hydraulic regimes even for paleokarst settings.

However, caves are also known as systems with low-energy input from the surface and low-energy *in situ* production. This fact may hamper the use of fossil invertebrates from caves due to the relatively low chance of finding identifiable cave specimens or surface specimens transported into caves. Despite the relatively low number of specimens found, we were successful in identifying invertebrates which could be dated by biostratigraphy-calibrated magnetostratigraphy back to about 1.77–4.8 Ma, i. e. across the Pliocene/Pleistocene boundary (Zupan Hajna et al. 2008). The invertebrate fauna was cross-correlated with the vertebrate fauna described from the same strata, and all evidence pointed to a colder phase associated with the transition to the Pleistocene. Two new genera and two new type species of the oribatid mite family Oppiidae (Acari: Oribatida) were recently proposed (Mikó et al. 2012).

MIKÓ L., MOUREK J., MELEG I.N. & MOLDOVAN O.T. (2012): Oribatid mite fossils from Quaternary and pre-Quaternary sediments in Slovenian caves I. Two new genera and two new species of the family Oppiidae from the Early Pleistocene. – *Acta Musei Nationalis Pragae, Series B – Historia Naturalis*, 68, 1–2: 23–34.

MOLDOVAN O.T., MIHEVC A., MIKÓ L., CONSTANTIN S., MELEG I., PETCULESCU A. & BOSÁK P. (2011): Invertebrate fossils from cave sediments: a new proxy for pre-Quaternary paleoenvironments. – *Biogeosciences*, 8: 1825–1837.

ZUPAN HAJNA N., MIHEVC A., PRUNER P. & BOSÁK P. (2008): *Palaeomagnetism and Magnetostratigraphy of Karst Sediments in Slovenia*. – Carsologica, 8: 1–266. Založba ZRC SAZU, Postojna–Ljubljana.

Bilateral co-operation between Czech Geological Survey, Praha and Geologisches Bundesanstalt Wien, Austria: **Palynology**

of Lower Gosau Subgroup of St. Gilgen village for explanatory text of Mondsee mapsheet (H. Lobitzer, Geologisches Bundesanstalt, Wien, Austria, L. Švábenická, Czech Geological Survey, Praha, Czech Republic & *M. Svobodová*; 2012)

Calcareous nannofossils and palynomorphs were studied in the Upper Cretaceous marls of the Gosau Subgroup from St. Gilgen and its vicinity in Salzkammergut, Austria. Dinoflagellate cysts *Odontochitina operculata*, *Palaeohystrichophora infusorioides*, microforaminifers and abundant phytoclasts of terrestrial origin as well as nannofossils *Lucianorhabdus* and *Braarudosphaera* reflect shallow-marine depositional conditions. Two studied localities differ in age: ?Middle-Late Turonian (zone UC9a) is supported by *Lithastrinus septenarius* and *Lucianorhabdus quadrifidus* and angiosperm pollen of Normapolles group *Complexiopollis complicatus*, *C. helmigii*, *C. microrugulatus*, *C. christae*. Upper Coniacian (zone UC11a-b) indicates *Lithastrinus grillii*. High number of reworked Lower Cretaceous microfossils in Coniacian deposits is remarkable.

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*, A. Nikitin & 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**

The characteristics of the wave fields observed during the transmission of quasi longitudinal ultrasonic waves through polycrystalline graphite samples have been studied. The specific features of propagation of elastic waves in a bilayer medium, where one of the layers (isotropic) is an acrylic glass hemisphere and the other (anisotropic) is a polycrystalline porous graphite hemisphere, are considered. The velocities and propagation times of quasi longitudinal waves in polycrystalline graphite samples and a bilayer acrylic glass graphite sample in different directions are experimentally measured by ultrasonic spatial sounding (Nikitin et al. 2012a). The experimental results are compared with theoretical calculations using the data on graphite crystallographic texture obtained previously by neutron diffraction (Nikitin et al. 2012b). The reasons for the discrepancy between the theoretical and experimental characteristics of elastic waves in the media under study are established and analysed (Nikitin et al. 2012c).

NIKITIN A.N., VASIN R.N., IVANKINA T.I., KRUGLOV A.A., LOKAJÍČEK T. & PHAN L.T.N. (2012a): Peculiarities of the propagation of quasi-longitudinal elastic waves through the interface between isotropic and anisotropic media: theoretical and experimental investigations. – *Crystallography Reports*, 57, 4: 560–568.

NIKITIN A.N., VASIN R.N., IVANKINA T.I., KRUGLOV A.A., LOKAJÍČEK T. & PHAN L.T.N. (2012b): Investigation of seismo-acoustic properties of specific polycrystalline materials to be used in nuclear reactors. – *Crystallography Reports*, 57, 5: 682–692.

NIKITIN A.N., LOKAJÍČEK T., KRUGLOV A.A., VASIN R.N. & ZEL' I.Yu. (2012c): Peculiarities of ultrasound propagation through layered structurally inhomogeneous solid bodies. – *Journal of Surface Investigation. X_ray, Synchrotron and Neutron Techniques,* 6, 6: 954–960.

Participation in 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. Margielewski, 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 Polish Flysch Carpathians are studied using a set of research methods applied to speleothems in non-karst caves. These caves are formed by mass movements in the sandstone lithologies. The flysch sandstones locally contain abundant carbonate cement, which results in 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 determination of the chronology of landslide movements since the late Glacial until 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 is comparison of radiocarbon and U-series disequilibrium dating methods applied to speleothems with elevated contents of impurities.

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, Academy of Sciences of the Czech Republic, Praha, Z. Šimůnek, Czech Geological Survey, Praha, S. Štamberg, Museum of Eastern Bohemia, Hradec Králové & *J. Zajíc*; 2010–2015)

Permian age (Lower Rotliegendes) was implied for the Stránka Horizon of the uppermost part of the Líně Formation (Central and Western Bohemian Basins) on the basis of new circumstantial evidence (absence of the index fossil *Sphaerolepis kounoviensis*) from the Be-1 Bechlín borehole. Data for the special acanthodian database and the database of Permain and Pennsylvanian faunas of the limnic basins of Czech Republic were collected and evaluated.

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. Koptíková*; Czech participants: *L. Koptíková*, *J. Hladil*, *S. Šlechta*, *P. Schnabl*, *L. Slavík*, *P. Čejchan*, J. Frýda, Š. Manda, P. Čáp, S. Vodrážková, L. Ferrová, P. Budil, Czech Geological Survey & O. Bábek, Palacký University in Olomouc; 2009–2013)

Czech scientists took part in three international conferences. 4th annual Meeting IGCP No. 580 "Magnetic susceptibility and Gamma-Ray Spectrometry through time" took place in Graz, Austria (June 24–30, 2012; Fig. 2) and included traditional sampling field campaign. This field work was focused on the Silurian/Devonian boundary and Lower Devonian in the Carnic Alps at Rio Malinfier West section which represents shallow marine sequences. The second joint event of all involved researchers was during the joint session of IGCP No. 596 & IGCP No. 580 and the SDS at International Geological Congress in Brisbane, Australia ("Unearthing our Past and Future – Resourcing Today and Tomorrow"; August 5–10, 2012) "Climate change and biodiversity patterns in the Mid-Paleozoic

■ **Fig. 2.** 4th annual Meeting IGCP – 580 "Magnetic susceptibility and Gamma-Ray Spectrometry through time" took place in Graz, Austria (June 24–30, 2012) – group photo. Photo by E. Kober.

■ **Fig. 3.** Field work at the Gelantipy road cut section in the Buchan Area (Victoria, Australia) – Lower Devonian limestone and shale sequences. From the left: P. Budil (Czech Geological Survey), John Talent (Macquarie University, Sydney), L. Ferrová, J. Frýda (Czech Geological Survey), K. Novotny, D. Mathieson (Macquarie University, Sydney). Photo by L. Koptíková.

(Early Devonian to Early Carboniferous)". Conference programme was followed by field work in the Buchan Area (Victoria, Australia) where Lower Devonian (Emsian) limestones and siliciclastics were studied. It was realized with the kind cooperation of colleagues from Macquarie University in Sydney (J. Talent, R. Mawson, D. Mathieson) during August 2012 (Fig. 3). Czech participants also attended special session dedicated to the IGCP No. 580 at the 4th International Geologica Belgica Meeting 2012 "Moving plates and melting icecaps. Processes and forcing factors in geology" which took place in Brussels, Belgium (September 11–14, 2012). A study on magnetic susceptibility logs of the Pragian–Emsian GSSP in Kitab (Uzbekistan) and coeval Prague Synform beds treating a long-distance stratigraphic correlation of magnetic susceptibility logs and its fitting using dynamic time warping method (DTW) was run and published by the Czech team (J. Hladil, L. Slavík, M. Vondra, L. Koptíková, P. Čejchan, P. Schnabl, J. Adamovič, F. Vacek, R. Vích, L. Lisá, P. Lisý) in 2012 in the Stratigraphy Journal. A "Mesozoic branch" study of the Tithonian – Berriasian pelagic sediments in the Tatra Mts. Pieniny Klippen Belt (Western Carpathians, Poland), where Czech scientists participated, was submitted to Cretaceous Research (Magnetic susceptibility and spectral gamma logs in the palaeoenvironmental changes at the Jurassic/Cretaceous boundary by J. Grabowski, J. Schnyder, K. Sobień, L. Koptíková, L. Krzemiński, A. Pszczółkowski, J. Hejnar, P. Schnabl).

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. Gorstian-Ludfordian boundary and early Ludfordian *leintwardinensis* Event have been analyzed along with systematic revision of 27 graptolite taxa (P. Štorch, Š. Manda and D.K. Loydell). New graptolite assemblage of Chinese type was identified from the Ordovician-Silurian boundary beds of the Carnic Alps (Štorch & Schönlaub 2012) and Pyrenees (joint work with Juan Carlos Gutiérrez-Marco and Josep Roqué).

ŠTORCH P. & SCHÖNLAUB H.-P. (2012): Ordovician-Silurian boundary graptolites of the Southern Alps, Austria. – *Bulletin of Geosciences*, 87, 4: 755–766.

Program Mobility supported by the Ministry of Education, Youth and Sports, 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 is scientifically aimed at the deciphering of potential sedimentary resources and process of sedimentations in the Magallanes foreland basin of the southernmost Andes (Tierra del Fuego) in cooperation with Argentinean colleagues. Integral part of the project is modelling of time-temperature exhumation/burial of rocks based on the individual fission-track age and fission-track track length of studied apatites and zircons. In order to reconstruct model for basin low-temperature evolution of sediments, we will date zircons and apatites using fission-track analytical technique.

In the early June of 2012, Dr. Juan Manuel Lirio from Instituto Argentino Antartica (IAA) visited the Institute of Geology of the ASCR, v. v. i. (IG ASCR) and also the Czech Geological Survey (CGS). The aim of his visit was not only a logistical preparation of a joint field research in 2012 and 2013, but also to learn analytical procedures of fission-track method in the workplace of the IG ASCR (Praha) and also in electron microprobe department located in Praha and Brno. Two Czech participants (Dr. Martin Svojtka and Dr. Daniel Nývlt) attended a planned trip to Argentina in September 2 to 16, 2012. We have focused on traditional geological and petrological research of Magallanes foreland basin sediments during the first year of the

■ **Fig. 4.** Cliff outcrop including sediments between Upper Paleocene–Lower Eocene (Punta Torcida Formation: mudstones and tuffaceous sandstones) and Middle Eocene (Leticia Formation: quartz-rich sandstones) in the Tierra del Fuego, Argentina (photo by M. Svojtka).

project. Field-trip studies were carried out in collaboration with Argentinian colleagues, without whose logistical assistance we are unable to work in this difficult area.

During our joint short fieldwork stay in Argentina, we collected 11 samples of fine- to medium-grained sandstones to conglomerates in the stratigraphic sequence of Upper Cretaceous to Upper Eocene (Fig. 4). Due to logistic problems, only a small part of these rock samples were brought to the Czech Republic and thus, we have studied these samples using EPMA analysis and checked the presence of apatites and zircons.

Grant-in-aid internal program of international cooperation projects Academy of Sciences of the Czech Republic, Project Code: M100130904: **Polyphase evolution of the highly metamorphosed rocks in collisional orogens: an example from the Bohemian Massif (Czech Republic)** (*M. Svojtka*, *J. Sláma*, *L. Ackerman*, S.W. Faryad, Faculty of Science, Charles University, Praha, Czech Republic, T. Hirajima, & T. Kobayashi, Kyoto University, Japan; 2009–2012)

The research activities were focused on the P-T reconstruction and geochemistry of high-pressure/ultrahigh-pressure rocks from the Bohemian Massif (Czech Republic). The first area of interest was rocks from the southern Bohemian Massif. First published study identified precursor of ultra-deep conditions (~ 6 GPa) for the Plešovice peridotite (Naemura et al. 2009a; Naemura et al. 2010; Naemura et al. 2011). We have also demonstrated the time constraint (ca 337 Ma) from the Plešovice peridotite based on zircon U-Th-Pb dating (Naemura et al. 2009c). Multiple equilibrium stages based on PT estimations were identified from garnet-rich gneiss at Ktiš in the Lhenice shear zone of the southern Bohemian Massif (Kobayashi et al. 2009, 2011a). Estimation of exhumation rate of high-pressure granulites from the south Bohemian granulite massifs (Moldanubian Zone) was based on combination of multiple (fission-track analysis on apatites and zircons, U-Pb and Lu-Hf method on zircons) chronometers (Svojtka et al. 2009, 2010).

Three papers were published from the Moldanubian Zone in the eastern part of the Bohemian Massif (Moravia). First paper deals with the origin of the Mohelno peridotite body, which is enclosed in the Gföhl granulites. It consists mainly of coarse spinel peridotite harzburgite and dunite; garnet peridotite occurs only in the sheared and deformed margins of the body. Origin and history of peridotites were determined using the mineral chemistry by electron microprobe analysis and olivine fabric patterns by the electron backscattered diffraction method for each rock type (Kamei et al. 2010). Second paper is focused on description of Sr-bearing phase, celestine ($SrSO_4$) that was found in ultrahigh-pressure (UHP) eclogite associated with the Nové Dvory peridotite mass in the Moldanubian Zone. *P-T* conditions of the studied eclogite was estimated as about 1,000–1,100 °C, 4.5–4.9 GPa (Nakamura et al. 2010). An ultrahigh-pressure metamorphic condition (~ 140 km) at ca 900 °C is identified in a third paper, focused on garnet-pyroxenite, containing primary supersilicic clinopyroxene as a part of mafic-ultramafic lenses enclosed in the Gföhl granulite at Horní Bory quarry of the Bohemian Massif. Petrological data indicated that the garnet-pyroxenite has isothermally (ca 900 °C) exhumed from upper mantle (~ 140 km) to the lower crust (~ 50 km), and the supersilicic clinopyroxene was decomposed to sodic augite and quartz during the exhumation (Naemura et al. 2009b).

We have also co-organized the widely attended 9th International Eclogite Conference 2011 held in Mariánské Lazně. The results from this project were presented in conference presentation (Kobayashi et al. 2011b; Nakamura et al. 2011; Svojtka et al. 2011; Usuki et al. 2011) and also as a short communications in the special volume of GeoLines journal (Faryad et al. 2011a). This GeoLines 23 volume contains a detailed description of recent results from HP/UHP localities illustrating the geological relations, lithological and geochemical features, and metamorphic evolution of different high-pressure and ultrahigh-pressure crystalline segments that formed by subduction and collision during the Variscan orogeny (Faryad et al. 2011b; Svojtka et al. 2011a, b).

FARYAD S.W., MEDARIS G.L. & SVOJTKA M. (Eds., 2011a): High-Pressure/Ultrahigh-Pressure Rocks in the Bohemian Massif (Proceedings of the 9th International Eclogite Conference 2011) – *Geolines*, 23: 1–136. Praha.

FARYAD S., FRANĚK J., VRÁNA S. & SVOJTKA M. (2011b): South Bohemian HP Granulites with Lenses of HP/UHP Mafic and Ultramafic Rocks. – *Geolines*, 23: 88–92.

KAMEI A., OBATA M., MICHIBAYASHI K., HIRAJIMA T. & SVOJTKA M. (2010): Two Contrasting Fabric Patterns of Olivine Observed in Garnet and Spinel Peridotite from a Mantle-derived Ultramafic Mass Enclosed in Felsic Granulite, the Moldanubian Zone, Czech Republic. – *Journal of Petrology*, 51, 1&2: 1–23.

KOBAYASHI T., HIRAJIMA T., KAWAKAMI T. & SVOJTKA M. (2009): Metamorphic history of garnet-rich gneiss at Ktiš in the Lhenice shear zone (Moldanubian Zone of the southern Bohemian Massif) inferred from inclusions and compositional zoning of garnet. – *In*: LEXA O., SCHULMANN K., BROWN M., WHITE R. & OBRIEN P. (Ed): *Granulites & granulites 2009, Institute of Petrology and Structural Geology, Univerzita Karlova,, Hrubá Skála, July 13 – 15. Proceedings*: 35. Hrubá Skála.

KOBAYASHI T., HIRAJIMA T., KAWAKAMI T. & SVOJTKA M. (2011a): Metamorphic history of garnet-rich gneiss at Ktiš in the Lhenice shear zone, Moldanubian Zone of the southern Bohemian Massif, inferred from inclusions and compositional zoning of garnet. – *Lithos*, 124, 1–2: 46–65.

KOBAYASHI T., HIRAJIMA T., HIROI Y., KAWAKAMI T. & SVOJTKA M. (2011b): Precursor high-pressure condition and partial melting in the Grt-rich gneiss at Ktiš in the Lhenice shear zone (Moldanubian zone of the southern Bohemian Massif, Czech Republic). – *In*: LEXA O. (Ed): *9th International Eclogite Conference 2011, Charles University, Institute of Geology ASCR, Czech geological Survey, Mariánské Lázně, August 6 – 9. Abstract volume*: 33. Praha.

NAEMURA K., HIRAJIMA T. & SVOJTKA M. (2009a): The Pressure–Temperature Path and the Origin of Phlogopite in Spinel–Garnet Peridotites from the Blanský les Massif of the Moldanubian Zone, Czech Republic. – *Journal of Petrology*, 50, 10: 1795–1827.

NAEMURA K., HISASHIMA H., HIRAJIMA T. & SVOJTKA M. (2009b): An ultrahigh-pressure metamorphic condition obtained from a new-type of garnet-pyroxenite in the Horní Bory granulite of the Bohemian Massif. – *Journal of Mineralogical and Petrological Sciences*, 104, 3: 168–175.

NAEMURA K., DUNKLEY D., USUKI T., HIRAJIMA T. & SVOJTKA M. (2009c): U-Pb dating of zircon from the Plešovice peridotite and its host granulite in the Moldanubian zone of the Bohemian Massif. – *116th Annual Meeting of the Geological Society of Japan, Geological Society of Japan, Okayama, September 4 – 6. Abstract volume*: 146. Okayama.

NAEMURA K., IKUTA D., KAGI H., ODAKE S., UEDA T., OHI S., KOBAYASHI T., HIRAJIMA T. & SVOJTKA M. (2010): Diamond and other mineralogical records of very deep origin in spinel-garnet peridotite from Moldanubian Zone, Bohemian Massif. – *2010 AGU Fall Meeting, American Geophysical Union, San Francisco, December 13 – 17. EOS, Transactions, American Geophysical Union*: 200–201. San Francisco.

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NAKAMURA D., KOBAYASHI T., SHIMOBAYASHI N., SVOJTKA M. & HIRAJIMA T. (2010): Sr-sulphate and associated minerals found from kyanite-bearing eclogite in the Moldanubian Zone of the Bohemian Massif, Czech Republic. – *Journal of Mineralogical and Petrological Sciences*, 105, 5: 251–261.

NAKAMURA D., SHIMOBAYASHI N., USUKI T., HIRAJIMA T. & SVOJTKA M. (2011): Conflicting garnet zonings preserved in UHP-UHT eclogite from the Moldanubian Zone (Nové Dvory, Czech Republic). – *In*: LEXA O. (Ed): *9th International Eclogite Conference 2011, Charles University, Institute of Geology ASCR, Czech geological Survey, Mariánské Lázně, August 6 – 9. Abstract volume*: 51–52. Praha.

SVOJTKA M., ACKERMAN L. & JELÍNEK E. (2011): Trace element geochemistry by laser ablation ICP-MS of mantle pyroxenites from the Bohemian Massif, Czech Republic. – *In*: LEXA O. (Ed): *9th International Eclogite Conference 2011, Charles University, Institute of Geology ASCR, Czech geological Survey, Mariánské Lázně, August 6 – 9. Abstract volume*: 72–73. Praha.

SVOJTKA M., SLÁMA J. & KOŠLER J. (2009): Laser Ablation ICP-MS U-Pb Dating and Hf Isotopic Measurements of Granulite Facies Rocks from the Southern Part of Bohemian Massif (Czech Republic). – *AGU Fall Meeting 2009, American Geophysical Union, San Francisco, December 11 – 18. EOS, Transactions, American Geophysical Union*: 237–238. San Francisco.

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SVOJTKA M., KOBAYASHI T. & HIRAJIMA T. (2011a): Garnet-Rich Gneisses (Kinzigites) of the Lhenice Shear Zone, Ktiš Quarry. – *Geolines*, 23: 95–99.

SVOJTKA M., HIRAJIMA T., VRÁNA S. & NAEMURA K. (2011b): Granulite and Garnet Peridotite, Plešovice Quarry, 5 km NNE of Český Krumlov. – *Geolines*, 23: 93–95.

USUKI T., LAN C., IIZUKA Y., NAKAMURA D., SVOJTKA M. & HIRAJIMA T. (2011): Garnet-clinopyroxene barometry for high-pressure mafic granulites from southern part of the Bohemian Massif, Czech Republic. – *In*: LEXA O. (Ed): *9th International Eclogite Conference 2011, Charles University, Institute of Geology ASCR, Czech geological Survey, Mariánské Lázně, August 6 – 9. Abstract volume*: 75–76. Praha.

Grant-in-aid internal program of international cooperation projects Academy of Sciences of the Czech Republic, 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 purpose of correlation of the middle Lochkovian conodont successions in key localities of peri-Gondwana is to establish a common preliminary refined biostratigraphical subdivision that can serve as a basis for a fine conodont-based correlation in the peri-Gondwanan areas of Europe and North Africa. Middle Lochkovian conodont faunas in neritic environments are mainly cosmopolitan and facilitate global correlations. They are chiefly composed of 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 (Spain; Czech Republic and Carnic Alps in Austria) the *Icriodus* and *Pelekysgnathus* record is also remarkable and can help in increasing the detail of correlations. *Ancyrodelloides* was traditionally the dominant ubiquitous middle-Lochkovian genus in neritic sediments, and the three-fold Lochkovian subdivision was mainly based on the occurrences and evolution within the genus. After the subsequent introduction of the genus *Lanea* (Murphy & Valenzuela-Ríos), part of the previous *Ancyrodelloides* stock was included in the new genus *Lanea*, and these two genera form the basis for the detailed biostratigraphical subdivision of the middle part of the Lochkovian. The Pyrenean set of sections exhibit the most complete and sequential record of these two genera and of the other relevant taxa afore-mentioned (*Flajsella, Masaraella, Pedavis, Kimognathus, Icriodus* and *Pelekysgnathus*) that permitted the establishment of one of the finest biostratigraphical subdivision of the interval. The validity of this subdivision has been confirmed also in the Carnic Alps and in the Prague Synform respectively, although the sequences in these relevant areas are currently not as complete as in the Pyrenees. The Prague Synform displays continuous successions of the Lochkovian strata, however, as yet no specimens of *Flajsella* have been identified and the frequency of occurrence of *Lanea* is lower there. The sequence in the Carnic Alps is more complete but still less diverse for the *Ancyrodelloides*, *Masaraella* and *Pedavis* genera.

Presence of more endemic genera (*Icriodus* and *Pelekysgnathus*) together with the more cosmopolitan faunas mentioned above supports interfacial correlations (benthonic-neritic) with other relevant areas as Celtiberia, Brittany and Morocco. In summary, the combined study of sections in three key regions, Pyrenees, Carnic Alps and Prague Synform, shows consistent stratigraphical distribution of cosmopolitan taxa, supporting the establishment of a fine biostratigraphical subdivision upon which detailed correlations can be based. This study amplifies the middle Lochkovian correlation net as well.

Grant-in-aid internal program of international cooperation projects Academy of Sciences of the Czech Republic, 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)

Due to three months support in 2012, we have completed fieldwork and a petrological study of the main lithological types of pyroxenites from the Moldanubian Zone and Kutná Hora Complex. Determinations of trace elements in minerals (garnet, clinopyroxene and orthopyroxene) were done using laser ablation system (New Wave UP-213) connected with mass spectrometer (ICP-HRMS Element 2). We have also documented photo images of these minerals by scanning microscope TESCAN Vega 3. In a clean laboratory, we have made analytical work on the preparation of Lu- Hf isotope spike (precisely defined quantity standard of known isotopic composition).

4b. Czech Science Foundation

Finished projects

No. 205/09/0184: **Small mammals at time of the middle Pliocene faunal turnover: aspects of faunal and phenotypic rearrangements in Central Europe** (*J. Wagner*, *S. Čermák*; I. Horáček, O. Fejfar, Faculty of Science, Charles University, Praha, Czech Republic; 2009–2012)

The constitution of modern faunal assemblages starts at the beginning of the Pliocene, after the salinity crisis in the Upper Turolian, the first Neogene peak of aridization well evident in all northern Hemisphere. After the first humid phase covering the most part of the Ruscinian, there were several aridization waves documented in faunal assemblages throughout Europe. This trend of aridization climaxed near the boundary MN16/17 (approximately the base of Gellasian), when the loess sedimentation, i.e. the beginning of glacial cycles, can be recognized in northern Hemisphere.

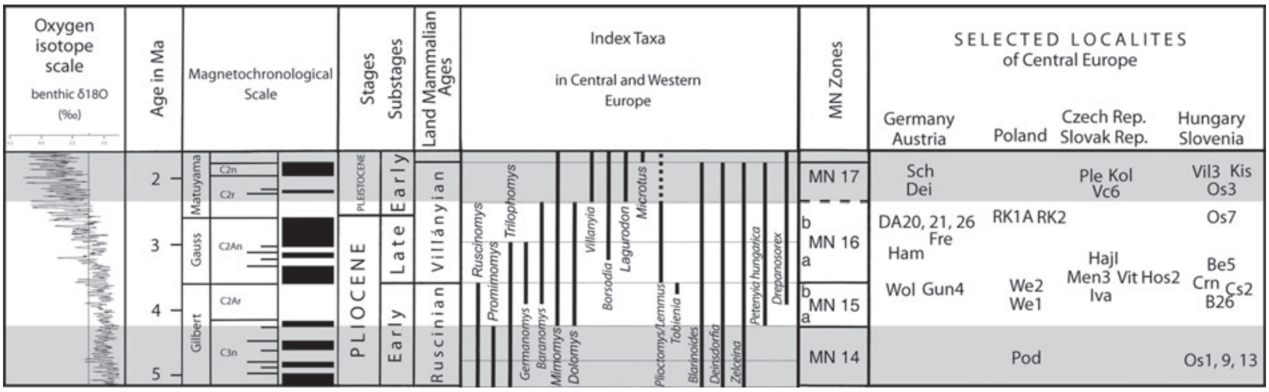
These global environmental changes are well documented in the evolution of the mammalian communities. This evolution can be recognized on the both, species and assemblage level, nevertheless in different dynamics. Taking into an account the recent knowledge on general trends of adaptation to increasing of aridity/cooling, the more northern faunas could play a more substantial role in forming of specific adapted lineages.

From this point of view, the Central European record represents a very important source of information. The project extended our knowledge of the history of mammalian communities and several model taxa during the Early to Late Pliocene in Central Europe and opened a possibility of a detailed paleobiogeographical comparison. We analyzed the patterns of faunal rearrangements during the Early/Late Pliocene boundary of the mid-European faunal development (biozones MN15–MN16). Extensive field excavations supplemented the mammalian fossil record of that stage with a large new material (sites Měňany 3, Hosťovce 2, Vitošov etc.). The material was analyzed with the aid of several morphometric techniques and compared with corresponding materials from other 14 Pliocene sites of Central Europe.

In particular, we focused mainly on the stratigraphically and paleobiogeographically important/interesting taxa of rodents and lagomorphs. In the case of paleoecological or paleobiogeographical problems, we reflected also the situation in selected large mammal taxa. The main results can be grouped as followed.

(1) **Lagomorpha**. All three families of lagomorphs recorded in the Central European Pliocene were revised in detail. The type series of *Prolagus bilobus* and *P. osmolskae* as well as additional material of *Prolagus* from Gundersheim-Findling and Gundersheim-fissure 4 were revised. Both species were synonymized and belonging to the former one broadly distributed in northern part of Central Europe (Čermák & Angelone 2013). The new interpretative taxonomic model for Late Miocene to Pliocene Prolagidae for Central and Eastern Europe were proposed (Čermák et al. 2012a). In the family Leporidae, the genera *Trischizolagus*, *Pliopentalagus*, and *Hypolagus* were studied. The westernmost occurrence of *Pliopentalagus dietrichi* and *Trischizolagus dumitrescuae* were proved, and a new model explaining their geographical distribution was presented (Čermák & Wagner 2013; see also Flynn et al. in review). The revision of genus *Hypolagus* concerned the taxonomical and stratigraphical reinterpretation of Central European fossil record and a new species was established (Čermák 2009; Čermák et al. 2012b). Among the leporids, *Hypolagus* is the only genus overstepping the Early/Late Pliocene boundary in Central Europe. Within Ochotonidae, based on the revision of most name-bearing specimens from respective period as well as extensive material obtained from the new excavation in Ukraine and Central Europe, a revision of Late Miocene to Early Pleistocene taxa from Eastern and Central Europe was realized (Čermák 2010).

(2) **Arvicolidae and Cricetidae**. These families traditionally yield biostratigraphically the most important taxa. The newly excavated locality of Měňany 3 yielded a rich arvicolid assemblage (more that 1 500 teeth) allowing us to refine essentially our understanding of evolutionary changes within *Mimomys*-lineages on the Early/Late Pliocene boundary. On the basis of newly excavated material and its comparison with personally obtained data from other Pliocene (MN15b–16b) locality in Central Europe we described in detail the changes in the *M. gracilis-stehlini*



■ Fig. 5. The updated Pliocene record of small mammals in Central Europe; localities and stratigraphic distribution of index taxa. Explanations: Be5 – Beremend 5; Be26 – Beremend 26; Cs2 – Csarnóta 2; Crn – Črnotiče II; Dei – Deinsdorf; DA 9, 20, 21, 26 – Deutsch-Altenburg 9, 20, 21, 26; Fre – Frechen; Gun4 – Gundersheim 4; HajI – Hajnáčka I; Ham – Hambach; Hos2 – Hosťovce 2; Iva – Ivanovce; Kis – Kisláng; Kol – Kolíňany; Men3 – Měňany 3; Os1, 9, 13 – Osztramos 1, 9, 13; Os3 – Osztramos 3; Os7 – Osztramos 7; Ple – Plešivec; Pod – Podlesice; RK1A – Rębielice Królewskie 1A; RK2 – Rębielice Królewskie 2; Sch – Schernfeld; Vc6 – Včeláre 6; Vil3 – Villány 3; Vit – Vitošov; We1 – Węże 1; We2 – Węże 2; Wol – Wölfersheim. Original.

lineage and newly established similar trends also in the *M. hassiacus*-lineage (Čermák et al. in prep.). With the exception of the FAD of *Lemmus* for Central Europe at the Hosťovce 2 locality (early MN16a), no other changes were found either in arvicolid/cricetid assemblages or in particular phyletic lineages.

(3) **Muridae**. The studies of murids concentrated on the problem of taxonomic status and phyletic relationship of taxa traditionally classified within the genus *Micromys*. We firstly revised the type series of *M. praeminutus* (MN15b, Csarnóta 2) and included in the study also most other material from MN15b to Q1 from Central Europe (Horáček et al. 2013). We concluded, on the basis of a detailed morphometric comparison of fossil and living forms, that the European fossil record (from Late Miocene to Early Pleistocene) represents an independent evolutionary lineage (with respect to the living and fossil East Asiatic forms), which is possibly congeneric with Late Miocene genus *Parapodemus*.

(4) **Biogeography**. An interesting problem is a sudden occurrence and short presence of *Pliopentalagus*, a rabbit genus with a possible affinity to South East Asia (*cf.* recent genus *Pentalagus*), in Central Europe at Early/Late Pliocene boundary (Ruscinian/Villányian). When we look at the history of mammalian faunogenesis during the Pliocene and Pleistocene in whole, we can identify similar events of South Asiatic elements immigration also at other important faunal boundaries (Villányian/Biharian, Biharian/Toringian). We therefore suppose that these immigration events are not accidental but are correlated with fundamental rearrangement of intra-assemblage links connected with important faunal turnovers (Wagner et al. 2012).

In general, the faunal dynamics of the MN15b to MN16 period in Central Europe appears to be characterized by a considerable stability with a clearly pronounced effects of local faunal provincialism. We found no clear support for a strict delimitation of subzones MN16a and MN16b, and, correspondingly, also the MN15/MN16 boundary was found to be only faintly pronounced and accompanied rather by gradual transitions both in phenotypic trends and community structure than the episodical faunal events (Fig. 5).

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ČERMÁK S. (2010): The Late Miocene and Pliocene Ochotoninae (Lagomorpha, Mammalia) of Europe – the present state of knowledge. – *In:* D. Nowakowski (Ed.): *Morphology and systematics of fossil vertebrates*: 9–28. DN Publisher. Wrocław.

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.

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No. 205/09/1170: **Upper mantle beneath neovolcanic zone of the Bohemian Massif: xenoliths and their host basalts** (*P. Špaček, Institute of Geophysics of the ASCR, v. v. i., Praha, & L. Ackerman, J. Ulrych*; 2009–2012)

Sampling and geochemical analyses of selected mantle xenoliths and their host basalt were completed within the framework of grant proposal work in period 2009–2012. During the project, a close co-operation was established with Gordon L. Medaris (University of Wisconsin-Madison, USA), Ernst Hegner (University München, Germany) and Kadosa Balogh (Hungarian Academy of Sciences, Hungary) to co-ordinate the research and provide analytical data.

(1) **Sampling**. Large representative populations of samples proved to be crucial for a correct assesment of the sampled mantle domains and necessary for finding the rare lithotypes which may nevertheless have high importance for the assessment of mantle petrology.

We performed on-site reconnaissance of ~40 localities and sampled all the sites where mantle xenoliths were available. We constituted a collection of >300 xenolith samples from localities in the Czech Republic (Brtník, Číhaná, Dobkovičky, Hlupice, Kozákov, Kraslice, Krásný Les, Kuzov, Mezina, Partyzánský vrch, Prackovice, Prachov, Provodín, and Zebín), Poland (Lutynia, Wilcza Gora) and Germany (Zinst, Hirschentanz and Teichelberg). Approximately 150 thin sections were made from representative or specific samples for further chemical, isotope and structural analyses. More than 30 representative samples of volcanic rocks were taken at selected sites for chemical and isotope analyses and dating.

(2) **Chemical analyses**. More than 60 mantle xenoliths of peridotite and pyroxenite were studied in detail on electron microprobe, and mineral chemistry was determined. In these samples the equilibration temperatures were calculated from mineral compositions using several geothermometers. Whole-rock major (wet analyses) and trace element (ICP-MS) compositions were obtained for selected samples (> 40 samples). Clinopyroxenes (12 samples) and compositional profiles through the symplectites (4 samples) were analyzed for trace element contents (REE, Y, Rb, Sr, Ba, Zr, Hf, Nb, Ta, U, Th) by laser ablation ICP-MS (LA-ICP-MS). From several samples of peridotite (NE Bavaria, České Středohoří Mts.) and pyroxenite, Sr-Nd isotopic compositions were analyzed. Twenty samples of peridotite xenoliths from NE Bavaria (Zinst, Hirschentanz, Teichelberg) were also analysed for Li isotopic compositions.

More than 60 samples of xenolith-bearing volcanic rocks were analyzed for major/trace element (REE, Y, Rb, Sr, HFSE, Ni, Co, U, Th etc.) contents and Sr-Nd isotope composition, and have been dated by K-Ar method when necessary.

Major and trace element compositions of mineral inclusions in placer zircons from the Ohře/Eger Rift were analyzed using a microprobe.

All data were used: (1) for the overall geochemical characterization of the mantle rocks (partial melting *vs.* metasomatism) and volcanic rocks (the nature of magma sources, the role of fractional crystallization and/or assimilation-fractional crystallization; (2) to establish K-Ar ages of selected volcanic rocks and their position within Neogene-Quaternary volcanism of the Bohemian Massif Neovolcanic zone; (3) to decipher the nature of mantle pyroxenite xenoliths and their association to peridotites; (4) to describe local styles of metasomatism and its effected on major/trace element and Sr-Nd-Li isotopic geochemistry, and (5) to decipher the sources of placer zircons in Ohře/Eger Rift and their relationship to alkaline magmatism and provide new data on the composition of Sr-pyrochlore.

Research highlights are as follows:

(1) **Geochemistry and petrology of pyroxenite xenoliths from Cenozoic alkaline basalts, Bohemian Massif**. Pyroxenites occur as rare, but important, mantle xenoliths within Cenozoic volcanic rocks of the Central European Volcanic Province (CEVP). Petrography, geothermobarometry, mineral chemistry as well as clinopyroxene trace-element and Sr–Nd isotopic compositions of six pyroxenite xenoliths hosted by Tertiary–Quaternary volcanic rocks from Kozákov (NE Bohemia), Dobkovičky and Kuzov (Ohře/Eger Rift), and Lutynia (SW Poland) were studied. Three Kozákov xenoliths record a complex nature and evolution, with one websterite containing symplectite pseudomorphs after garnet which originated by exsolution from highly aluminous clinopyroxene. The composition of websterite from Dobkovičky suggests its origin as a cumulate from melt derived from a highly depleted mantle source with a composition similar to depleted MORB mantle (DMM). At Lutynia, composition of melt calculated to be in equilibrium with Lutynia websterite clinopyroxene is very similar to that in equilibrium with metasomatized amphibole-bearing peridotite. The results are summarized in Ackerman et al. (2012).

(2) **Quaternary volcanism in the Bohemian Massif and implications for the upper mantle**. Several localities of Plio-Pleistocene volcanism were studied in detail in terms of major/trace element geochemistry, Sr-Nd isotopic composition and K-Ar age. Our data have shown that volcanism took the place between 0.26 and 6 Ma. Two volcanic series were distinguished (basanitic and melilitic). The former is older and more primitive in terms of Sr-Nd isotopes, while the latter is younger and shows partly evolved Sr-Nd signatures. From the trace element composition it is clear that parent magmas underwent only very limited process of assimilation-fractional crystallization. Conversely, trace element variations in both series can be explained by mixing of asthenospheric and metasomatized mantle. The mantle xenoliths are extremely rare in Quaternary volcanics, but it is clear that mantle composition is different in Western Bohemia (metasomatized) from that in the Northern Moravia (depleted).

(3) **Melting and alkaline-carbonatitic metasomatism of NE Bavaria upper mantle xenoliths**. Upper mantle xenoliths from NE Bavaria (Zinst, Hirschentanz, Teichelberg) record a complex history. Some xenoliths from Zinst contain unique, fine-grained symplectites pseudomorphing garnet. We worked on detailed petrographic descriptions, major and trace element compositions of whole-rock samples and individual mineral phases and

Sr–Nd–Li isotopic compositions for a suite of mantle xenoliths in order to assess the conditions of origin and subsequent history of subcontinental lithospheric mantle. Additionally, major and trace element data as well as Sr-Nd-Li isotopic compositions and K-Ar ages for host basalts were used to discuss possible relationship between xenoliths and host basalts. Our results for the xenoliths suite from NE Bavaria suggest variable melting degrees in the spinel stability field and subsequent enrichment of the xenoliths by alkali-rich melts resulting in both cryptic as well as modal metasomatism, the latter being evidenced by carbonate-bearing melt pockets present in some xenoliths. We argue that the source of infiltrating melt is most likely peridotite with important contribution of recycled crustal material such as eclogite.

(4) **Chemical heterogeneity of the sub-volcanic upper mantle beneath the Bohemian Massif**. The analyses of xenolith suites and host basalts show a significant variability of their chemical composition. Xenoliths of the České středohoří Mts. and Krušné hory Mts. are mostly strongly depleted (harzburgites/dunites with olivine #Mg of 89.6 to 90.9) while xenoliths from German localities are characterized by lherzolites. This points to the chemical heterogeneity of the lithospheric upper mantle beneath the Ohře Rift and contrasting processes of its evolution in different areas or periods. We studied in detail spinel-bearing peridotite mantle xenoliths from central (České Středohoří Mts. – Dobkovičky, Kuzov, Prackovice) and eastern (Brtníky) parts of the Ohře/Eger Rift to provide more details on mantle composition beneath the rift. The xenoliths from Dobkovičky have predominantly composition of harzburgite and coarse-grained texture with common signs of host lava infiltration and hydrothermal alteration. The Kuzov lherzolites have equigranular texture, while the Prackovice lherzolites exhibit partially serpentinized coarse-grained texture. Lherzolite xenoliths from Brtníky have a porphyroclastic texture with large clinopyroxene and orthopyroxene grains. Spinel forms symplectites with pyroxenes or rarely also Al-rich rounded inclusions on silicate grain boundaries. The equilibrium temperatures were calculated using several geothermometers obtaining the best reliable results with two-pyroxene geothermometer. Calculated temperatures varied from 850 to 1,062 °C for xenoliths from the České Středohoří Mts. localities and between 869 and 940 °C for xenoliths from Brtníky. The mineral composition and whole-rock geochemical analyses show a highly refractory character of the studied mantle xenoliths. Trace element contents are highly variable and show depleted nature of mantle peridotite in case of compatible elements, but strong enrichment in incompatible elements. These geochemical patterns suggest that upper mantle underwent variable partial melting degrees during melt extraction and subsequent metasomatism most likely by basaltic melt.

Isotopic Sr-Nd analyses of host basalts from the České středohoří Mts. show relatively significant variation, too. Basalts from the western part of the region (Kuzov and Medvědí vrch) have lower values of epsilon Nd (+3.3–3.6) than the basalts of central part of the region (epsilon Nd of +4.2–4.6). Taking into account the calculated model ages of Nd it seems that the magmas were derived from sources with different isotopic ratios of Nd.

(5) **Mineral inclusions in placer zircon from the Ohře (Eger) Graben: new data on "strontiopyrochlore"**. From the set of of 80 zircon megacrysts from alluvial placers of the Cenozoic alkali basalt area of northern Bohemia and southeastern Saxony, three representative megacrysts from the Podsedice deposit were selected for an in-depth study of inclusion minerals. The genetically most interesting inclusion species is "strontiopyrochlore", for which its presence within areas of zircon oscillatory zoning suggests a magmatic origin. This mode of origin contrasts with the previous observations indicating the formation of "strontiopyrochlore" as strictly secondary mineral in altered carbonatite. The Sr concentration of "strontiopyrochlore" from Podsedice varies between 7.4 and 12 wt.% SrO (i.e. 29–48 at.% Sr of the total A-site cations). The infiltration of late- or post-magmatic Fe-rich hydrothermal fluids caused a partial substitution of Nb^{5+} by Fe^{3+} in the B-site of the pyrochlore structure. The results are summarized in Seifert et al. (2012).

(6) **Garnet breakdown in peridotite xenoliths from Zinst, Bohemian Massif.** Garnet (Grt) decomposition was documented in mantle xenoliths from Zinst (Bavaria, Germany) containing complex, fine-grained, zoned Opx-Sp-Plg symplectites representing garnet pseudomorphs. These were studied in a detail to understand the relative timing and mechanisms of garnet breakdown in the sub-volcanic upper mantle. The current research suggests the multi-phase process including: (1) the pre-volcanic, relatively slow reaction Ol+Grt→Opx+Cpx+Sp related to lithospheric thinning in Tertiary or lithospheric thinning/underplating in the Permian; (2) high-temperature (1,200–1,300 °C) isochemical breakdown of Grt to Al-Opx+Al-Sp+An symplectite, most likely related to the underplating of the sampled mantle by Na-rich (carbonate-rich) magmas in the Oligocene, and (3) syn-volcanic (Oligocene), isochemical breakdown of Grt to Al-Opx+Al-Sp+An ultrafine-grained symplectite + local penetration of basanite magma into xenoliths and related transformations of symplectites. Element transfer during garnet decomposition was studied by the *in situ* LA-ICP-MS analyses. In general, laser ablation profiles from cores (Zone IV) to rims (Zone III) reveal significant LREE (La, Ce, Pr, Nd), LILE and other trace element (e.g., Li, U) enrichment coupled with Zr-Hf depletion towards the rims. These chemical features, as well as microstructural observations, suggest that garnet decomposition was likely associated with the introduction of mantle-derived melts and/or fluids.

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No. P210/10/1105: **Trace elements in igneous quartz – frozen information about silicate melt evolution** (*K. Breiter, M. Svojtka, L. Ackerman, Z. Korbelová, J. Leichmann & K. Švecová, Masaryk University Brno, Czech Republic*; 2010–2012)

The aim of this project was the utilization of the chemical composition of magmatic quartz to better understand the genesis of Variscan granites and rhyolites in the Bohemian Massif. The chemistry of rock-forming minerals, such as quartz, feldspar and mica often reveals detailed information about crystallization processes and fractionation trends of granites, while the concentration of trace elements in minerals is controlled by their abundance in the melt, the thermodynamic conditions in the system, and the partitioning between different phases. However, feldspars and micas are commonly altered due to late- to post-magmatic interaction with late-magmatic and hydrothermal fluids. Quartz is more resistant in this environment, with the consequence that the magmatic trace-element signature is commonly preserved (e.g., Müller et al. 2010). Thus quartz and chemical composition provide detail information about pT and chemical evolution of silicic magma.

The trace element concentrations in quartz were determined in polished quartz section (> 150 μm thick) at the Institute of Geology of the ASCR, v. v. i. using a Thermo-Finnigan Element 2 sector field ICP-MS coupled with a 213-nm NdYAG laser (New Wave Research UP-213). The laser was fired at a repetition rate of 20 Hz, the laser energy was 8–10 $J.cm^{-2}$, 55 to 100 μm beam size was used, and laser patterns were 100 μm in length. The ablated material was transported by a high-purity He gas from the laser ablation cell at a flow rate of 0.8–0.9 $l.min^{-1}$. Data for the gas blank were acquired at 35 s followed by 100 s for the laser ablation signal. The washout time between the measurements of the individual laser spot lines was 90 s.

The optimal laser speed was tested and stabilized by scanning a 1-micron laser beam across the quartz sample surface. The sample introduction system was modified to enable the simultaneous nebulization of a tracer solution through an Aridus IITM desolvating nebulizer (CETAC Technologies) and a T-piece tube attached to the back end of the plasma torch. This setup allows the instrument to be tuned appropriately. The formation of oxides (MO+/M+) was monitored using a U solution (concentration of 300 ppt). The measured $^{254}UO/^{238}U$ ratio was typically less than 0.005. During the laser ablation analyses, the natural ^{205}Tl was used in the tracer solution, which was aspirated to the plasma in an argon-helium carrier gas mixture. The following isotopes were measured at the low mass resolution mode (m/Δm = 300): ^{7}Li, ^{9}Be, ^{11}B, ^{74}Ge, ^{85}Rb, ^{88}Sr, ^{93}Nb, ^{137}Ba, ^{118}Sn and ^{208}Pb, while ^{23}Na, ^{27}Al, ^{31}P, ^{47}Ti, ^{52}Cr, ^{55}Mn and ^{56}Fe required a medium resolution (m/Δm = 4,000). These individual isotopes and associated resolutions were selected to distinguish the potential interferences (e.g., argides, oxides and nitrides) on the corresponding masses. All of the data were calibrated against the external standard of synthetic silicate glass NIST SRM 612. The relative 1 sigma error ranges between 5 and 15 % for most detected elements. The time-resolved signal data were processed using the Glitter software (http://www.glitter-gemoc.com/).

Within the Bohemian Massif, several contrasting types of granitoid plutons of Variscan (ca 350–310 Ma) age occur (Cháb et al. 2010). The studied samples combine the differences resulting from the parental magma composition, with the differences caused by melt fractionation, contamination, mixing and other processes. Quartz from the following main types of Variscan granitoid plutons in the Bohemian Massif was collected and analyzed: (1) Central Bohemian Pluton (CBP) – I-type pluton composed of tonalites, granodiorites and granites; (2) Central Moldanubian Pluton (CMP) – typical two-mica granites of S-type; (3) Rozvadov Pluton – peraluminous S-type granite with standard two-mica, fractionated zinnwaldite granites and unusual biotite-cordierite tonalite, and (4) Teplice caldera – A-type volcano-plutonic system composed of Teplice rhyolite and Cínovec granite.

Altogether, we performed more than 300 analyses of igneous quartz.

For interpretation we compared our new data also with the previously published data from the peraluminous Nejdek pluton in the western Krušné hory/Erzgebirge and A-type granites of the Hora Svaté Kateřiny stock, central Krušné hory/Erzgebirge (Breiter & Müller 2009).

According to contents of Al and Ti (Fig. 6a), quartz from Bohemian Variscan granitoids can be subdivided into four groups, which more or less correspond to geochemical nature of the plutons: (1) Quartz from all suites of the I-type CBP is characterized by relatively low Al contents in the range of 35–161 ppm (mostly 20–80 ppm) and a relatively wide spread of Ti contents of 29–143 ppm (mostly 40–100 ppm). Differences among individual suites are expressed in different Ti contents; (2) Common S-type two-mica and muscovite granites (CMP) and moderately fractionated facies of the S-type Nejdek Pluton contain quartz enriched in Al (mostly 100–200 ppm and 300–500 ppm, respectively). Contents of Ti (mostly 40–100 ppm) are similar to group 1. Geochemical evolution within these plutons is expressed mainly in decrease of the Ti contents; (3) Quartz from less to moderately fractionated A-type rhyolites and granites from the Teplice caldera is characterized by Al contents of 100–250 ppm and low Ti of 10–60 ppm. Magmatic evolution is characterized by a strong depletion in Ti and a moderate increase in Al contents; (4) Highly fractionated facies of the S-type granites (e.g., Waidhaus granite in the Rozvadov Pluton, Podlesí stock in the Nejdek Pluton) and the A-type granites (Hora Svaté Kateřiny stock) have quartz that is strongly enriched in Al with contents from ~300 to more than ~1,000 ppm, but substantially depleted in Ti with contents mostly below 20 ppm.

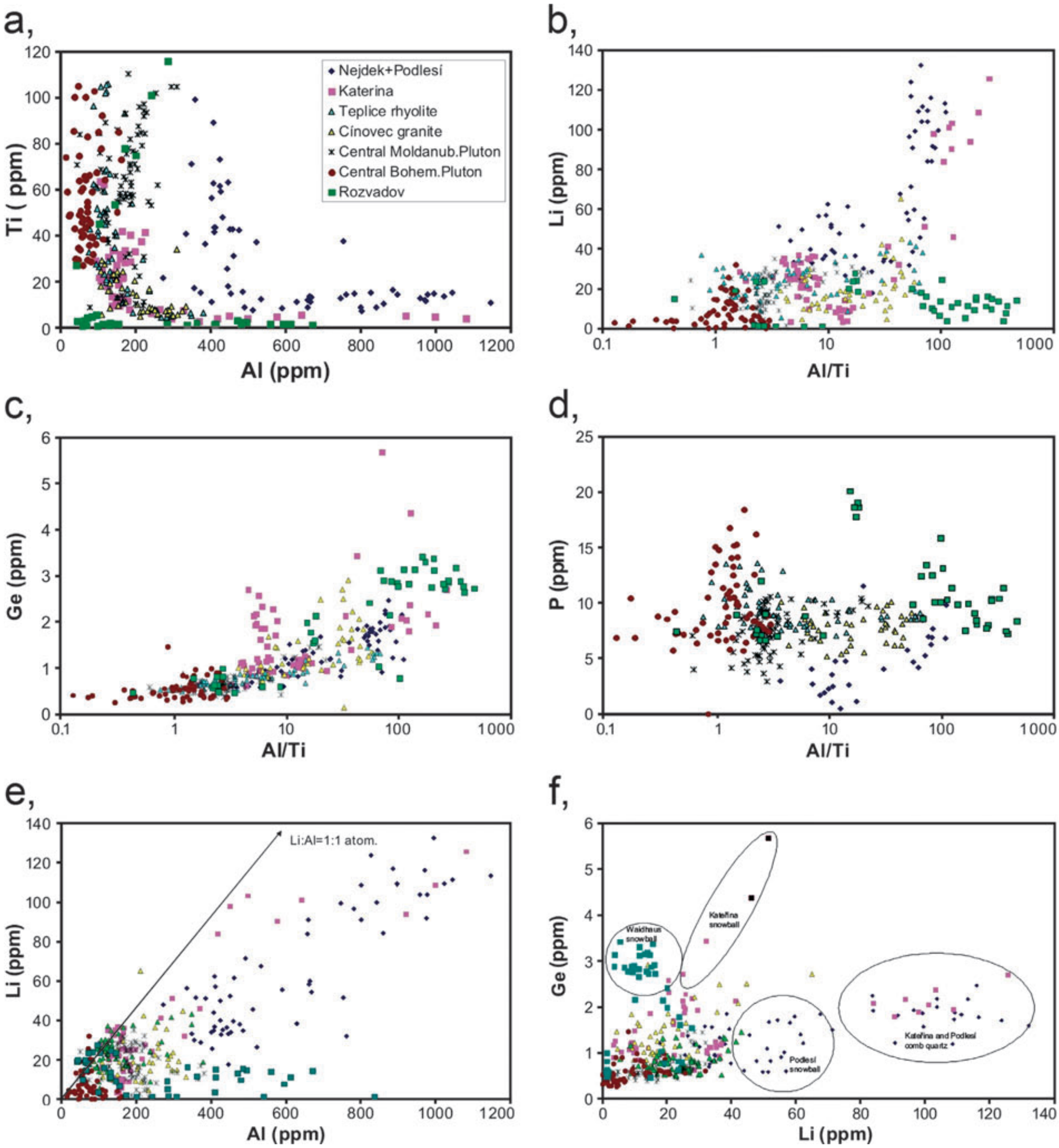
Because the Al/Ti ratio in quartz is a good indicator of the parent melt degree of fractionation (e.g., Jacamon & Larsen 2009), this ratio is used as a basis for visualizing the behavior of other analyzed elements during the fractionation of individual plutons.

The contents of Li in quartz vary over a wide range (Fig. 6b). The lowest contents were found in the Sázava- and Blatná-suite granitoids of the CBP (means 3.8 and 3.1 ppm, respectively) and in the cordierite-bearing tonalite Kolerda from the Rozvadov Pluton with 1.4 ppm Li. However, the most common contents of Li range from 13–27 ppm. In comparison, Li concentrations in the range of 39–60 ppm are characteristic for all peraluminous granites from the Nejdek Pluton.

Beryllium contents are generally very low with mean concentrations in the range between 0.10 and 0.92 ppm found in peraluminous granites from Nejdek Pluton, Rozvadov Pluton and the two-mica Čímĕř- and Eisgarn-type granites of the CMP. The highest Be values with the of mean 0.92 ppm were found in the stockscheider from Podlesí. In other granites studied, Be contents were usually below the detection limit of 0.12 ppm.

The rubidium contents from the majority of minor/moderate evolved granitoids is less than 0.25 ppm Rb. Slightly elevated levels were found in three samples from the Nejdek Pluton with the means of 2.0–3.5 ppm, in the Waidhaus granite from the Rozvadov Pluton (mean 0.89 ppm Rb) and in one of the granite porphyry dykes in the CMP with the mean of 1.1 ppm Rb.

Crystalochemically, Ge is similar to Si, but its much lower content in the Earth's crust results in low Ge contents in quartz (Fig. 6c). The lowest contents were found in the Sázava and Blatná suites from the CBP (0.46 and 0.40 ppm, respectively). In contrast, the highest contents were found in two samples from the strongly fractionated granites in the Nejdek Pluton



■ **Fig. 6.** Trace element contents in magmatic quartz from the studied plutons in the Bohemian Massif : (a) Al vs. Ti, (b) Al/Ti vs. Li, (c) Al/Ti vs. Ge, (d) Al/Ti vs. P, (e) Al vs. Li, line of atomic ration Li/Al = 1.1 according to proposed substitution $Si^{4+} \leftrightarrow Al^{3+} + Li^{+}$ is shown, (f) Ge vs. Li: note that early (comb) and late (snowball) populations of quartz from the strongly fractionated granites differ in their contents of Li and Ge. Comb quartz is relatively Li-enriched and snowball quartz is relatively Ge-enriched compared to quartz from "common" granites. Original.

(means 1.2 and 1.5 Ge) and in quartz from the peraluminous strongly fractionated facies of the Rozvadov Pluton (means 1.7 and 3.0 ppm Ge).

The contents of Fe in quartz vary in a wide range from <1 ppm to 500 ppm. However, most samples exhibit low Fe (means ≤7 ppm Fe), which are characteristic for all I-type granites of the CBP and S-type granites from the Rozvadov Pluton/CMP.

Phosphorus is capable of entering into crystal lattice of some alumosilicates in contents of over 1 wt.%, but this ability to enter into the quartz lattice is very limited (Müller et al. 2012). Most of the studied rocks have P contents in quartz in the range of ~6–10 ppm, with no differences among granites of different geochemical types (Fig. 6d).

Tin is present in a low concentrations with the means for individual samples in the range of 0.04–0.28 ppm Sn with the maximum found in the Říčany granite from the CBP.

The Li/Al ratio illustrates well the differences among the fractionation trends of individual plutons (Fig. 6e). Li correlates positively with Al in quartz from the fractionated granites of S-type (Nejdek-Podlesí) and A-type (Hora Svaté Kateřiny) with Li/Al atomic ratios of approximately 0.5. That means that approximately one half of the Al atoms in the quartz lattice are compensated with interstitial Li ($Si^{4+} \leftrightarrow Al^{3+} + Li^{+}$ substitution). The rest of the aluminum is probably compensated by ions H^{+}. Quartz from the S-type Waidhaus granite of the Rozvadov Pluton is strongly deficient in Li with respect to its Al content, while the data from the S-type CMP and the A-type rhyolites (Teplice caldera) are scattered.

The Ge vs. Li plot (Fig. 6f) demonstrates differences between late textural types of quartz from strongly fractionated granites. On one hand, while quartz from "primitive" granites contains 40 ppm Li and 1.5 ppm Ge at the most, the comb quartz from both S- and A-type granites is strongly enriched in Li and only moderately in Ge. On the other hand, groundmass quartz and snowball quartz are relatively poor in Li but strongly enriched in Ge in some plutons. Therefore, the Li contents are controlled by the order of crystallization; comb quartz crystallizes before Li-mica, and the groundmass- and snowball-quartz crystallize after. However, the mechanism controlling the Ge enrichment is not clear.

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No. P210/10/1309: **Behaviour of geochemical twins Al/Ga and Si/Ge in different types of acid silicate melts** (*K. Breiter*, *L. Ackerman*, *Z. Korbelová*, V. Kanický, T. Vaculovič & N. Kohoutková, Masaryk University Brno, Czech Republic; 2010–2012)

The aim of this project was to define Ga and Ge contents and establish the Al/Ga and Si/Ge ratios in different types of natural silicate melts (granitoids) and in major rock-forming minerals – quartz, feldspars, micas, and amphiboles. Till now, only very limited data about Ge and Ga contents in silicate mineral have been published (Shaw 1957, Bernstein 1985).

The contents of trace elements in minerals were determined in polished thin sections (150–200 ěm thick) or mineral grains using the LA-ICP-MS. This instrumental setup consists of the laser ablation system UP213 (NewWave Research, USA) and the ICP-MS Agilent 7500CE (Agilent, Japan) located in Department of Chemistry, Masaryk University Brno. Sample aerosol generated by ablation at the laser beam wavelength of 213 nm was transported by He carrier gas (1.0 $l.min^{-1}$) into the ICP source of the quadrupole mass spectrometer, which was equipped with a reaction-collision cell to suppress isobaric interferences. Ablation was performed at the laser beam fluence of 21 $J.cm^{-2}$, a laser spot diameter of 65 μm and a repetition rate of 10 Hz. The following isotopes were measured: ^{27}Al, ^{28}Si, ^{45}Sc, ^{56}Fe, ^{69}Ga, ^{71}Ga, ^{72}Ge, ^{74}Ge, ^{115}In, ^{118}Sn, and ^{205}Tl. Two isotopes for both gallium and germanium were measured to detect possible isobaric interferences. Measured isotopic ratios $^{69}Ga/^{71}Ga$ and $^{72}Ge/^{74}Ge$ were compared with natural abundance ratios to ensure that neither of the two isotopic pairs exhibited interferences. For quantification, ^{71}Ga and ^{74}Ge were employed due to their lower limits of detection (LOD). Calibration with normalization to the Si-content in particular mineral was performed using certified reference material NIST612.

Element abundances of major elements (Si, Al, Ti, Fe, Mg, Mn, Ca, Na, K, F and P) in minerals were determined using CAMECA SX100 microprobe in the Institute of Geology, Academy of Sciences of the Czech Republic, Praha, at an accelerating voltage and beam current of 15 kV and 10 nA, respectively, and a beam diameter of 2 μm.

The contents of Ge, Ga, In and Tl were analyzed in co-existing silicate minerals, namely quartz, plagioclase, K-feldspar and mica in typical samples from major plutons from Bohemian Massif: (1) the Central Bohemian Pluton (CBP) situated in the south-central part of the Czech Republic is a typical composite pluton of I-type; (2) the South Bohemian Pluton is a complex of Variscan peraluminous granites in southern Bohemia and northern Austria. The pluton is composed of several composite plutons; the largest are the Melechov Massif in the north, the Central Massif in the SE and the Plechý Massif in the SW; (3) the Nejdek Pluton is the most typical example of a strongly peraluminous rare metal-bearing plutons in the western Krušné

Hory/Erzgebirge area. Its evolution terminated in the extremely fractionated Podlesí stock with examples of layered rocks, unidirectional solidification textures and greisenization, and (4) Late-Variscan A-type volcano-plutonic complex of the eastern Erzgebirge (Altenberg-Teplice caldera) comprises comagmatic slightly peraluminous "Teplice rhyolite" and slightly younger rare metal granites of the Cínovec.

For comparison, we examined also typical granitoids from well-known pluton in Europe: (1) highly fractionated Variscan Li-P-F-rich Beauvoir Pluton (France); (2) highly fractionated Variscan Li-P-F-rich leucogranite from Argemela (Portugal), and (3) Proterozoic rapakivi-type Wiborg Batholith including fractionated Kimi stock (Finland).

Figures 7a and b show the contents of Ge and Ga in co-existing acid plagioclases (mostly albite) and mica of the biotite-zinnwaldite series. Contents of both elements in granites and their rock-forming minerals increase during fractionation: minerals from the geochemically less evolved Moldanubian Pluton are Ge- and Ga-poor, while minerals from highly fractionated ore-bearing plutons are often Ge- and/or Ga-enriched. Nevertheless, there is no general correlation between the two discussed elements. The highest Ge content in albite was found in the S-type Argemela granite (6–11 ppm), while the highest Ga content (60–100 ppm) was encountered in some samples from the Beauvoir Pluton and Wiborg Batholith.

In the case of mica, the highest content of Ge was found in zinnwaldite in the A-type granite from Cínovec (10–40 ppm); micas from all other studied plutons contain only 1–15 ppm Ge. On the contrary, the highest content of Ga was found in Fe-Li micas from the Nejdek Pluton (100–150 ppm) and the Wiborg Batholith (200–270 ppm) and also in muscovite from the Moldadnubian Pluton (up to 170 ppm). Also in mica, no general correlation between contents of Ge and Ga can be established. The only exception is the Cínovec Pluton with trend to enrichment in both Ge and Ga in the upper, most fractionated part of the cupola.

The Ga distribution between both co-existing feldspars shows that Kfs from Moldanubian Pluton contain slightly more Ga than associated albite-oligoclase. In all other studied plutons, albite contains more Ga than associated K-feldspar. Contents of Ge in both feldspars are similar in all studied plutons, from about 1 ppm in Moldanubian Pluton to 2–5 ppm in granites at Cínovec and Beauvoir.

Taking together, there is no principal difference in contents of Ge and Ga in rock-forming minerals from granites of S-, I- and A-type.

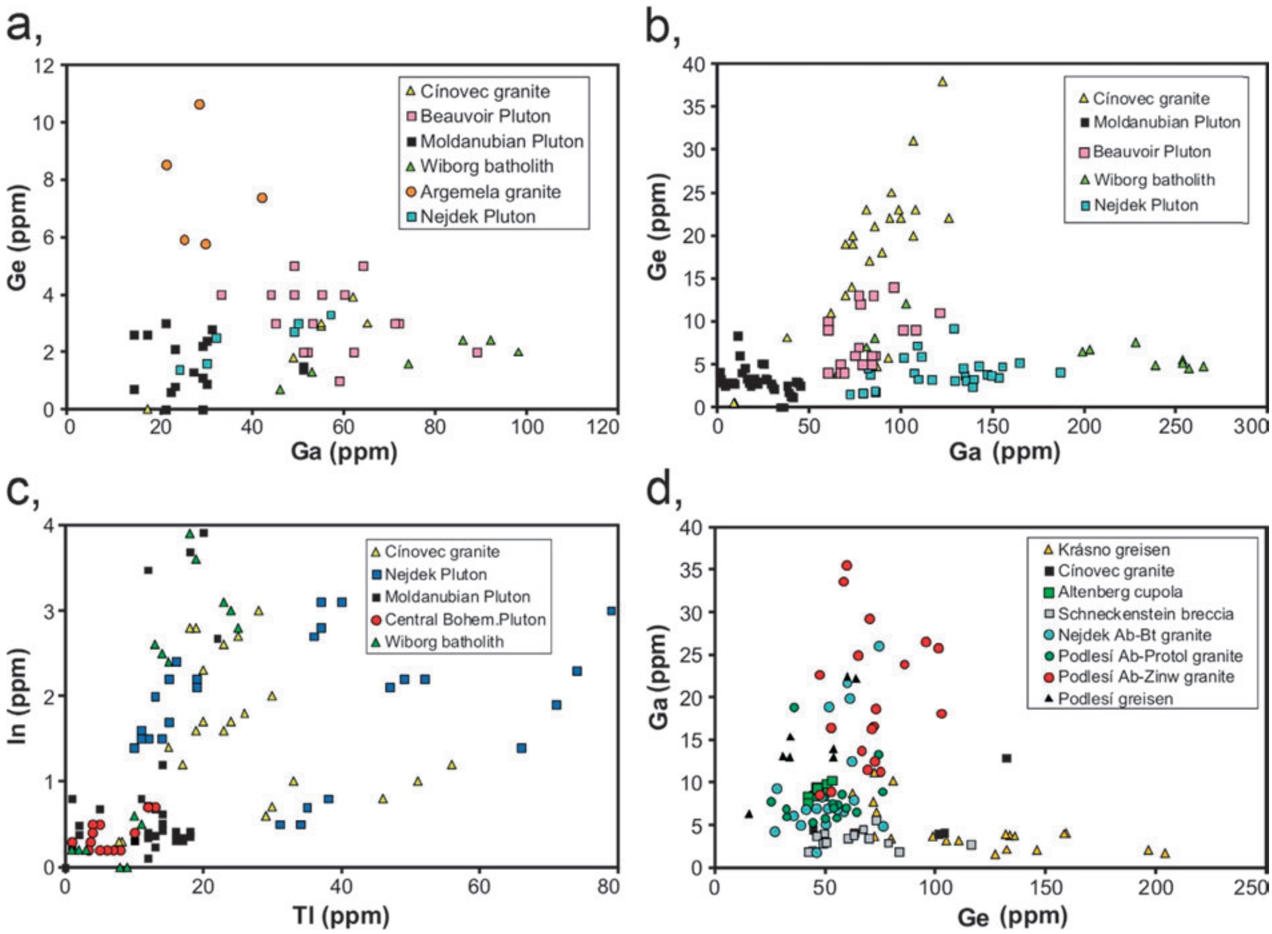

Fig. 7. Contents of Ge, Ga, Tl and In in the analyzed rock-forming minerals: a. contents of Ge and Ga in plagioclase; b. contents of Ge and Ga in micas of the biotite-zinnwaldite series; c. contents of Ge and Ga in topaz; d. contents of Tl and In in micas of the biotite-zinnwaldite series. Original.

Particular interest has been paid to the study of topaz. Topaz is a relatively common mineral component of complex pegmatites, fractionated fluorine-enriched granites and greisens created by their hydrothermal transformation, but data about the trace element contents of topaz are relatively scarce. Published data (review in Bernstein 1985) demonstrate the ability of topaz to concentrate primarily Ge and submissively also Ga. On the basis of ion size consideration, Ge^{4+} is expected to replace Si^{4+} in tetrahedral site while Ga^{3+} is expected to replace Al^{3+} in octahedral site (Goldschmidt 1954).

Analyzed samples represent the principal types of fractionated tin-bearing granites of S- and A-type from the Krušné hory/Erzgebirge Mountains and the products of their hydrothermal alteration (Breiter et al. 1999). All studied topaz grains are rich in F (17.9–19.8 wt.%, 1.73–1.90 apfu), and the most important minor/trace elements in topaz are P, Ge and Ga. Contents of P up to 1 wt.% P_2O_5 (0.025 apfu) was found in topaz from the strongly peraluminous P-rich magmatic systems at Podlesí. Regardless of its genetic type, topaz from granites usually contains 50–80 ppm Ge (Fig. 7c). The highest values (up to 200 ppm Ge) were found in topaz from quartz-topaz-apatite greisen in Krásno. In fractionated granites and greisens, topaz contains 24–88 % of bulk Ge-content of the rock. In contrast, topaz is not able to concentrate Ga. The Ga content of topaz (mostly 10–35 ppm in S-type rocks, <10 ppm Ga in A-type rocks) is usually lower than the bulk Ga-content of the rock. For other elements, values of up to 16 ppm Sc, 23 ppm Sn, and more than 400 ppm Fe were occasionally found. In fractionated granites and greisens, topaz contains 23–87 % of bulk Ge-content of the rock. In contrast, topaz is not able to concentrate Ga.

Along Ge and Ga, we analyzed in all minerals also for In and Tl, while data about contents of these elements in rock-forming minerals are rare (Shaw 1957). Thallium is geochemically similar to K, thus potassium-bearing minerals are the most important carriers of Tl in silicate rocks. Analyzed K-feldspars contain usually 10–30 ppm Tl, in Beauvoir up to 40 ppm Tl. Micas of biotite-zinnwaldite series contain up to 80 ppm Th. The contents of In in biotite increase from the I-type Central Bohemian Pluton (<1 ppm In) to micas from fractionated granites of all types (up to 4 ppm In, Fig. 7d).

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No. P210/10/1760: **Cryogenic cave carbonates: Mechanisms of formation and relationship to permafrost depth** (*K. Žák*, *M. Filippi*, *R. Živor* & *R. Skála*; 2010–2012)

The main project task was the study of coarse-grained cryogenic cave carbonates (further CCC, Fig. 8) formed in caves during freezing of karst waters, and their utilization as a tool for the estimation of former permafrost depths. The research done within this thee-year project followed the original project proposal, with several extensions into new sub-topics, which were originally not planned. Individual research activities can be divided into nine main research topics. They are listed in order of decreasing importance below.

1. The main project goal – study of CCC in caves of Central Europe and their use for estimation of the permafrost thickness during the Last Glacial was completely fulfilled. Extensive studies were realized in 20 caves located in the territory of Germany, Czech Republic, Slovakia and Poland. The caves studied in this topic are low-ventilation or completely isolated caves, which show temperature of the cave interior similar to those of the limestone massif around the cave. They cannot be cooled to freezing by air exchange with outside atmosphere, but only by temperature changes of the limestone massif. Together 19 samples of CCC were dated by the U-series method in cooperation with two laboratories in Germany. With the earlier available data the whole set of dated CCC sites with known position in the underground reached 44. To confirm cryogenic formation of the studied carbonates several hundreds of new C and O stable isotope data were gathered, both within the project and by cooperating research teams in Germany and Slovakia. Cave ventilation data and depth-below-surface data were obtained for each of the studied sites. This extensive data set was interpreted from the point of view of minimum permafrost depth of the Last Glacial. The final paper was published first in the discussion journal "Climate in the Past – Discussions" (Žák et al. 2012a), and after reviews and public open discussion it was published in a special volume "Advances in Understanding and Applying Speleothem Climate Proxies" of the prestigious journal "Climate of the Past" (Žák et al. 2012b). The data show that the permafrost depth changed and that precipitation of CCC in caves occurred repeatedly during the Marine Isotope Stages 4, 3, and 2. The most important periods of CCC formation were between 40 and 21 ka and from 17 to 12 ka before present (BP). The final permafrost destruction occurred in the studied Central European region between 15 and 12 ka BP. A model of cave behavior during permafrost growth and destruction was also included in the paper. In the studied part of the Central European lowlands and highlands a minimum permafrost depth of the Last Glacial of 65 m was estimated. In the High Tatra Mts., Slovakia, the permafrost of the Last Glacial penetrated to a depth of at least 285 m below the surface. Colleagues from several institutions in Germany, Slovakia and Poland participated in sample acquisition and processing.

2. CCC of similar type as the studied samples from 20 caves in Central Europe was found in several caves of the Ural Mts., Russia. Cooperation was established with the Mining Institute of the Ural Branch of the Russian Academy of Sciences to study them. Five samples were dated by U-series method in a German laboratory, cryogenic origin of samples was confirmed by C and O stable isotope studies, and a paper on first CCC find in caves of Ural Mts. was submitted to Russian journal "Geokhimiya".

3. During visits in quite a different cave type, recently iced caves of "cold-air trap type", the project participants recognized the importance of a specific type of cave pearls, which grow in periglacial zones of these caves. A larger research team includ-

ing colleagues from several institutions in Slovakia, Romania and United States was established. Carbonate cave pearls from several ice caves were thoroughly studied by a set of petrographic and geochemical methods, and a paper describing this genetically new type of cave pearls was published in "Journal of Sedimentary Research" (Žák et al. 2013). The pearls grow by a combination of initial cryogenic precipitation during seasonal drip water freezing, and of common carbonate precipitation during period of ice absence.

4. Fine-grained cryogenic precipitates, formed either by rapid water freezing on the ice surface in caves with recent perennial ice or on the surface of seasonal ice formations in cave entrances, were also studied. The study resulted in a description of the first proved occurrence of mineral ikaite ($CaCO_3 \cdot 6H_2O$) in the Czech Republic (Žák et al. 2010).

5. Earlier studies of hydraulic interactions between a large, low-gradient Berounka River, and flooded cave of the Bohemian Karst were finalized and extended. An attention was given to behavior of the flooded phreatic and epiphreatic cave zone during ice jams on the river (ice jams and barriers form either during the river freezing or during the spring ice cover destruction). Ice jams were recognized as an important feature increasing the water level in the river and enabling rapid infiltration of the river water into the karst cavities. Measurements of water temperature and water level in the caves have been done using an automatic continuous record. Thanks to this the importance of ice jams on the river for karstification in adjacent karst massif was proved for the first time (Vysoká et al. 2012).

6. Limestone rock overhangs with abundant dripping water in mountainous regions host a specific type of soft, porous carbonate precipitate (inappropriately called "foam sinter"). This type of sediment is well known, and its presence has been repeatedly described and published in the Czech Republic and Slovakia, but it is practically unknown in the international literature. As originally not planned project widening a study of this carbonate precipitate was initiated. The main goal is to describe the formation processes (cryogenic *vs.* non-cryogenic carbonate precipitation, importance of winter and summer precipitation) with a set of mineralogical and geochemical methods, and to introduce specific carbonate sedimentation processes below the limestone rock overhangs into the international literature. The selected study site was "Ružový previs" ("Overhang with

■ **Fig. 8.** Cryogenic cave carbonates from the Portálová Cave in the Bohemian Karst. Photo by Michal Filippi.

roses") in the High Fatra Mts. in Slovakia. The field study included excavation of a research pit, sampling, radiocarbon and biostratigraphic dating, and geochemical and mineralogical studies. The paper on this sub-topic will be submitted in 2013.

7. Planned experimental freezing of calcium bicarbonate water was initiated and first freezing runs were performed. With respect to significant widening of the study area where the natural samples have been collected, and with respect to extension of the project scope to several originally unplanned topics, these cryo-experiments will continue in 2013 and the final paper on them will be prepared in the second part of 2013. Some cryogenic precipitates are stored for now in the refrigerator and are waiting for mineralogical and stable isotope analyses.

8. As another research activity, geomorphologic studies were performed in the Křivoklátsko Protected Landscape Area (PLA) and the Brdy Hills Military Area. During these studies, a detailed attention was paid to geomorphic features related to existence of former permafrost, like cryoplanation terraces, rocks of the "tor" type, frost-riven cliffs, gelifluction features, etc. The results of the geomorphic studied of the Křivoklátsko PLA were published by Ložek & Žák (2011). During the studies of the Brdy Hills Military Area, which is also planned to be converted to a new PLA in short future, the area was recognized as a unique region with well-preserved features of periglacial geomorphology. As a result of this, 16 localities with important geomorphologic features related to former periglacial climate and permafrost existence have been selected, and proposed to be declared as nature reservations or nature monuments within the intended PLA. During the studies several new, unknown, non-karst caves formed by gravitational movements of the rocks were found, mapped and described. The paper on them was published in a local reviewed journal "Český kras".

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ŽÁK K., RICHTER D.K., FILIPPI M., ŽIVOR R., DEININGER M., MANGINI A. & SCHOLZ D. (2012b): Coarsely crystalline cryogenic cave carbonate – a new archive to estimate the Last Glacial minimum permafrost depth in Central Europe. – *Climate of the Past*, 8, 6: 1821–1837.

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.

Continued projects

No. 205/09/0703: **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)

Upper Silurian sedimentary succession of the Prague Synform preserved a particularly complete record of global biotic crisis, named Kozlowskii or Lau Event, as well as subsequent recovery of the marine biota. The most affected among pelagic faunas were planktonic graptolites. Almost simultaneous, selective extinction of several little phylogenetically related taxa with ventrally curved rhabdosomes (*Bohemograptus, Polonograptus, Neocucullograptus*) was recorded at the top of the *kozlowskii* Biozone. Also the common and widespread pelagic ostracodes of the genus *Entomis* became extinct whereas pelagic orthocerid cephalopods and the nektonic crustacean *Ceratiocaris* passed unaffected through the extinction interval. Conodont fauna suffered less extinction than suggested by earlier data from Gotland – the type area of the Lau Event. In the Prague Synform, sediments of the critical interval are dominated by minute elements of long-ranging stock of *Delotaxis*. Faunal extinction was apparently coincident with major fluctuations in sea level indicated by local unconformities associated with debris flows slumped from the adjacent carbonate platform. Prominent positive excursion of ä^{13}C commenced at the same level. New data demonstrated the coincidence of the graptolite crisis with benthic fauna changes and fall in sea level manifested by a facies change and a carbon isotope excursion. Subsequent gradual recovery and restoration of the conodont diversity enabled further refinement of the existing regional zonal subdivision of the interval that followed after the Lau Event and recognition of *plodowskii*, *latialatus*, *parasnajdri* and *crispa* biozones. Graptolite recovery was delayed relative to the recovery of benthic fauna and conodonts and closely postdated the end of the isotopic excursion. Taxa heralding subsequent faunas of Pridolian type are described from the *latilobus-balticus* and *fragmentalis* graptolite biozones. Data obtained from the Prague Synform and their interpretation contributed to general understanding the late Ludlow biotic crisis and its correlation with abiotic indicators of the environmental change.

No. 205/09/1918: **Soluble and insoluble fraction of inorganic pollutants in various types of precipitation, their quantification and input into the ecosystems** (J. Fišák, D. Řezáčová, P. Chaloupecký, Institute of Atmospheric Physics of the ASCR, v. v. i., Praha, M. Tesař, M. Štír, J. Polívka, Institute of Hydrodynamics of the ASCR, v. v. i., Praha, *J. Rohovec*, *P. Kubínová* & *P. Skřivan*; 2009–2014)

Collection of samples as well as chemical analyses continued in the year 2012. Different kinds of precipitation samples were collected, i.e. bulk precipitation in the open air area, throughfall under the forest canopy and surface water (Lesni potok site). 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. Main portion of the samples of interest were collected by the principal applicant and first join applicant at various sites in CR (Šumava Mts., Jizerské hory Mts., Krkonoše Mts.). In the each of the mountainous regions the both active and passive cloud and fog water samplers were installed and operated. In 2012 the well equipped meteorological station situated on the slope of the Smědavská Mt. was supplemented by the equipment for the continuous registration of the dew.

Chemical analyses of liquid samples taken were performed on ICP EOS (macroelements, Al, Ca, Fe, K, Mg, Mn, Na, P, S, Si), ICP-MS (micro and ultramicroelements, As, Ba, Be, Cd, Co, Cs, Ni, Pb, Sr, Tl, Th, U and rare earths), HPLC (anions, Cl, NO_3, SO_4). Solid particles collected on nitrocellulose filters 0.45 μm were decomposed using the established microwave technique in the Mars or Milestone microwave ovens. The decomposed samples were analyzed on the same element set as the filtrated liquids in order to calculate and compare the soluble and insoluble fraction of inorganic pollutants. Isotopic ratios $^{206}Pb/^{207}Pb$ resp. $^{208}Pb/^{206}Pb$ were analyzed on ICP-MS, studied and elucidated. Systematic study of the lead isotopic ratios measured could reflect the type of the source of pollution. The data obtained were compared with literature results for different lead sources.

No. 206/09/1564: **A multi-proxy paleoecological investigation of the unique sediments from the former Komořanské jezero Lake, Most Basin, Czech Republic** (J. Novák, University of South Bohemia, České Budějovice; V. Jankovská, Institute of Botany of the ASCR, v. v. i., Brno, Czech Repiblic & *L. Lisá*; 2009–2013)

The Komořanské jezero Lake formed the largest water body (cca 25 km^2) in the area of the Czech Republic and was nearly completely drought in the 19th century. Its origin is linked with the tectonic subsidence of the part of the Most Basin and assumed damming of the Bílina River near the medieval town of Most at the end of the Last Glacial period. The sediments at the base are composed of gravelly sands, lake sediments began to form during the Late Pleistocene–Early Holocene transition. This large but relatively shallow lake was extraordinary also due to its location where southern and northern parts were exposed to very different abiotic conditions.

The absolute majority of the lake sediments were removed due to the progress in coal mining in the 1980s. Their remains were buried under the spoil banks and are not accessible today. Paleoecological potential of the locality was irretrievably lost, and the last chance for saving paleolimnological information from probably the most valuable sediment in the Czech Republic is a detailed analysis of four rediscovered (PK-1-C, PK-1-CH, PK-1-I and PK-1-W) sediment cores gathered during sampling in 1983. During 2009 season were those cores precisely sampled and a number of paleocological analyses were applied.

Stratigraphic sections in sediments of the Komořanské Lake, including the interval of 7200–2100 y BC, were studied by means of multi-proxy analysis.The data gathered were compared to settlement density. Diatom inferred total phosphorus (di-TP = 60–80 μg.l^{-1}) and pH (di-pH = ± 7.6) along with concentrations of analyzed elements indicated very stable aquatic conditions during the period 7200–2700 BC. An enhanced concentration of microcharcoals with 4 peaks of ca 400 y amplitude was recorded at ca 6500–4800 BC corresponding to the Atlantic period. Natural fires of mixed-oak forest were suggested by the regular nature of burning and undetectable human impact. No evident shift in the fire regime and aquatic environment was detected at the Mesolithic-Neolithic border at ca 5600 y BC. The high and steady microcharcoal concentration at ca 4800–2900 y BC corresponding to the Late Neolithic was apparently caused by alternation in land use.

No. 210/12/2053: **Floristic changes as a result of climate development during Upper Paleozoic ice age in the basins of the Czech Republic** (*J. Bek*, S. Opluštil, Faculty of Science, Charles University, Praha, Czech republic, J. Pšenička, West Bohemian Museum, Plzeň, Czech Republic, M. Libertín, National Museum, Praha, Czech Reopublic & Z. Šimůnek, Czech Geological Survey, Praha, Czech Republic; 2012–2015)

Activity in the first year of the project followed basically the planes performed in the project proposal. It included (a) literature and archival data search; (b) database construction and testing; (c) input of data into database; (d) field excursions and museum collection examinations, and (e) instrumental analyses.

It was necessary to ensure appropriate communication background to achieve maximum results of the project. This was achieved by establishing a project website (http://www.zcm.cz/gacr2053/). The website is used for communication, data entry into the database, checking the results of individual team members and ultimately for sharing information resources used for the project.

The database is provided by Oracle Mysql. The proposal of database is normalized in two normal forms. Frontend to the database is created using PHP scripting language. Basic work with the database is generated using the PHP Maker 9 software. This software suits the demands of this project the best. The database is divided into two major units which are represented by macrofloral and palynological data. These units mostly use common code lists such as references, lithostratigraphy or chronostratigraphy. The hierarchical structure such as the location (country, region, district) are implemented as tables referring to themselves (self-referenced table). For storing image data, it has been chosen to save the database as a BLOB (Binary Large Object), because of the level of database security and an easier portability. Records outside the module for publishing and pdf notice board are added for easier communication between users and the exchange of text. Work with data requires user authentication, based on which there are allowed access levels and rights to data. User activity is monitored.

In the second half of the year the database was sufficiently tested to be ready for data input, although some details were tuned also during this part of the year. Till the end of the elapsed year almost two thousands of floral and a thousand of palynological samples were entered in the database. The floral data come from Brandov Basin, Pilsen Basin, Radnice Basin, Kladno-Rakovník Basin, Upper Silesian Basin and others. The first paper (Šimůnek et al. 2012) was published during 2012 and others are/were prepared and sent to international journals or even already accepted (Bek 2013).

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No. P104/12/0915: **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, Czech Republic & *T. Lokajíček*; 2012–2015)

The project is aimed at: (1) aggregate sampling; (2) laboratory preparation and analysis of ASR (alkali-silica 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.

Laboratory study of the ASR by acoustic emission requires modification/improvement of completer recording system, mainly acoustic emission transducers, as there is required long term monitoring of AE under high temperature 80 °C and at alkali environment. Under the collaboration with 3S Sedlak Ltd., there were developed high temperature piezoceramic sensors with high sensitivity, which enable long term monitoring of AE at higher temperature. Very important part of the project solution was protection of all sensors together with cables against high temperature alkali bath. Several protection measures were tested: (1) plastic bags; (2) the PVA protective layer, and (3) the PVC solution. According to the current running tests, the best protection of the transducers can be achieved by the PVC solution. As there is a plan of using gauge transducer to monitor concrete samples deformation simultaneously with the AE during accelerated mortar bar test, protection of gauge transducers was also tested. The following samples were prepared from quartzite (Těchobuz): (1) spherical samples, which were tested under confining stress up to 400 MPa to determine their elastic anisotropy and preferred orientation of microcracks; (2) bar samples, these will be investigated by the same laboratory approach as concrete ones.

No. P210/10/2351: **Paleomagnetism & geochemistry of volcanic rocks: Implications to paleosetting 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, Praha, Czech Republic; 2010–2014)

The first solved tasks were focused on the paleomagnetism and paleogeography of the Prague Synform. This structure lies in the central upper part of the Barrandian area and consists of Cambrian (prevalence of siliciclastic sediments), Ordovician (siliciclastics and volcaniclastics), Silurian (often with black "graptolite shales", basaltic dykes, sills and lava flows) and Devonian rocks (prevalence of carbonate sediments, notably limestones). These rocks were heated up to 100 °C during the Variscan orogenic history and then underwent severe tropical weathering during the Mesozoic. These processes resulted in the dissolution of magnetite and in the growth of new hematite on several sites. To understand the origin and the age of individual paleomagnetic components, the main magnetic carriers must be studied by using special rock-magnetic methods. Paleomagnetic behaviour of younger rocks must be understood to involve the entire superimposed history of these rocks.

According to the project plan for 2012 we studied, evaluated and integrated geochemical, paleomagnetic, rock-magnetic and stratigraphic methods from different Ordovician and Silurian localities in the Prague Synform. Nine Silurian sites were sampled for detailed paleomagnetic and rockmagnetic studies: quarries of Kosov (5 new sites) and Chlustina (4 new sites). Paleomagnetic analyses performed on Silurian basalts, their contact aureoles and surrounding rocks involved: (1) progressive thermal demagnetization using the MAVACS (Magnetic Vacuum Control System) equipment with step intervals of 60 to 40 °C; (2) demagnetization by Alternating Field (AF) technique using Superconducting Rock Magnetometer type 755 4 K with steps every 5 to 20 mT, and (3) separation of the remanent magnetization (RM) components with the help of the multi-component analysis. Two RM components were extracted from specimens. Component C1 is established by temperature range 160–440 ºC (480 ºC) and by AF field range of 10(20)–80(100) mT, reflecting the presence of magnetite or Ti-magnetite, with a component of magnetization (D = 138 to 217º, I = –27 to –46º). On the other hand, component C2 belongs to temperature range 80–440 ºC (540 ºC) and/or AF field range 10–80(100) mT, reflecting magnetite or Ti-magnetite presence. Tilt-corrected mean paleomagnetic direction of RM (D = 194–228º, I = 20–38º) corresponds to Permian or Triassic direction for the Bohemian Massif (with no significant rotation; Kletetschka et al. 2012).

Magnetic scanning: Magnetic eye-like texture revealed during the scanning points to dominant magnetic carriers associated primarily with the amygdales formed inside the lava flow's vesicles of sample from U Vitáčků site, section near Lištice. Paleodirections are stable (D = 20°, I = –4°) and point to the Permo-Carboniferous episode during which the magnetic information from amygdales originated. Magnetic texture of the sample from the Lištice Quarry revealed strongly isolated dipolar signature, therefore the sample with large distribution of grain sizes of magnetic carriers. These phenomena, when occurring within the investigated rock sample, result in chaotic paleodirections due to variable viscosity of contrasting grain sizes of magnetic minerals. The result is overall demagnetization of the original remanence and strong viscous overprint. Magnetic scanning of sample from the Loděnice-Bubovice locality revealed a homogeneous magnetic signature with signs of anisotropy, possibly pointing to the settling of the lava flow. This sample indicates the most reliable paleomagnetic characteristic and shows only little signs of either diagenetic and/or viscous overprint of the fairly stable Silurian paleomagnetic direction (D = 227°, I = –26° after the tilt correction) for the Prague Synform. We calculated mean paleomagnetic direction from 112 samples (12 sites and localities) including virtual geomagnetic pole position SI: fitting the Silurian directions [compared with the results from surrounding sedimentary strata (D = 191º, I = –33º)] resulted in paleorotation of 163–175º. Paleolatitudes calculated from these data of the Prague Synform volcanic rocks fall in the interval of 21–32º S. The micro-magnetic anomaly distribution over the sampled surfaces revealed relationship with the origin of magnetic phases. Namely, magnetic scans suggested three magnetic characters: (1) localized magnetic anomalies; (2) magnetic texture related to the formation of vesicles, and (3) magnetic texture that relates to the massive basaltic matrix. Analysis of the constructed magnetic maps along with their paleomagnetic character, optical-reflected and transmitted microscopy revealed the primary sources of the paleomagnetic signal.

Magnetic susceptibility (MS) and gamma-ray spectrometry (GRS) curves were established through the Lau Event interval at the Požár 1 section (Silurian, Ludlow). Paper on Lau event and its petrophysical record is going to be submitted to special issue approved for 2013 within the IGCP project No. 580 to the "Special Publication of the Geological Society of London" edition. Method of comparison of MS stratigraphic records by means of dynamic time warrping (DTW) techniques, the basic version (with a guide) was published on the website of the Academy (Vondra & Hladil 2012), and it was possibly the first on-line accessible application in this direction worldwide.

At the same time, a comprehensive and most demanding test has been carried out using the MS stratigraphic data from Barrandian area (Czech Republic) and Zeravshan area (Uzbekistan). This study was published in a prominent journal for stratigraphy on 20th March 2012, after a lot of successively made amendments. Technically, this paper was involved into delayed 2011 volume of the US journal of Stratigraphy (Hladil et al. 2011).

Major focus of paleomagnetic study is the investigation of samples from new localities and interpretation – based on rock-magnetic methods – of paleorotation and/or remagnetization during the Carboniferous to the Late Permian (determination of primary and secondary paleomagnetic component). Detailed studies of remanent magnetization (NRM) provide information on translation and rotation history of separate tectonic blocks and Variscan remagnetization. Paleomagnetism is used to assess the approximate ages, and paleorotation and paleolatitude support the final geotectonic position. The next step will be very important: to separate localities and calculate mean direction and rotation and correlate different blocks within the terrane mosaic.

Integration of geochemical, paleomagnetic, rock-magnetic and stratigraphic methods was discussed on the existence of Perunica microplate in Silurian times (Tasáryová et al. 2012) and the timing and kinematics of breakup of the northern margin of Gondwana. Further results coming from the continued studies on basal Middle Devonian events were also presented during this year (Koptíková et al. 2012).

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No. P210/11/1369: **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)

Within the framework of the anthropogenic Hg deposition assessment through analysis of soils, we compared the pools of mercury in soils at the studied sites of Lesní potok (LP), Lysina (LYS) and Jezeří (JEZ). The mineral soil pools of Hg dominated over the organic soil pools of Hg at all three sites. Although the organic soils contain one order of magnitude higher Hg concentrations over the mineral soils (350 and 75 $\mu g.kg^{-1}$) the domination of mineral soil Hg pools was caused primarily by the its significantly higher density and thickness. The density and thickness of organic horizons (O and A horizons) reached ~200 $kg.m^{-3}$ and 10 cm, for the mineral soil horizons it was ~1,200 $kg.m^{-3}$ and 75 cm. Thus the organic soil pools at sites LP, LYS and JEZ averaged at 9.4 $mg.m^{-2}$ while the mineral soil pools reached 75.2 $mg.m^{-2}$. Comparing of the individual sites suggests that the greatest organic soil Hg pools were found at site LP (14 $mg.m^{-2}$) but the greatest pool of Hg in mineral soil occurred at site LYS (65 $mg.m^{-2}$). The size of organic soil Hg pools depends mostly on the level of deposition *via* precipitation and litterfall. From the peat profiles we know the deposition in central Bohemia was the greatest one within the area of the Czech Republic due to Pribram Ore district emissions, so it would explain the highest concentration of Hg in organic soil and organic pools at site LP. The following task was to explain the reason for the greatest Hg pool in mineral soil at site LYS. We found statistically significant relationship between the pool size of organic carbon (C) and Hg in the mineral soils. This suggests that mineral pool of Hg at each site depends on the mobility and storage of organic carbon in the mineral soil. Data from sites LP, LYS and JEZ were further supplemented with data from the sites of Pluhův bor (PLB, adjacent to LYS but with different lithology) and Liz (LIZ) in the Bohemian Forest area typical with lower level of historical acid deposition. The data from these two sites supported previous statements because the overall greatest mineral soil pool of Hg (125 mg.m^{-2}) occurred at site LIZ in the Bohemian Forest which is supposed to be the least impacted by the historical emissions as we know from the peat cores.

Summarizing the data from the soil profiles at 5 studied sites, it was possible to conclude on general trends in Hg concentration in the forested areas of the Czech Republic. Within the organic soil (forest litter) Hg concentrations increased with increasing humification of the litter. The least decomposed litter horizons Oi averaged at 175 µg.kg^{-1}, partly decomposed Oe horizons averaged at 380 µg.kg^{-1} and humified Oa horizons averaged at 520 µg.kg^{-1}. Increasing concentrations of Hg in litter with increasing level of humification are not only due to the original Hg contained in the deposited litter but also due to adsorption of Hg deposited by the wet precipitation. The most decomposed litter in the Oa horizons has been adsorbing Hg over the longest period of time because it is the oldest. In mineral soil the concentrations of Hg decrease downwards from A(E), B to C horizons. We further investigated on the relationships between Hg concentrations and concentrations of C, N and S in individual soil samples at all sites. Negative statistical relationships of Hg and C concentrations were found for organic (litter) horizons but positive relationships of Hg and C similar to results from North America. Similar results occurred in case of N but the North American studies did not include analysis of S and surprisingly contrary to carbon, the concentrations of Hg and S correlated positively in both litter and mineral soils. These finds on soil Hg pools and concentrations in wider context of the Czech Republic were presented at the BIOGEOMON 2012 conference (Buchtová et al. 2012) and are currently being summarized in publication, which will be submitted in year 2013. Analyses of methylated Hg compounds in soils were not completed yet but will progress in year 2013.

The results from soil solutions at the JEZ site indicate that the Hg/DOC ratio decreases with depth in the soil profile. The topmost soil solutions below the organic litter horizons exhibit mean Hg(ng.l^{-1})/DOC(mg.l^{-1}) values of 0.16 and 0.14 in beech and spruce stands but the soil solutions in 90 cm depth have mean Hg(ng.l^{-1})/DOC(mg.l^{-1}) values of 2.13 and 2.73. Similar observation was made while studying the variations in Hg/DOC ratios in soils. The finds on variations in Hg/DOC ratios in soil solutions from different depths are very important with respect to stream hydrology. The soil solutions sampled from depth of 10 cm and 20 cm at LYS catchment contained the highest concentrations of MeHg 0.26 and 0.77 ng.l^{-1}, which represented 2.9 and 1.1 % of total Hg concentration.

In year 2012, the spring snowmelt was successfully sampled at sites JEZ and LIZ. The results from site JEZ indicate that the concentrations of Hg in runoff may increase during the initial stages of snowmelt from 5.2 ng.l^{-1} on February 29 up to 17 ng.l^{-1} on March 1. The peak discharge occurred on March 2 and concentration of Hg decreased to 10 ng.l^{-1} probably due to the increased contribution of melting snow in the stream discharge. The JEZ catchment is typical with high discharges because its stream is draining area of 2.6 km^2 while streams at catchments LP, LYS, PLB or LIZ drain smaller areas of 0.75, 0.27, 0.22 and 0.99 km^2. Therefore the discharge changed from initial 196 l.s^{-1} up to ~385 l.s^{-1} at JEZ during the snowmelt in 2012. The 12 year baseflow discharge at JEZ catchment amounted at 19 l.s^{-1}. Unfortunately relatively high discharges under normal condition were probably responsible for relatively low concentrations of Hg in runoff from JEZ, which complicated the analysis of methylated Hg. Due to this the snowmelt, the JEZ site will be re-sample again in 2013 and the data set will be supplemented with analyses of MeHg. The results from snowmelt at LIZ catchment were less clear. The concentrations of DOC increased sharply during the initial stages of the snowmelt but Hg concentrations did not follow. The absence of correlation between DOC and Hg concentrations in stream water at the site will be further studied in year 2013. The most significant correlation between DOC or UV absorbance and Hg concentrations was observed at the LYS site and adjacent catchment PLB. Both of these catchments are found within relatively impacted area in terms of past atmospheric deposition. The export of Hg at both catchments has been intimately linked to the export of DOC. The Hg output from LYS and PLB amounted at 59.6 and 91.5 mg.ha^{-1} in the hydrological year 2012 and the DOC export reached 82 and 83 kg.ha^{-1}. Thus at the Lysina catchment rate of export has been 0.74 ng of Hg per mg of DOC and at PLB catchment 1.04 ng of Hg per mg of DOC. Methylated Hg compounds in the stream water at sites LYS and PLB formed 0.2–5.0 and 0.5–1.1 % of the THg concentration (MeHg conc. 0.13 and 0.09 ng.l^{-1}). The concentrations of MeHg in stream water at sites JEZ and LIZ reached 0.06 and 0.08 ng.l^{-1}, representing 1.0 and 1.8 % of the total Hg concentration. These results thus indicate that the highest percentage of MeHg in stream water was at LYS catchment probably due to the presence of wetland (peat) area. Similar to THg changes of MeHg concentrations in streams and soil solutions were found seasonally dependent due to the necessary microbial activity. At the same time there is the effect of discharge, which increases DOC, THg and MeHg concentrations primarily in the initial stages of the hydrological episode.

BUCHTOVÁ J., NAVRÁTIL T., ROHOVEC J., HOJDOVÁ M., KRAM P., OULEHLE F. & MYŠKA O. (2012): Mercury distribution in litter and soils at 8 Czech forest sites. – *BIOGEOMON 2012, Book of Abstracts*: 67.

No. P405/11/1590: **Neolithic rondels from the perspective of micromorphologic and formative analysis** (P. Květina, Institute of Archaeology in Prague of the ASCR, v. v. i., Praha, Czech Republic & *L. Lisá*; 2011–2013)

The aim of the project is to obtain new answers to frequently formulated questions on the form and demise of Late Neolithic rondels using a special methodology. Micromorphological analysis combined with radiocarbon dating and the classic analysis of archaeological finds will be used to resolve specific questions concerning the existence of Neolithic rondels, especially to clarify the method and time of filling rondel ditches.

During the 2012 the rest of samples from the Kolín research were processed. Each sample was unpacked and a detailed lithological description was made. Finally, bulk samples were taken and positions of micromorphological samples were chosen and sampled. Samples were sent to the Gent laboratory for thin sectioning, in case of bulk samples the magnetic susceptibility and basic geochemical analyses were made. Also samples for ^{14}C dating from Georgia laboratory were obtained and additional fieldwork was organized with the aim to find analogies of rondel ditch infillings. In the first case we have a chance to study and sample the famous Tesetice rondel, in the second two cases we sampled infilling of roman ditches. One, originally in loess deposits at the Vrable site, Slovakia, and in the second case we dug up and sampled infilling from the excavations of roman ditch in Burgstahl, Pasohlávky, which was processed 27 years ago. The facies type described there fits our interpretations. In all cases similar facies types were founded as we know from the Kolín rondels, but in this case with much clearer formation contexts.

No. P405/11/1729: **Medieval castle in alluvial plain** (M. Plaček, Archaia Brno, o. p. s., Brno, Czech Republic, L. Petr, University of Western Bohemia, Pilsen, Czech Republic & *L. Lisá*; 2011–2014)

The Medieval castle in Veselí nad Moravou represents a uniqe European site with many well preserved wooden buildings, construction elements, and unprecedented volume of organic remains. Using the multidisciplinary approach the environmental conditions within this locality were clarified and the anthropogenic influence on the alluvial plain formation were tested.

During the second year of the project, the general hypotheses about the maintenance of horse stable were made. Additional analyses of isotope composition were carried out and the first results were published at the conference of environmental archaeology in Prague. Also a paper addressed to the Journal of Archaeological Science was written and submitted. During this year, the fieldwork continues to find new evidence about the Medieval climate in the study area. A core in the alluvial plain of the Morava River was made and samples started to be proceeded.

4c. Grant Agency of the Academy of Sciences of the Czech Republic

Continued projects

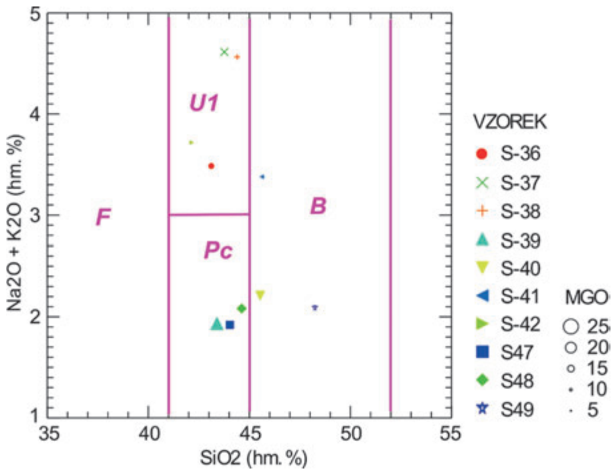
No. IAA300130902: **Characteristics of the mantle sources and crystallization history of the subvolcanic alkaline rock series: Geochemical and Sr-Nd isotope signature (an example from the České stredohoří Mts., Ohře/Eger Rift)** (*R. Skála*, *J. Ulrych*, *V. Böhmová*, *L. Ackerman*, *J. Filip*, Z. Řanda,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

As a part of the research project we also studied picritic basalts and similar rocks from the České středohoří Mts.; principal goals of this study were to characterize these rocks in terms of their mineral composition, contents of major and minor elements as well as Sr-Nd isotopic systematics. Although the macroscopic and microscopic appearance of the all investigated rocks match that of picrites or picrobasalts, major element composition plotted into TAS diagram (Le Maitre 1989, 2002) shows that of 10 analyzed rocks only 3 samples lie in the field of picritic basalts whereas others correspond chemically to basalts or fall in basanite/tephrite field (Fig. 9). The reason for this discrepancy is most probably the alteration of the rocks, predominantly mafic minerals. This hypothesis is strongly supported by the results of electron microprobe study, which shows considerable alteration of olivine xenocrysts as well as a part of fine-grained matrix.

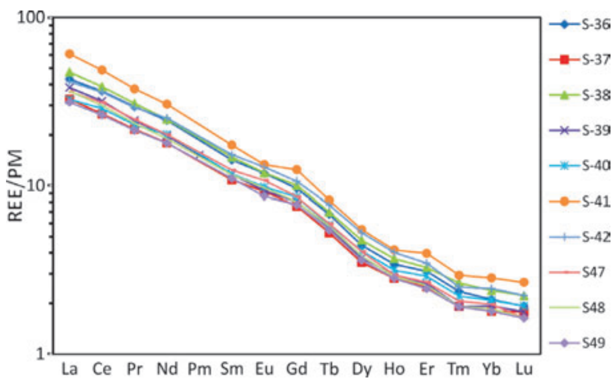
Next to contents of major elements, also concentrations of trace elements were determined. For example, the contents of rare earth elements (REE, Fig. 10) generally follow the trend observed for the rocks of the Roztoky Intrusive Center (RIC) yet they are lower. This may indicate a lower degree of contamination by the crustal material and/or even the lack of the differentiation compared to subvolcanic rocks of the RIC.

Strontium and neodymium isotope compositions (Fig. 11) show that the analyzed picrite-like rocks, with the exception of one analysis, coincide with the trend delineated by the subvolcanic and dike rocks of the RIC; they display the closest similarity to sodalite syenites.

In addition to presented data also the ages and time-temperature evolutions of pegmatite samples (Dolní Bory, Rožná,

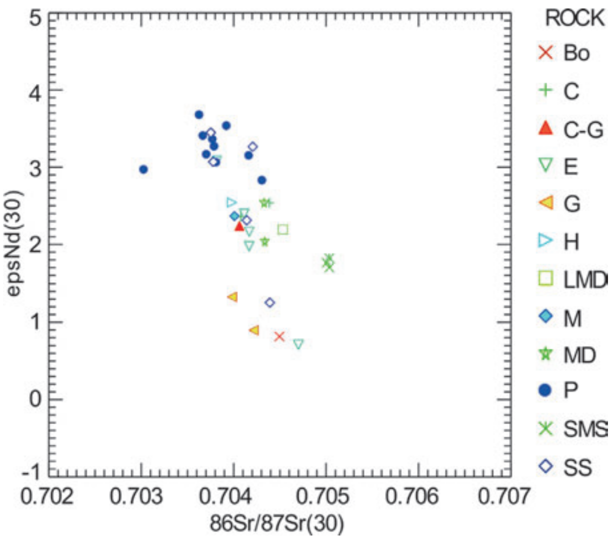


■ **Fig. 9.** Classification of "picritic" rocks in the TAS diagram after Le Maitre ed. (2002). Size of the symbols illustrates the MgO content of (in wt.%) – see scale right of the legend. Rock types: F – foidite, Pc – picrobasalt, B – basalt, U1 – basanite/tephrite. Original.



■ **Fig. 10.** Contents of REE in picritic basalts and similar rocks from the České středohoří Mts. normalized to primitive mantle. Normalizing values after McDonough & Sun (1995). Original.

Puklice near Jihlava) and one durbachite sample (Mehelnik) were determined as a part of the project.The pegmatite samples revealed very similar fission-track annealing, age and time-temperature evolution. The samples were uplifted from the zone of



■ **Fig. 11.** Systematics of Sr and Nd isotopes. Rock types: Bo – bostonite, C – camptonite, C-G – camptonite to gauteite, E – essexite, G – gauteite, H – hornblendite, LMD – leucomonzodiorite, M – monchiquite, MD – monzodiorite, P – picrite, SMS – sodalite monzosyenite, SS – sodalite syenite. Original.

total annealing (≥120 °C) at 200 Ma, then the temperature was stabilized for a very long time (180 My), remained at temperatures from 60 °C to 80°C until the Miocene (ca 20 Ma), and after stabilization, followed the period of relatively quick uplift to the present surface. The durbachite sample from Mehelnik was uplifted from the zone of total annealing at 170 Ma, and after period of temperature stabilization (from 60 °C to 80 °C) at 15 Ma it was uplifted to the present surface.

The ages and time-temperature evolutions of four granitoid samples from waterworks tunnel at Bedřichov (Jizerské hory Mts) were measured in cooperation with the Czech Geological Survey. At measuring error range, ages and time-temperature evolutions were equivalent for the four samples. The samples were uplifted from the zone of total annealing at 70 Ma, temperature fell from 120 °C to 80 °C, and after a period of stabilization, at 10 Ma, the temperature rapidly decreased to recent temperature.

Le MAITRE R.W. (ed., 1989): *A Classification of Igneous Rocks and Glossary of Terms: Recommendations of the International Union of Geological Sciences Subcommission on the Systematics of Igneous Rocks*. – Blackwell. 236 p. Oxford.

Le MAITRE R.W. (ed., 2002): *Igneous Rocks. A Classification and Glossary of Terms. Recommendations of the International Union of Geological Sciences Subcommission on the Systematics of Igneous Rocks, 2nd ed*. – Cambridge University Press. 256p. Cambridge, New York, Melbourne.

McDONOUGH W. F. & SUN S. (1995): The composition of the Earth. – *Chemical Geology*, 120, 3–4: 223–254.

4d. Grants of the State Departments

State Office for the Nuclear Safety, No. 7403: **New interpretation of geological, geotechnical, hydrological and meteorological safety guidelines for site installations of new nuclear facilities after Fukushima-Daichi disaster** (Coordinator: *V. Cílek*; *J. Adamovič*, *K. Breiter* & *R. Mikuláš*; 2012)

The accident at the Japanese nuclear power plant of Fukushima-Daiichi in March 2011 (triggered by the earthquake and subsequent tsunami) caused international debate on the safety of nuclear energy usage. Countries operating with nuclear facilities have acceded to update the safety criteria for siting nuclear facilities, which are enshrined in the Czech legislation in Decree of the State Office for the Nuclear Safety No. 215/1997 Coll. Geological, hydrogeological, geotechnical and hydrological criteria were updated based on the latest scientific knowledge and in comparison with international documents IAEA and were processed transparently and discussed at meetings with the participation of experts from several institutions and publicly presented at a press conference on June 6, 2012 in Prague. The practical result of the detailed elaboration and updating safety criteria is Safety guide BN-JB-1.14, 2012, currently used in the licensing process of siting of new blocks 3 and 4 of the Temelín nuclear power plant.

Ministry of Education, Youth and Sports, „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 ~1 nm to ~100 nm and their deposition in surface layers of silicate minerals as olivine and pyroxene is being developed. Subsequently, the changes in reflectance spectra of such modified minerals 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.

Ministry of the Environment of the CR, Project TYPE No. SP/2d1/141/07: **Certification of the approved methods of reclamation and management of non-natural environments** (T. Gremlica, Institute of Ecopolitics, Praha, Czech Republic & *V. Cílek*; 2012)

The project dealing with non-natural environments (2007–2011, see previous Research Reports) was funded till the end of 2011, but the Methodics was officially approved by Ministry of Environment in August 2012. The electronic version of the Methodics is located at official pages of the Ministry (www.env.cz) and the paper copies are displaced in the Library of the Ministry and in the Library of Institute of Geology of the ASCR, v. v. i.

Higher Territorial Self-governing Units' Foundation, Innovation Programs for Regional Development, Karlovy Vary Region Authority, No. UEPRKKK201211: **Karlovy Vary hot-spring salt** (Project leader: *J. Hladil*, Project co-leader: J. Švec, Original Karlsbader Sprudelsalz, s. r. o., Karlovy Vary, Czech Republic; Co-investigators: *J. Rohovec*, *Š. Matoušková*, *V. Cílek*, *L. Lisá* & *T. Navrátil*; 2012)

The research- and innovation-oriented grant led to increased knowledge on the hot-spring precipitation from the Karlovy Vary (Carlsbad) mineral thermal water, together with crystallization sequence of aragonite and calcite but mainly how to transfer all this new knowledge based on the natural analogue into improved transport and accumulation stages of the production processes themselves.

The results of the project are offering a lot of variants for the present products related to the Carlsbad hot-spring salt, as well as those which are in development or newly proposed. Besides the particular datasets and inferred recommendations for the technology, the project specifies also the subjects of the basic and applied research that are appropriate for the future.

The most tangible result is a voluminous (and entirely original) analytical set of data that combines the modern methods and approaches (beginning from ICP-MS, ICP-OES, XRD, HPLC, PSA, etc., and ending with MS and GRS). This dataset substantiates the ways in which the salt production and quality of inputs (thermal mineral water of sodium–bicarbonate–sulphate type) must be controlled.

The performance of the tasks, large volume of the project work and conclusions correspond very well to the given assignment, bringing a new view on the established production and, consequently, leading to immediate corrections and formulation of further perspectives of development and innovations in the production process.

Proposals related to change of the technology and/or modification of individual parameters are to: (1) keep a better control on the primary and secondary variability of the raw water

■ **Fig. 12.** The complex research of the Karlovy Vary hot-spring systems has been carried out by the laboratories of the Institute of Geology of the ASCR, v. v. i. for several last decades. An illustration to the Project no. UEPRKKK201211 (Karlovy Vary hot-spring salt) shows T. Navrátil and J. Hladil who are measuring the microenvironmental parameters on the Sealing Plate on July 28, 2005. Photo by L. Lisá.

source – composition and properties of thermal mineral water which is input to further processing; (2) correct the raw-water treatment technology in the aeration-oxidation stage; (3) insert the germicide units since the early stages of water treatment; (4) optimize the process segment before the separation of the iron-rich sludge, and (5) consider a (re)-doping by pharmaceutically interesting chemical elements (during the process).

Proposals to improve the utility value of the products from Carlsbad hot-spring salt, their commercial use and production of other derived products of this type are to: (1) increase the content of the selected chemical elements in the Carlsbad bath salt products; (2) start the distribution of the original Carlsbad hot-spring salt also in the form of liquid concentrate (decreased energy requirements facilitation of the use of this concentrate for drinking courses), as the use of concentrates outperforms the preparation from solid salt – due to the preservation of colloidal characteristic of several components and, vice versa, considering the low solubility of some minor components contained in the solid salt evaporates; (3) with the sales promotion of the products derived from the original Czech Carlsbad hot-spring salt, manufactured on the basis of the OKSS technologies, an emphasis must be put on the fact that allergenic heavy metals (nickel, cobalt, cadmium, chromium) are almost totally eliminated by these technologies, and (4) as above, but with emphasis on the trace amounts of an element hitherto not mentioned, that originates from the natural healing sources of Carlsbad and has potential curative properties. Particularly the presence of specific minor and trace element concentrations is the key difference between the true Carlsbad hot-spring salt products and preparations based on the synthetic components.

Recommendations in the field of basic research are to: (1) keep continuity with the previous monitoring of the quasi-natural precipitates from the Carlsbad thermal mineral water as well as rich microbiotic life which inhabit the related sediments around the quasi-natural springs, including an unique and very rich scenery of the hot-spring travertine forms and rills and pools, changing with decreased temperature of mineral water, degassing, changing eH and pH parameters and precipitation of solids – these studies have almost 200 years long history and the continuation requires restoration of "the quasi- natural hot-springs: the scientific natural laboratory and touristic attraction" in the main spring-and-borehole area or other appropriate place; such an object can provide a very important data series related to changing microbial infestation at the contact of atmospheric boundary layer and hot-spring systems as well as about the evolution of microclimate in the spa valley; (2) solve the open questions related to precipitation from a mixture of inorganic and organic colloids (thermal mineral water, microbiota, solids); in addition, the possible occurrences of rare microbiota even in the deep rock (mineral water) environments also belong to very attractive research subjects; these and other subjects are challenging the research, and the results coming from Carlsbad would be appreciated world-wide; (3) obtain the effective series of proxy data on variability of natural materials (but also bath products) by means of magnetic susceptibility (MS) and gamma-ray spectrometric (GRS) measurements – the MS measurements detect the concentrations of iron which correspond also to concentrations of many other litophile elements which precipitate together with iron, and (4) employ the GRS approach that is much promising to improve the knowledge about radioisotopes in the Carlsbad thermal water system, and also as it relates to the products which are used for healing applications.

The fruitful continuations can be seen also among many partial technological tasks which are closely related to the spa products of Carlsbad. It is because of the fact that any of careful solutions based on such particular requirements usually leads to broadening of knowledge base, new data etc. – thus, influencing the sphere of basic research.

The grant provided by the Department of Regional Development at Karlovy Vary Region authority significantly contributed to the improvement of general knowledge about Karlovy Vary (Carlsbad) mineral waters and salts, and this is immediately transferred into modified technologies of the Carlsbad hot-spring salt production. The academic knowledge together with know-how introduced by this project may certainly have a positive effect on the development of the spa business in the Karlovy Vary Region of western Bohemia and for its promotion abroad.

4e. Industrial Grants and Projects

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 quarry also in 2012. The continuation of calcite veins and cavities of the thermomineral paleokarst (sometimes also with calcite crystals) discovered in 2009 and 2010 was documented.

Institute of Archaeology of the ASCR, v. v. i. in Praha, Project No. 7364: **Do Rybníčků locality, Dolní Chabry** (*L. Lisá*)

The infilling of Stitary culture object and its cultural layers were studied by the method of micromorphology, magnetic susceptibility and geochemistry with the aim to detect trampled floor, maintenance or agricultural practices. The prepared and trampled floor was not recognized. The object served probably just as a brickyard hole and was used for dwelling just for a short period.

Moravian Museum in Brno, Project No. 7375: **Kůlna Cave** (*L. Lisá*)

Cave sediments of famous Paleolithic Kůlna Cave located in the northern part of the Moravian Karst are recently studied by the multi proxy approach. This approach includes the methods of facies analysis, micromorphology, geochemistry, isotope analyses, phytolith, charcoal and pollen analyses. So far the first results show significant differences between the sedimentary infilling of the front part of the cave connected with Northern entrance and the rest of the cave. A number of depositional processes took place there from the frost creep in the Pleniglacial period, aerial deposition together with animal deposition during the warm insterstadial period as well as for example quick erosional deposition during the changes of stadial and interstadial condition. The darker horizons within 7b layer originally interpreted as climatic events were reinterpreted as a result of quick seasonal redeposition and mix of older soil sediments and unaffected loess.

Moravian Museum in Brno, Project No. 7381: **Blučina** (*L. Lisá*)

The composition and the origin of pellets from the Neolithic locality of Blučina near Brno city were studied. Due to the state of decomposition by digestion, the bone material was interpreted as a bird pellet. On the other side the composition of bone fragments, i.e. fragments of bones from relatively big animals correspond more to the excrements of a carnivore. Such material would be digested quite quickly as for example in the case of an old individual.

Czech Geological Survey, Praha, Project No. 7406: **Regional geology and geological maping – zoopaleontological explanatory texts to geological maps 1: 25 000** (*J. Zajíc*)

The chapter on Permo-Carboniferous zoopaleontology and ichnology was compiled for the explanatory text to the Geological map No. 03-414 Vrchlabí (1: 25,000). The oldest known faunas (uppermost Carboniferous) of this area come from the Lower and Middle Semily Formation both from the Štěpanice-Čikvásky Horizon (Stephanian C; *Sphaerolepis-Elonichthys* local bio/ecozone) of one borehole and one adit dump and out of the above mentioned horizon from the famous road cut at Vrchlabí. The Lowermost Permian (Rudník Horizon of the Vrchlabí Formation; Lower Rotliegend; *Acanthodes gracilis* local bio/ecozone) faunas were discovered in four boreholes, one adit dump and six other outcrops. Rare branchiosaurid amphibians were collected especially at the localities of the Vrchlabí road cut and Prostřední Lánov, behind the factory. The youngest faunas come from the Kalná Horizon of the Upper Prosečné Formation (Upper Rotliegend; *Xenacanthus decheni* local bio/ecozone). Two outcrops, one exploration adit and four adit dumps contain representative animal fossils and ichnofossils of the horizon.

■ **Fig. 13.** *Acanthodes* sp.; bent articulated specimen; Vrchlabí road cut; Vrchlabí Formation, Rudník Horizon; Lower Permian (Lower Rotliegend; local bio/ecozone *Acanthodes gracilis*). Photo by J. Zajíc.

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

Geochemical monitoring of atmospheric deposition in the area of the Bohemian Switzerland National Park continued in year 2012 at site KV. Two types of precipitation were sampled – bulk precipitation and spruce throughfall.

The hydrological year 2012 could be characterized as average according to the precipitation of 864 mm, while the long-term average for the area is 800 mm. November–January and June–July periods were typical with overflow of the samplers, the volume of precipitation exceeded the sampler capacity. Thus the appropriate data on sample volume were extrapolated from measurements of the Hydrometeorological station of the Bohemian Switzerland National Park, located approximately 3 km away. The spruce throughfall precipitation reached 701 mm, which represents over 80 % of the bulk precipitation volume. The smallest difference (6%) between the volume of bulk precipitation and spruce throughfall occurred during May probably due to the episodic character of the precipitation events. The pH of bulk precipitation ranged from 4.35 to 6.31 and of spruce throughfall from 4.05 to 6.31.

Podblanické ekocentrum ČSOP Vlašim, Project No. 7418: **The Blaník Knights Area Geopark: Chapter Geology for nomination document to The Blaník Knights Area Geopark** (*J. Kadlec*)

Geological history of the region planned to establish as The Blaník Knights Area Geopark (Blanice Graben) is summarized in the document. The report is completed with a list of 21 points significant from geological point of view. Geology of each point is described in detail. The points form a network for future geological trips.

Česká společnost archeologická o. p. s., Praha, Projects No. 7422 and 7427: **Magnetic fabric of sediments at selected sites in Prague and surroundings. 2012 report** (*J. Kadlec & K. Čížková*)

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

Asekol s. r. o., Project No. 7423: **Analysis of the CRT glass – leaching tests** (*T. Navrátil, J. Rohovec & Š. Matoušková*)

With respect to the original assignment, total and leachable concentrations of yttrium (Y) were determined on samples of crushed CRT glass. The aim was to test Y as a possible tracer of fluorescent coatings content in the crushed CRT glass samples.

■ **Fig. 14.** Prepared large scale shards of CRT glass containing defined amount of the fluorescent coatings. Batch tests of scrap TV material in the 100ml bottles. Fine-grained crushed samples of cleaned TV screens in plastic bags. Photo by T. Navrátil.

Tests included leaching of CRT glass samples with inorganic acids (HCl, HNO_3, aqua regia).

Due to problems with Y as indicator of residual fluorescent coatings in the CRT glass samples further tasks included testing and evaluating of sulfur (S) as a possible tracing analyte. We further tested the reaction of CRT glass material (Fig. 14) with aqua regia under specified conditions of leaching according to the customer needs. Finally, we analyzed a number of TV/PC monitor scrap samples to assess its possible contamination with fluorescent coatings. Several samples of fluorescent coatings were analyzed throughout all stages for reference.

From the results of individual experiments, it was concluded that part of yttrium can be leached from the CRT glass material and another part from fluorescent coatings. Unfortunately, the individual contributions of Y from the fluorescent coatings and screen glass to the total content of Y are comparable. The leaching of yttrium from the glass increases with a decreasing grain size of the material and leaching time as demonstrated by the results of this study. Yttrium is therefore not a good choice for a fluorescent coatings tracer.

Moreover, the analyses of leachable barium and cerium during the leaching of CRT glass allow to conclude on relatively easy dissolution of CRT glass especially dependent on grain size. Fine grain size (Fig. 14) crushing should be recommended to avoid significant contributions of elements from CRT glass.

Finally, sulfur appeared as a good analyte to quantify the residual fluorescent coatings amount on the screen glass due to its negligible content in the CRT glass and relatively high content in fluorescent coatings.

Institute of Inorganic Chemistry ASCR, v. v. i., Praha, Project No. 7426: **Paleomagnetic properties of Libkovice unit, Most Basin** (*P. Pruner*)

Nine sites in the Tušimice quarry and 12 sites in Bílina were sampled and processed in order to find paleomagnetic directions. Hand-operated drilling on outcrops provided 216 laboratory samples. Only two normal and one reverse polarity intervals were proved, which implies that the the Libkovice Member was deposited within approx. 1 My.

Czech Geological Survey, Praha, Project No. 7444: **Re-Os and highly siderophile element systematics of mantle xenoliths from Zinst, NE Bavaria** (*L. Ackerman*)

Eighteen samples of mantle xenoliths from Zinst were analyzed for highly siderophile element (HSE) concentrations and Re-Os isotopic compositions. The results suggest strongly incompatible behaviour of HSE during melt percolation, however, some Os model depletion ages show values up to 2.0 Ga.

Czech Geological Survey, Praha, Project No. 7453 & Charles University in Prague, Praha, Project No. 7461: **Paleomagnetic properties of Permian deposits in the Krkonoše Piedmont Basin** (*P. Schnabl*)

The main goal of this study was to find the end of the Permian paleomagnetic reversal. Pilot samples from upper Permian sediments of the Krkonoše Piedmont Basin show paleomagnetic directions 200/-5. This direction originated during reverse polarity superchrone, the normal polarity site has not been found yet. Samples from the Úpice site contain large amount of goethite and proved that the sampled lithology (unlithified clays) is not suitable for paleomagnetic study. Conglomerate test performed on samples from the Hrádeček site proved that the samples from well lithified rocks are much more suitable for the research. Several additional sections are prepared for the year 2013.

Czech Republic – Nature Conservation Agency of the Czech Republic, Praha, Project No. 7454: **Important geological, paleontological and geomorphological localities and features of the Brdy Military Training Area** (*K. Žák*, *R. Mikuláš* & *P. Bosák*)

The Brdy Military Training Area is planned to be declared a protected nature area. As a part of the planned conversion of this large (260 sq. km) territory from army to civil use, all valuable aspects of its nature were catalogued in 2012. The report contains a condensed review of the geological history of the area and describes the most important paleontological localities, geomorphological evolution of the area, and the deposits of ore and non-metallic raw materials mined in the past. The most important part of the study is a description of together 78 important sites of geological heritage. Of these, 18 sites were proposed to be declared as Nature Reserves or Nature Monuments with important geological, paleontological or geomorphological content.

4f. Programmes of Institutional Research Plan

Project No. 9133: **Kinematic and dynamic analysis of brittle deformation of the Lusatian Fault zone: a key to deciphering the platform tectonic history of the N part of Bohemian Massif** (*M. Coubal*)

The course of the principal fault of the Lusatian Fault zone was verified between Doubice and Jedlová in the Šluknov area and at other sites in the Ještěd Hill piedmont area. Detailed mapping of the fault trace in complex relief and test pits helped to determine the dip angle of the thrust plane. Kinematic character of the fault was characterized for different segments of the fault. In the Šluknov area, the Lusatian Fault is a very gently dipping thrust (dip angle ca 16°) with the total displacement magnitude of over 4 km. In the Ještěd Hill piedmont area, the principal fault dips at 25–35° with the total displacement magnitude of min. 2 km. In the Malá Skála segment, the dip angle further increases to 40–60° with a similar displacement magnitude. Thrusting was controlled by subhorizontal NNE–SSW compression. The favourable orientation of the fault plane relative to the stress ellipsoid axes led to an extensive thrust in the W part but the almost normal orientation of the fault plane to the maximum principal stress axis in the E resulted in a "bulldozer effect" associated with the origin of numerous drag structures (rotation of strata to upright position). Kinematics of brittle deformation was studied and analyzed at all mentioned sites with the aim to complete data on the effect of Cenozoic stress fields in the Bohemian Massif.

Project No. 9138: **Mechanical and thermal effects of dike intrusions on porous host rocks** (*J. Adamovič*)

Columnar jointing was studied in the Nubian Sandstone on samples from Jabal Wahaaba at the 3rd Nile Cataract in northern Sudan and compared with Cretaceous columnar-jointed sandstones along intrusive bodies in the Bohemian Massif. Sandstone columns at Jabal Wahaaba are developed in a subhorizontal layer about 3 m thick, they are of two sizes: columns ca 6–9 cm in diameter near the base of the colonnade pass upwards into columns 2–3 cm in diameter but sometimes more than 1 m long. X-ray diffraction analyses indicated the presence of kaolinite and greigite (Fe_3S_4) in unaffected sandstone and of kaolinite and hematite in the jointed sandstone. Microscopic analysis of columnar-jointed sandstone proved the presence of corrosive secondary pores generally exceeding grain diameter in their size. These may have functioned as jets for fluid advection at peak fluid-pressure conditions, as suggested by dense microfracutures in quartz grains lining the pores. Temperatures in the host sandstone should be anticipated below 1,000 °C, maybe even below the alpha-quartz/beta-quartz transition of 573 °C, as a result of heat dissipation by circulating fluids. The dominance of heat convection – rather than heat conduction – points to dynamic fragmentation by expanding liquid and gas phases and the subsequent relaxation. In this respect, the joint pattern on a plane perpendicular to column axes can be best described by the Voronoi fragmentation. Although the immediate heat source cannot be precisely identified at Jebel Wahaaba, the perfectly developed colonnade in the Nubian Sandstone can be paralleled with other examples of columnar jointing in quartzose sandstones with identified heat sources. The style of deformation and micro-deformation clearly suggests that the sandstone was water-saturated at the time of magma emplacement (probably in the Late Cretaceous). The process of joint formation was associated with syn-emplacement fluid expansion rather than with post-emplacement host-rock cooling.

Project No. 9139: **Stratigraphy and tectonic development of the Cenozoic volcanism** (*V. Cajz*)

Previously published field data on tectonic structures in the NW part of the Milešovké středohoří Mts. (a part of the České středohoří Volcanic Complex) were processed using morphometric analyses in GIS tools. This allows evaluating tectonic activity in its youngest stage of development (Dužár et al. 2012). The morphostructural evolution and volcano-tectonic activity of the České středohoří volcanic range is recently predominantly considered to be predisposed by the location of this area inside the intracontinental rift structure. The results indicate that the relief of the area is highly affected by post-volcanic tectonic activity caused by late Cenozoic stress fields. It is suggested that this region was in its youngest development stage of different behaviour than the considered rift structure, as visible in its geological setting. The older syn- and post-volcanic tectonic structures were reactivated in younger periods. Based on the age of the best preserved lower Pleistocene terraces, the area was most probably under the influence of young Cenozoic tectonic activity at least until 1 Ma. The results of this morphometric analyses also prove the validity of the definition of newly described tectonic nodes and faults (Cajz & Valečka 2010), and shows new insight on the complexity of tectonic setting inside this part of the volcanic complex and the rift structure itself.

DUŽÁR J., RAŠKA P. & CAJZ V. (2012): Geomorfologické projevy mladě kenozoické tektoniky v severozápadní části Milešovkého středohoří. – *Zprávy o geologických výzkumech v roce 2011*: 75–81.

CAJZ V. & VALEČKA J. (2010): Tectonic setting of the Ohře/Eger Graben between the central part of the České středohoří Mts. and the Most Basin, a regional study. – *Journal of Geosciences*, 55, 3: 201–215.

Project No. 9141: **Mesoproterozoic terrane in the South Bohemian Moldanubicum** (*J. Fiala*)

The search for metasediments with a presumed age of >2.1 Ga continued with processing of samples from the vicinity of the Světlík orthogneiss between Český Krumlov and Frymburk. Zircons for Nb-Pb mass spectrometry were isolated, and samples for Sm-Nd determination of model ages were prepared. These two methods are expected to yield ages higher than those determined for the Světlík orthogneiss (2.1 Ga using U-Pb and 3.2 Ga using Sm-Nd).

Project No. 9142: **Age determination of rocks using fission tracks after the decay of ^{238}U nuclei (FTA) in titanite** (*J. Filip*)

The development of a new method of fission track dating analysis by using titanite in cooperation with the Nuclear Physics Institute of the ASCR, v. v. i. has been continuing. The testing of the selected irradiation channel at Řež and its acceptability for dating was realized.

The titanite standards (Durango) and titanites from real rock samples which come from south Moravia near Brno (Obřany, Maloměřice, Josefov-Habrůvka and Blansko-Lažánky) were processed in accordance with the Wagner-Jonckheere method. The stack of titanites was completed by apatite standards (Durango) and by a set of apatite samples which were irradiated at Oregon facility before. Apatites were dated for comparison.

The sample processing and measurement were performed by two independent observers with a very good agreement.The difference between age measurements was not greater than 5 %. In comparison with Oregon samples, a higher ^{60}Co activity was registered.

Project No. 9143: **Post-Variscan time-temperature evolution of sedimentary basins and their source areas along the Lusatian Fault, Bohemian Massif** (*D. Kořínková*)

The ongoing project is designed as a thesis and is a continuation of the project No. 9130 from 2011. Its aim is 1) to reconstruct the time-temperature evolution of studied area, which is the result of the activity on the Elbe Fault Zone and 2) bring new data about the tectonic subsidence/uplift (cooling rate) in the studied area using fission-track analysis (FTA).

In 2012, the first set of samples underwent preparation for FTA (crushing, magnetic separation and heavy-liquid separation of apatites, thin sections and polished sections for FTA); irradiation of samples in nuclear reactor; apatite-FTA and time-temperature modelling of measured data. These results will be presented at the Meeting of the Central European Tectonic Studies Groups (CETEG2013) in April 2013 in Hungary. Furthermore, the next set of rocks from the basins and uplifted blocks along the Lusatian Fault was acquired from NW/N and NE/E Bohemia, Saxony (Germany) and Silesia (Poland). These samples are being processed for FTA (see previous set of samples).

Project No. 9144: **Contrasting mineral parageneses of Plio-Pleistocene volcanics of the Bohemian Massif** (*J. Ulrych*)

Two distinct rock series can be recognized: (a) an older basanitic (6–0.8 Ma) characterized by a lower degree of silica undersaturation, lower Mg# (62–74) and mildly elevated concentrations of incompatible elements if compared to primitive upper mantle. The nepheline basanite magma differentiated to an alkali basalt – trachybasalt series by polybaric fractionation of olivine and clinopyroxene, and (b) a younger melilititic (1.0–0.26 Ma) characterized by a higher degree of silica undersaturation, Mg# (68–72) and contents of incompatible elements. Principally different mineral associations of plagioclase / anorthoclase ± nepheline are characteristic of rocks of the older basanitic series, and melilite ± nepheline, and/or sodalite of the younger melilititic series.

Project No. 9146: **Fieldwork in the Javoříčské Caves and Bulhary loess section** (*S. Šlechta*)

The main goal of the institutional project was sampling of cave sediments and loess deposits with paleosoils for palaomagnetism and geochemistry. Samples of cryogenic calcites were taken in the Za hájovnou Cave (Javoříčský Karst) for K. Žák. One hundred oriented samples were collected for paleomagnetic survey and dating of cave sediments. The research adds new information to paleontological discoveries of J. Wagner and to radiometric dating by J. Lundberg (Canada). There was a reconnaissance of other profiles in the Javoříčské Caves for effective planning of further research. Fifty samples for rock magnetic measurements were collected from fossil soils at the Bulhary section. The soils were formed during the last interglacial period.

Project No. 9300: **Study of fossil ecosystems and their dependence on global climatic and paleogeographic changes (interaction and development of processes)** (*Co-ordinator: M. Svobodová; contributions: R. Mikuláš, T. Přikryl, Z. Roček, M. Svobodová, R. Vodrážka, J. Zajíc & J. Žítt*)

Specific directions of this project focused on paleobiology, paleoecology, and biostratigraphy of selected fossil groups (fishes, frogs, echinoderms, sponges, ichnofossils, and palynomorphs) in various stratigraphical positions(from the Lower Paleozoic, Upper Paleozoic, Upper Cretaceous to the Upper Tertiary) in the area of the Czech Republic, Germany, Poland, Ukraine, Abkhazia, Russia, China and USA.

Trace fossils and ichnofabrics were recognized in the Middle to Upper Devonian deposits of the East European Platform at the Onega Lake (NW Russia), developed as the Old Red Sandstone facies. The studied sequence is upper Givetian to Middle Frasnian in age. The most diverse ichnoassemblage was ascertained in the earliest Frasnian. Combination of ichnologic and sedimentary data points to the assumption that these deposits probably originated in wave- and tide-influenced environments, possibly in a brackish-water estuary. Towards the middle Frasnian, less diverse, ichnoassemblage can be attributed to the tidally influenced channels and bars (*R. Mikuláš*).

In the Upper Ordovician of the Barrandian area (Czech Republic), a distinctively tiered assemblage of trace fossils was found. Ther ichnogenus *Zoophycos* represents the middle tier (few centimetres below the seal floor); the deepest tier is occupied by the feeding trace *Teichichnus* (*R. Mikuláš*).

Fishes with preserved prey remains in the abdominal cavity area were occasionally found during paleoichthyological research. Such direct evidence allows to recognize feeding habits of these fishes and to consider paleoecological consequences. The dietary habits of the Oligocene bristlemouth fish *Scopeloides glarisianus* (Agassiz) were published based on functional morphology as well as fossil materials from the localities in Poland, Ukraine, the Czech Republic, and the northern Caucasus in Russia and Abkhazia. Similarly as in the recent relatives from the genus *Gonostoma*, *S. glarisianus* fed on crustaceans, the larger specimens fed on fishes (usually represented by smaller individuals of the same species; *T. Přikryl*).

Fossil fish scales from the Antarctica (Eocene, La Meseta Formation; Seymour Island) were studied, permitting the characterization of five morphotypes. Three morphotypes are similar to scales of recent trachichthyids, clupeids, and gadids. The other two morphotypes are represented only by poorly preserved specimens and their classification is preliminary. The fish scale assemblage originates within a high-energy, shallow marine environment (*T. Přikryl*).

A small palaeobatrachid from the Late Eocene of Kučlín, Czech Republic is described and compared with Middle Eocene palaeobatrachids from Messel, and with Middle Eocene palaeobatrachids from Geiseltal. The distribution of Eocene palaeobatrachids, encompassing only western and central Europe, contrasts with the distribution of palaeobatrachids in post-Eocene times. This suggests a shift in their distribution between the Late Cretaceous and Paleocene (western Europe) and the Pliocene and Pleistocene (eastern Europe). The last palaeobatrachids were recorded from the Muchkap interglacial (621–568 ka) in Russia. This implies that palaeobatrachids, as obligate water-dwellers, did not survive the Oka glaciation (474–425 ka). They were probably "trapped" between a periglacial zone with temperatures below freezing in the north and a dry steppe zone in the south (*T. Přikryl* & *Z. Roček*).

Specimens of a single anuran genus *Liaobatrachus* from the Lower Cretaceous of northeast China illustrate post-metamorphic developmental stages from early juvenile to fully grown adult. The relative ages of the individuals were estimated based on body size combined with degree of ossification. Postmetamorphic developmental data not only provide a basis for comparisons with other fossil and recent anuran taxa, but also help to identify both age-independent (i.e. size-independent) characters that can be used for taxonomic comparisons among individuals of various sizes (i.e. ages) and age-dependent (i.e. size-dependent, ontogenetically variable) characters that can only be used for comparisons across corresponding developmental stages (*Z. Roček*).

Screen-washing of matrix from 37 Upper Cretaceous microvertebrate localities in southern Utah, USA, yielded a rich sample of anuran disarticulated bones, including nearly 200 ilia. Because the bones are relatively small and delicate and were subject to pre-mortem transport and unavoidable damage when the fossiliferous matrix was collected and processed, none of the recovered ilia retained intact shafts. This means that features such as the form of the anterior end of the shaft and the presence and form of a dorsal crest cannot be used to identify the fossils. Urodele bones also are known from many of the same localities. When anuran and urodele ilia are isolated and missing much of their shafts, they are superficially similar, so it was important to reliably differentiate ilia of the two groups. Here we provide a list and brief descriptions of some of the features that we found useful for distinguishing between anuran and urodele ilia (*Z. Roček* & *T. Přikryl*).

Palynological research of Lower Turonian assemblages continued on the nearshore locality of Přípeklí near Kolín. Marine dinoflagellate cysts dominate in all studied samples. Poor preservation of microfossils is very often influenced by high percentage of $CaCO_3$ in sediments, weathering and/or the presence of pyrite. Dinoflagellate cysts are mostly white in color. Transgressive character of deposition is documented by the dominance of dinocysts *Palaeohystrichophora infusorioides,* common *Microdinium ornatum, Subtilisphaera hyalina*. Prasinophyte algae *Pterospermella helios, P. australiensis* and *Leiosphaeridia* sp. are abundant. Depositional environment reflects shallow-marine conditions. Extremely rare presence of the Normapolles pollen confirms the Lower Turonian age (*Complexiopollis vulgaris, Atlantopollis microrugulatus*) (*M. Svobodová*).

Totaly 32 older boreholes that reached fossiliferous horizons of the Líně Formation (uppermost Carboniferous – assumed lowermost Permian) were re-examined. The most common are faunas of the Zdětín and Klobuky Horizons. Some drill cores yielded animal remains also from the generally red beds out of fossiliferous horizons. Stratigraphically most important is fauna of the uppermost Stránka Horizon. This fauna comes from only three boreholes (no open-air outcrop is known) of the Mšeno-Roudnice Basin. The most important fossils were found in the Be-1 Bechlín borehole (thin-walled pelecypods, ostracodes, xenacanthid sharks and actinopterygian fishes). Circumstantial evidence, especially the absence of the uppermost Carboniferous index taxon *Sphaerolepis kounoviensis* (actinopterygian fish), indicate the Lower Permian age of the Stránka Horizon (*J. Zajíc*).

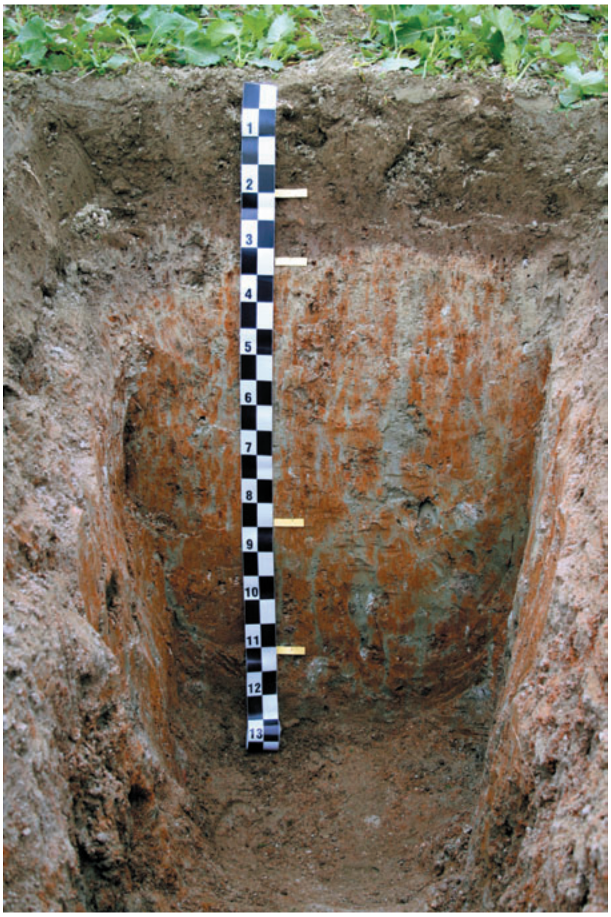
Investigations of the Early Turonian condensed horizon were finished in part of invertebrate faecal pellets and phosphogenesis (nearshore settings at Plaňany near Kolín). Pellet deposits are mostly uniform vertically reflecting relatively stable conditions and composition of producer communities. Intensive phosphogenesis and taphonomic processes enabling preservation and concentration of phosphatic particles were studied in connection with phosphatic crust formation and encrusting epifaunas. Lithological and macrofaunal (echinoderms, sponges) investigations provided new data on the age and sedimentary environments. Results were summarized in a paper submitted and accepted in the Cretaceous Research journal, London. Similar studies at Markovice near Čáslav and in the Kolín surroundings (Nová Ves, Velim) are in progress. Studies of the material derived from two new exposures of the Upper Cenomanian–Lower Turonian age, Nad Peklem locality near Kolín (road bypass constructions), were finished and results prepared for publication. Echinoid studies (*Micraster*, Upper Turonian) and *Cyathidium* (Crinoidea, Lower Turonian) are being finished with results prepared for publication in 2013 (*J. Žítt*).

Project No. 9405: **Soil conditions at localities with changes in land use type** (Co-ordinator: *A. Žigová*; contribution: *M. Šťastný*)

Land management has a major impact on the state of soil cover. The main objective was to evaluate the influence of changes in land use on the basic soil properties.

The study area of Krymlov is located 55 km to the east of Prague. The research was provided on the soil type of Stagnosol developed on Permo-Carboniferous bedrock. These soils are periodically wet and mottled in the topsoil and subsoil. The selection soil profiles was done on the basis of soil survey and knowledge of land use history. The list of localities with the geographic coordinates, type of land use and stratigraphy of soil profiles is presented in Tab. 1.

One site (Fig. 15) was originally arable soil. Conversion of arable soil to meadow (Fig. 16) on one from the studied areas was done 18 years ago. A change in land use to spruce forest



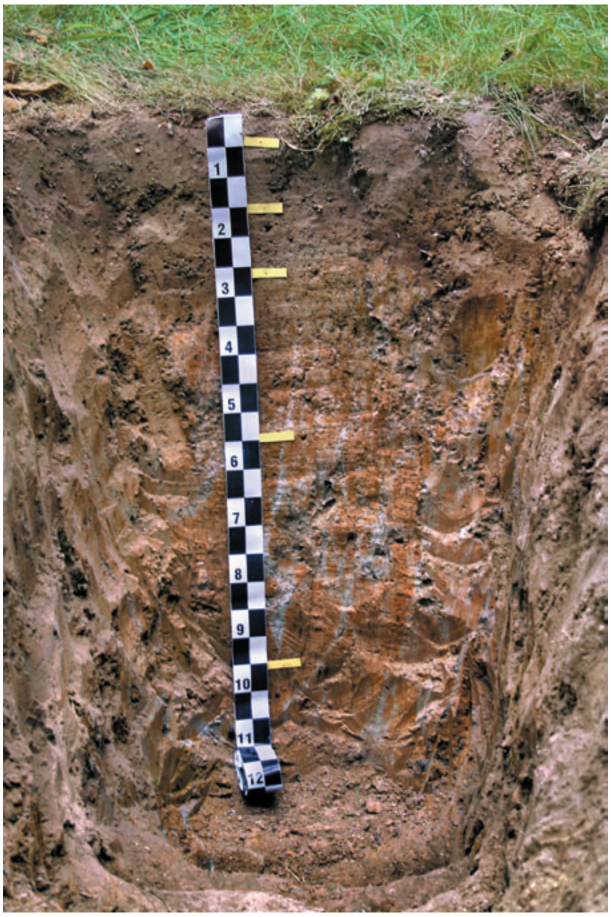
■ **Fig. 15.** Stagnosol under the conventional tillage. Photo by A. Žigová.

■ **Fig. 16.** Stagnosol under the meadow. Photo by A. Žigová.

Profile	Coordinate N	Coordinate E	Land use	Stratigraphy of soil profile
1	49°56′47.7″	14°55′30.4″	Arable soil	Apg-AhgBg1-Bg1-Bg2-Cg
2	49°56′56.3″	14°55′44.5″	Meadow soil	Adg-AdgBg1-Bg1-Bg2-Cg
3	49°56′42.6″	14°55′31.2″	Forest soil	O-Ahg-AhgBg1-Bg1-Bg2-Cg
4	49°56′43.6″	14°55′30.3″	Forest soil	O-Ahg-AhgBg1-Bg1-Bg2-Cg

■ **Tab. 1.** Location and basic information about the studied soil profiles.

■ **Fig. 17.** Stagnosol under the spruce forest. Photo by A. Žigová.



■ **Fig. 18.** Stagnosol under the birch forest. Photo by A. Žigová.

(Fig. 17) and birch forest (Fig. 18) in the study areas took place 50 years ago. Soils were classified according to the World Reference Base for Soil Resources. Morphological description of individual soil profiles was done by the FAO procedure (Guidelines for Soil Description). Soil profiles were excavated down to the C horizon. Samples were collected from individual horizons of soil profiles. Colors were identified by the Munsell Soil Color Charts. The individual analyses were determined using standard laboratory techniques. Physical properties such as moisture, maximum capillary capacity, bulk density, particle density and porosity were measured in undisturbed core samples. Metal cylinders 100 cm^3 in volume were pressed into the soil and measured using the standard method. Chemical soil properties from individual horizons, such as pH_{H2O}, pH_{KCl}, cation exchange capacity, base saturation were used for decription of chemical properties of soils. The process of humification was evaluated on the basis of values of C_{ox} and N_t.

Agriculture and meadow soils have an acid reaction in the upper part of profiles. In the case of forest soils, upper part of profiles showed a strong acid reaction. Lower values of cation exchange capacity and base saturation were obtained for the forest soils. The results revealed differences in the process of humification in different conditions of land use. Forest soils have higher contents of C_{ox} and N_t than agricultural and meadow soils. All soils have very similar chemical and organic matter properties in the B and C horizons. The results showed considerable differences in the physical properties (moisture, maximum capillary capacity, bulk density and porosity) in the upper portions of soils. These parametrs are the same in the bottom portions of the soils. More favorable physical properties in the O and A horizons are displayed by the forest soils. Particle density of the studied soils is controlled by parent material.

Project No. 9407: **Malacocoenological and stratigraphical evidence in Quaternary sediments in the Czech Republic (Holocene to Modern)** (*J. Hlaváč*)

Interesting data have been achieved within the study of molluscan thanatocoenoses at Žalov near Prague from the grave fillings dated to Bylany culture, Hallstatt Age (800/700 to 550/500 BC), and Early Mediaeval Age. The molluscan thanatocoenoses dated to the Bylany culture were more abundant with evidenced numerous index species of specific paleoenvironmental characteristics. These contain open-ground habitats characterized by the occurrence of xerothermophilous species *Truncatellina cylindrica*, *Cochlicopa lubricella*, *Cepaea vindobonensis*, and even the true steppe species *Chondrula tridens*, and the habitats of bush and sporadic tree patches with the species *Euomphalia strigella* and *Fruticicola fruticum*. The high number of fresh-water bivalves of genus *Unio* (*U. crassus*, *U. tumidus*) documents an occasional applying of these species for nutrition. A conchological material of Early Medieval Age was very poor in determined species level consisting of adaptable and tolerant open-ground elements such as *Vallonia pulchella*, *Vitrea contracta* and steppe species *Chondrula tridens* with important portion of species of allochthonous origin (e.g., terricollous species *Cecilioides acicula*). The most important find is the evidence of prosobranchiate snail *Cypraea* (*Monetaria*) *moneta*, known as a cauri.

Project No. 9409: **Silver in macrofungi** (*J. Borovička*)

Interaction of Ag with communities of soil saprotrophic organisms was studied in two different soils using a metagenomic approach. Silver was applied in mineral form as well as naturally bound in dry fruit-body biomass of the Ag-hyperaccumulating ectomycorrhizal fungus Amanita solitaria. Contrasting behavior of fungi and bacteria in reaction to Ag dosages was observed. The majority of bacterial ribotypes tended to prefer the soil with low doses of Ag, the ribotypes of fungi were more abundant in untreated soils and soils treated with the highest Ag concentration. Organically bound and mineral forms of Ag did not differ substantially in their effects on microbes in samples. The results indicate that decomposing Ag-rich fungal biomass can significantly alter the soil microbiota. In consequence, this can contribute to formation of spot-like non-homogeneities in soil microbial distribution.

Project No. 9601: **Physical properties and mineralogy of micrometeorites from Antarctica and Novaya Zemlya (Russia)** (*T. Kohout*)

Micrometeorites (MMs) are silt-sized particles released predominantly from asteroids and comets into interplanetary space. They carry important information about the composition and structure of asteroid surfaces as well as of cometary dust. Thus, knowledge of MMs physical properties is essential in the interpretation of ground-based or space-based observation of asteroids and comets as well as in a modeling of cosmic dust atmospheric entry (meteor phenomena). Through comparative X-ray microtomography (XMT) and Electron Microprobe Analysis (EMPA) studies the internal structure, density, porosity, and mineralogy of MMs was determined. Our MM collection contained unmelted, partially melted (scoriaceous) as well as entirely melted particles. This allowed for porosity and bulk and grain density comparison among these types as well as for the determination of meteoroid properties through atmospheric entry at various velocities.

4g. Defended theses

Koptíková L. (2012): The basic composite section in the Barrandian Lower Devonian succession of the beds using magnetic susceptibility stratigraphy. Ph.D. Thesis.

The composite reference section in the Lower Devonian succession was established using the magnetic susceptibility (MS) and gamma-ray spectrometric (GRS) logs from 5 sections representing both deep- and shallow-water environment of carbonate slope systems in the Prague Synform. Both background data and data across the boundaries of geological units or event intervals were acquired with the emphasis on obtaining continuous data series. Such a complex, detailed and multidisciplinary data set (petrophysical, lithological, mineralogical and geochemical parameters) has never been collected here. They were linked to the existing biostratigraphical scales and offer complex information for interregional and global correlations now with the precision of a few centimetres, which is a resolution 10 to 100 fold higher than in any established biostratigraphic scale in the Devonian of the Prague Synform.

Matoušková Š. (2012): Vzdělávání v anorganické chemii v kontextu života současného člověka (Education in Inorganic Chemistry in Context of Common Life). Ph.D. Thesis.

The objective of this Ph.D. thesis is to contribute to the effectiveness and quality of education of inorganic chemistry in the context of common life. The first chapter characterizes the current state of inorganic chemistry as a science and as a teaching subject. The requirements of the teachers teaching inorganic chemistry in secondary schools were determined by using the method of personal interview in the second chapter. After comparing the school systems in the third chapter and the analysis of selected textbooks used in the Czech Republic and in one of the countries of Germany, the criteria for creating teaching materials for inorganic chemistry were set. A textbook on the topic of the transition metals for secondary school pupils was created by means of a transformation of a scientific text. Many pictures, photographs and experiment instructions were added to the text to make it more approachable for pupils. Finally, the textbook was evaluated by chemistry teachers at secondary schools in the form of a questionnaire survey and adjusted to the final form.

Schnabl P. (2012): Paleomagnetism and magnetomineralogy of rocks from the Bohemian Massif and Tethyan Realm. Ph.D. Thesis.

The thesis deals with paleomagnetic and rock magnetic properties of Silurian/Devonian and Jurassic/Cretaceous limestones, Paleogene/Neogene basaltic rocks and altered Silurian basalts. The main goal is to determine the history of the Earth's magnetic field from the Silurian to the present. Two lithostratigraphic formations are defined in the Jičín volcanic field on the basis of volcanology, paleomagnetism and radiometric dating. The Trosky Formation (24.6?/18.3–15.7 Ma) is composed of several Strombolian-type volcanoes, while the Kozákov Formation (5.2–4.6 Ma) is represented by effusive products with a crater vent of a single giant volcano. One Pliocene (4.3–3.3 Ma) and two Pleistocene phases (2.6–2.1 Ma and 1.8–1.1 Ma) of volcanic activity were identified. Magnetostratigraphy is a very important tool for the definition of the Jurassic/Cretaceous boundary. The boundary between the *Crassicolaria* and *Calpionella* zones is present within geopolarity zone M19n. The boundary between the ammonite zones *Jacobi* and *Durangites* also lies close to this point. Paleomagnetic directions of Silurian and Devonian rocks in the Bohemian Massif are very difficult to interpret and have been studied as a challenging problem for many years. In the Barrandian area, two potential components have been identified: approximately 200°/–30° and 200°/+30°. The first direction has been reported as the primary one by several authors, while the second one is possibly of secondary origin but also Lower Paleozoic in age. This interpretation implies an approximately 200° clockwise (160° counter-clockwise) rotation during the Variscan orogeny. According to the second theory, which has not been published yet, the direction 200°/+30° is the primary one and the direction 200°/–30° is a secondary one, caused by supergene processes related to tropical weathering in the Mesozoic. None of these two theories is supported by clear evidence. This thesis, however, presents several specialized rock magnetic methods which can help to solve this task. Newly obtained data rather suggest the validity of the first theory. This means that the Barrandian area was rotated 200° clockwise or 160° counter-clockwise until the end of Variscan orogenic processes.

Wagner J. (2012): Concept of species in bears (Ursidae): practical, historical, and theoretical viewpoint. Ph.D. Thesis.

The thesis surveys topic of taxonomic diversity and phylogeny of bears (Mammalia, Ursidae) and aspects of its contextual setting under effects of changing conceptual and methodological viewpoints. This problem is studied from several perspectives. The historical perspective is represented by a critical overview of the history of specific and infraspecific classification of bears with special respect to mutual influences of this classification and theoretical concepts of species accepted in particular periods. The perspective of material approach is exemplified by a material-based study of taxonomical and phyletic status of selected Pliocene to Middle Pleistocene ursine taxa. Along with deconstruction of some traditional hypotheses this produced a model explaining species diversification in ursine bears and its discussion in terms of factual relevance of included background concepts.

In the pre-evolutionary period the bear species were usually understood broadly, as incipient immanent entities, yet exhibiting obvious certain infraspecific variability. This was established using definitions of varieties (mostly not identifiable with present subspecies or infraspecific taxa) considered as unstable modes of particular species. Although, in the post-Darwinian period, the concept and taxonomic treatment of species did not change essentially, significance of the infraspecies variation and its taxonomic meaning grew considerably. The concept of subspecies – the pre-species entities indicating evolutionary dynamics of a species, enriched praxis of taxonomical analyses considerably. Approximately from 1890 to 1930, a large number of new species and subspecies were described, using nominalistic approach, yet mostly based on the differences today interpreted as infrasubspecific. A new taxonomy in 40's, operating with the biological concept of species, brought a strong critical revision upon vast majority of these taxa and the number of valid species declined significantly. This viewpoint and its classification products dominated till the end of 20th century. Since then the taxonomical practice, operating with formal tools of the cladistic analyses and phylogenetic concept of species, brought a new wave of changes. Among other, this new viewpoint leads to repeated increase in number of valid species.

Naturally, the above mentioned conceptual and methodological shifts considerably influenced also the concepts and ideas of diversity of bear fossil record and its phylogenetic meaning. I confronted the historical issue of these topics with results of my own material-based analysis and taxonomical revision of the Late Biharian bears, mostly from Central Europe. Its outputs suggest that (1) most of the bear remains from this period represent *U. deningeri* which exhibits already most of the spelaeoid apomorphies, (2) *U. suessenbornensis*, *U. e. gombaszogensis* and *U. savini* are synonyms to *U. deningeri*, (3) the presence of arctoid bears at the localities of Chlum IV and Sackdilling and most probably also Kövesvárad and Voigtstedt suggest sympatry of two different clades in European Biharian stage, while (4) *U. savini* was excluded as a possible ancestor of *U. deningeri*. The taxonomic diversity of Plio-Pleistocene bears of Europe is further supplemented with another clade: *Ursus* aff. *thibetanus* identified in Villány 3. Its appearance suggests an immigration of this clade from Asia near the Villanyian/Biharian boundary, yet its presence in Europe was probably temporal only as no other positive evidence of *Ursus* gr. *minimus-thibetanus* in Early Pleistocene of Europe is available. Based on the bears, the age of the Šandalje 1 locality was newly re-evaluated as Toringian.

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

5a. Papers published in 2012

*publications in journals included in the ISI Web of Science (IF value according to a list from 2012)

9.737* BUNCH T.E., HERMES R.E., MOORE A., KENNETT D.J., WEAVER J.C., WITTKE J.H., DECARLI P.S., BISCHOFF J.L., HILLMAN G.C., HOWARD G.A., KIMBEL D.R., *KLETETSCHKA G.*, LIPO C.P., SAKAI S., REVAY Z., WEST A., FIRESTONE R.B. & KENNETT J.P. (2012): Very high-temperature impact melt products as evidence for cosmic airbursts and impacts 12.900 yeares ago. – *Proceedings of the National Academy of Sciences of the United States of America,* 109, 28: E1903–E1912.

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3.556* *ŽÁK K.*, RICHTER D.K., *FILIPPI M.*, *ŽIVOR R.*, DEININGER M., MANGINI A. & SCHOLZ D. (2012): Coarsely crystalline cryogenic cave carbonate – a new archive to estimate the Last Glacial minimum permafrost depth in Central Europe. – *Climate of the Past*, 8, 6: 1821–1837.

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2.939* *SLÁMA J.* & KOŠLER J., 2012: Effects of sampling and mineral separation on accuracy of detrital zircon studies. – *Geochemistry Geophysics Geosystems*, 13, 5: 1–17.

2.800* *ŽÁK K.*, *SKÁLA R.*, ŘANDA Z. & MIZERA J. (2012): A review of volatile compounds in tektites, and carbon content and isotopic composition of moldavite glass. – *Meteoritics and Planetary Science*, 47, 6: 1010–1028.

2.800* *KOHOUT T.*, PESONEN L., DEUTSCH A., WÜNNEMAN K., NOWKA D., HORNEMANN U. & HEIKINHEIMO E. (2012): Shock experiments in range of 10–45 GPa with small multidomain magnetite in porous targets. – *Metoritics & Planetary Science*, 47, 10: 1671–1680.

2.770* *ACKERMAN L., ROHOVEC J.* & ŠEBEK O. (2012): Determination of total sulfur in fifteen geological materials using Inductively coupled plasma-optical emission spectrometry (ICP-OES) and combustion/infrared spektrometry. – *Geostandards and Geoanalytical Research*, 36, 4: 407–414.

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2.212* PLÁŠIL J., FEJFAROVÁ K., *SKÁLA R.*, ŠKODA R., MEISSER N., HLOUŠEK J., CÍSAŘOVÁ I., DUŠEK M., VESELOVSKÝ F., ČEJKA J., SEJKORA J. & ONDRUŠ P. (2012): The crystal chemistry of the uranyl carbonate mineral grimselite, $(K,Na)_3Na[(UO_2)(CO_3)_3]$(H_2O), from Jáchymov, Czech Republic. – *Mineralogical Magazine*, 76, 3: 443–453.

2.212* HAVLOVÁ V., VEČERNÍK P., NAJSER J., SOSNA K. & *BREITER K.* (2012): Radionuclide diffusion into undisturbed and altered crystalline rocks. – *Mineralogical Magazine*, 76, 8: 3191–3201.

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2.169* MAJZLAN J., *DRAHOTA P.*, *FILIPPI M.*, GREVEL K.D., KAHL W.-A., PLÁŠIL J., BOERIO-GOATES J. & WOODFIELD B.F. (2012): Thermodynamic properties of scorodite and parascorodite,($FeAsO_4{\cdot}2H_2O$), kaňkite ($FeAsO_4{\cdot}3.5H_2O$), and $FeAsO_4$. – *Hydrometallurgy*, 117–118: 47–56.

1.962* *LISÁ L., LISÝ P.,* CHADIMA M., *ČEJCHAN P.*, BAJER A., *CÍLEK V.*, SUKOVÁ L. & *SCHNABL P.* (2012): Microfacies description linked to the magnetic and non-magnetic proxy as a promising environmental tool: Case study from alluvial deposits of the Nile River. – *Quaternary International*, 266: 25–33.

1.962* *CÍLEK V.,* BÁRTA M., *LISÁ L.*, POKORNÁ A., JUŘIČKOVÁ L., BRŮNA V., MAHMOUD A.M., BAJER A., NOVÁK J. & BENEŠ J. (2012): Diachronic development of the Lake Abusir during the third milénium BC, Cairo, Egypt. – *Quaternary International*, 266, 4: 14–24.

1.933* *BEK J.* (2012): A review of the genus *Lycospora*. – *Review of Palaeobotany and Palynology*, 174: 122–135.

1.889* NOVÁK J., *LISÁ L.*, POKORNÝ P. & KUNA M. (2012): Charcoal analyses as an environmental tool for the study of Early Medieval sunken houses infills in Roztoky near Prague, Czech Republic. – *Journal of Archaeological Science*, 39, 4: 808–817.

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form, Czech Republic). – *Geological Journal*, 47, 6: 616–631.

1.212* *VACH M.* & *SVOJTKA M.* (2012): Evaluation of Molar Volume Effect for Calculation of Diffusion in Binary Systems. – *Metallurgical Materials Transaction B*, 43, 6: 1446–1453.

1.200* *LOKAJÍČEK T.*, RUDAJEV V., DWIVEDI R.D., GOEL R.K. & SWARUP A. (2012): Influence of thermal heating on elastic wave velocities in granulite. – *International Journal of Rock Mechanics & Mining Sciences,* 54, 1: 1–8.

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1.143* *CAJZ V., SCHNABL P.*, PÉCSKAY Z., SKÁCELOVÁ Z., *VENHODOVÁ D., ŠLECHTA S.* & *ČÍŽKOVÁ K.* (2012): Chronological implication of paleomagnetic record of the Late Cenozoic volcanic activity in Moravo-Silesian Border – NE Bohemian Massif. – *Geologica Carpathica*, 63, 5: 423–435.

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1.141* WAGNER J. & *ČERMÁK S.* (2012): Revision of the early Middle Pleistocene bears (Ursidae, Mammalia) of Central Europe, with special respect to possible co-occurrence of spelaeoid and arctoid lineages. – *Bulletin of Geosciences*, 87, 3: 461–496.

1.141* *ŠTORCH P.* & SCHÖNLAUB H.-P. (2012): Ordovician-Silurian boundary graptolites of the Southern Alps, Austria. – *Bulletin of Geosciences*, 87, 4: 755–766.

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

1.141* *BEK J.* & LEARY R.L. (2012): *Porostrobus nathorstii* (Leary & Mickle) emend. and itsspores from the Namurian of Illinois, USA. – *Bulletin of Geosciences*, 87, 1: 45–52.

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Lectures for popular audience

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BOROVIČKA J.: Houby a geologické podloží. *Lecture. Přednáškový cyklus České botanické společnosti, Praha 2, November 12, 2012*. Praha.
BOROVIČKA J.: Houby a geologické podloží. *Lecture. Univerzita Karlova v Praze, PřF UK, Praha 2, April 24, 2012*. Praha.
BOROVIČKA J.: Mykolog na konferenci. *Lecture. Přednáškový cyklus České mykologické společnosti, Praha 1, June 11, 2012*. Praha.
BOROVIČKA J.: Na houby. *Lecture. Young MBSA, cyklus setkání, Praha 9, October 6, 2012*. Praha.
BOROVIČKA J.: Psychoaktivní houby. *Lecture. Přednáškový cyklus Českého svazu ochránců přírody, Praha 4, November 8, 2012*. Praha.
BOROVIČKA J.: S DNA na houby. *Lecture. Přednáškový cyklus České mykologické společnosti, Praha 1, November 19, 2012*. Praha.

BREITER K.: 800 years of mining activity and 450 years of geological research in the Krušné hory/Erzgebirge Mts. *Lecture. University of Belém, May 31, 2012*. Belém.

CÍLEK V.: Být krajinou (To be a landscape). *Opening lecture. Exhibition of work by M. Šejna, October 13, 2012*. Blansko.

CÍLEK V.: Co se děje se světem? (What is happening to the world?). *Lecture. Malostranský klášter, October* 31, *2012*. Praha.

CÍLEK V.: Energetika, krajina a klima (Energy-Landscape-Climate). *Invited lecture. Conference "Šetrné budovy", Archip, September 25, 2012*. Praha.

CÍLEK V.: Energie –potraviny – klima (Energy-Food-Climate). *Lecture. ČVÚT, October 3, 2012*. Praha.

CÍLEK V.: Od kolapsu k regeneraci (From collapse to regeneration) *Lecture.Charitas, November 6, 2012*. Praha.

CÍLEK V.: Pozoruj tu zemi (Observe the Earth). *Lecture. Luxor, October 12, 2012*. Praha.

CÍLEK V.: Proměna moderní krajiny (Changes of the contemporary landscape). *Lecture. Seminar dedicated to 40 years aniversary of CHKO Labské pískovce. October 11, 2012*. Děčín.

CÍLEK V.: Přechodná období – kolapsy a regenerace civilizací (Transitional periods – collapse and regeneration). *Lecture. Faculty of Liberal Arts, Ostrava University., October 24, 2012*. Ostrava.

CÍLEK V.: Staré cesty v historii krajiny (Old roads in the history of a landscape). *Lecture. Městská knihovna Třebíč. October 1, 2012*. Třebíč.

CÍLEK V.: Sucho a lodní suchary (Droughts and naval biscuits). *Lecture. Evangelický sbor, September 19, 2012*. Praha.

CÍLEK V.: Voda (Water). *Lecture. Violino- Energetický klub, October 25, 2012*. Praha.

CÍLEK V.: Země a energetické zdroje (Earth and its energy sources). *Lecture. Městská knihovna Třebíč, September 30, 2012*. Třebíč.

KADLEC J.: Klimatické změny v geologické minulosti a v současnosti. *Lecture. Klub Jurta, August 31, 2012*. Buchovy.

KADLEC J.: Objevování krás Moravskeho krasu. *Lecture. Cafe Barrande, April 26, 2012*. Praha.

KOPTÍKOVÁ L.: Co vše obnáší vědní obor jménem geologie, co nám vše může říci a jaký význam má pro každého z nás v současnosti? *Lecture. „Kurzy Otevřené vědy pro pedagogy chemie, fyziky a biologie – 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 30, 2012*. Třešť.

MIKULÁŠ R., POKORNÝ P., *CÍLEK V.* & PAVELKA Z.: Máme se připravovat na výrazné omezení civilizačních vymožeností? *Discussion. Akademická kavárna, Rada pro popularizaci vědy AV ČR, June13, 2012*. Praha.

MIKULÁŠ R.: Černá hodinka s Radkem Mikulášem nejen o ledu a o pískovcích. *Lecture and discussion. Knihovna Police nad Metují, May 17, 2012*. Police nad Metují.

MIKULÁŠ R.: Energie dinosaurů – zkamenělé stopy. *Lecture. Národní muzeum, Týden vědy a techniky 2012, Academy of Sciences of the Czech Republic, November 6, 2012*. Praha.

MIKULÁŠ R.: Fyzikální principy v paleobiologii a v geologii. *Lecture. Střední průmyslová škola stavební Dušní, January 3, 2012*. Praha.

MIKULÁŠ R.: Jaké to je být dinosaurem na konci druhohor. *Lecture. CONiáš 2012, Městská knihovna v Praze, September 15, 2012*. Praha.

MIKULÁŠ R.: Ovoce a led. *Lecture. O.s. Boreč; October 27, 2012*. Boreč.

MIKULÁŠ R.: Procházka pravěkým lesem s geologem Radkem Mikulášem. *Lecture and excursion. O.s. Kladno minulé, September 20, 2012*. Vašírov u Lán.

MIKULÁŠ R.: Sad mého otce. O historii, přírodních podmínkách a o vzpomínkách na sadařství v Čechách. *Lecture and discussion. Municipal Museum in Volyně, April 17, 2012*. Volyně.

MIKULÁŠ R.: Stopy dinosaurů. *Lecture and discussion. Knihovna Police nad Metují, May 17, 2012*. Police nad Metují.

MIKULÁŠ R.: Zaniklé sady v okolí Kunratického lesa. *Lecture and excursion. Otvírání studánek, MÚ MČ Praha-Kunratice, April 21, 2012*. Praha.

VOJTĚCHOVSKÝ M., CUSACK P., NOLL U. & *CÍLEK V.*: Lignite landscapes of Germany and Bohemia. *Lecture. Tranzit Club, October 2, 2012*. Praha.

Exhibitions

CÍLEK V.: Praha a Voda. *Texts to exhibition and catalog, Staroměstská radnice, November 16, 2012 to January 29, 2013*. Praha.

LISÁ L., *LISÝ P.*, SUKOVÁ L. & *CÍLEK V.*: Sabaloka and the Sixth Nile Cataract in space and time. *Exhibition in Gallery Truhlárna, December, 2012 to February, 2013*. Kokořín.

ŠTORCH P. & BUSINSKÁ L. (2012): Inspirující krása šišek jehličnanů celého světa. *Exhibition in Sládečkovo vlastivědné muzeum, January 19 to March 25, 2012*. Kladno.

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BOSÁK P., *PRUNER P.* & BELLA P. (Eds., 2012): *Výzkum vybraných travertinů na Slovensku. Etapová zpráva č. 1 – Liptov*. – Inst. Geol. ASCR, v. v. i. for Catholic University in Ružomberok: 1–33. Praha.

BOSÁK P., *PRUNER P.*, BELLA P. (Eds.), *ŠLECHTA S.*, *ČÍŽKOVÁ K.*, *PETRÁČEK J.*, *DOBROVOLNÝ J.* & *SKÁLA R.* (2012): *Výzkum sedimentárních výplní vybraných jeskyní na Slovensku. Etapová zpráva č. 7 – Jasovská jaskyňa*. – Inst. Geol. ASCR, v. v. i. for Catholic University in Ružomberoku: 1–61. Praha.

CÍLEK V. in DRÁBOVÁ D. & PAČES V. (Eds., 2012): *The perspectives of energetics in Czech Republic. The Report of Independent Comission on Energy*. – The Ministry of Industry and Office of the Government of CR: 1–38. Praha.

CÍLEK V., *MIKULÁŠ R.*, *ADAMOVIČ J.*, *BREITER K.* & HAVLÍN-NOVÁKOVÁ D. (2012): *Návrh bezpečnostních*

kritérií pro umisťování nových jaderných zařízení a velmi významných zdrojů ionizujícího záření po havárii JE Fukušima 2.– Inst. Geol. ASCR, v. v. i. for Státní ústav pro jadernou bezpečnost: 1–42. Praha.

HLADIL J., *ROHOVEC J.* & *MATOUŠKOVÁ Š.* (2012): *Karlovarská vřídelní sůl – výsledky týkající se procesu, suroviny a produktů, včetně požadovaných doporučení (Adresná podkladová součást grantového projektu: zakázková zpráva s omezeným šířením)*. – Inst. Geol. ASCR, v. v. i. for Original Karlsbader Sprudelsalz, s. r. o.: 1–48. Praha.

KADLEC J. & *ČÍŽKOVÁ K.* (2012): *Magnetická stavba sedimentů na vybraných archeologických lokalitách v Praze a okolí. Zpráva za rok 2012.* – Inst. Geology AS CR, v. v. i. for Česká společnost archeologická, o.p.s.: 1 – 20. Zruč n. Sázavou.:

KADLEC J., ŠTĚDRÁ V. & STANZELOVÁ Z. (2012): *Geopark kraj blanických rytířů: Kapitola: Geologie : pro nominační dokument geoparku Kraj blanických rytířů.* – Inst. Geol. AS CR, v. v. i. for Podblanické ekocentrum ČSOP, Vlašim.: 1–48. Praha.

LISÁ L. (2012): *Mikromorfologický posudek sedimentů z lokality Dolní Chabry - Do Rybníčků.* – – Inst. Geol. ASCR, v. v. i. for Institute of Archaeology ASCR: 1–23. Praha.

LISÁ L. (2012): *Pelety z lokality Blučina II. Unpublished research report*. –Inst. Geol. AS CR, v. v. i. for Moravian Museum: 1–16. Praha.

NAVRÁTIL T., *DOBEŠOVÁ I.*, *ROHOVEC J.* & *HUBIČKOVÁ S.* (2012): *Monitoring srážkových vod na území NPČŠ. Zpráva za rok 2011*.– Inst. Geol. AS CR, v. v. i. for Administration of National Park Bohemian Switzerland: 1–15. Praha.

NAVRÁTIL T. & *ROHOVEC J.* (2012): *Analysis of the CRT glass – leaching tests. Report.* – Inst. Geol. AS CR, v. v. i. for Asekol s.r.o.: 1–20. Praha.

PETRUŽÁLEK M., *LOKAJÍČEK T.*, *SVITEK T.*, FILLER V., *ERDINGEROVÁ J.* & NEMEJOVSKÝ V. (2012): *Detailed anisotropy of longitudinal velocities of oriented samples from boreholes: PTV1, MEV1, PDV1, PBV1*. – Inst. Geol. AS CR, v. v. i. for Arcadis Geotechnika a. s.: 1–40. Praha.

PETRUŽÁLEK M., *SVITEK T.*, *ERDINGEROVÁ J.* & NEMEJOVSKÝ V. (2012): *Triaxiální pevnosti proinjektované zeminy. Kontrolní zkoušky kvality TI na staveništi E1 stavba Metro V.A* – Inst. Geol. AS CR, v. v. i. for Arcadis Geotechnika a. s.: 1–16. Praha

PETRUŽÁLEK M., *SVITEK T.*, *ERDINGEROVÁ J.* & NEMEJOVSKÝ V. (2012): *Triaxiální pevnosti proinjektované zeminy. Kontrolní zkoušky kvality TI na staveništi E1 stavba Metro V.A v Praze – vrty pro TDI*. – Inst. Geol. AS CR, v. v. i. for Arcadis Geotechnika a. s.: 1–19. Praha.

PETRUŽÁLEK M., *SVITEK T.*, *ERDINGEROVÁ J.* & NEMEJOVSKÝ V. (2012): *Triaxiální pevnosti proinjektované zeminy. Kontrolní zkoušky kvality TI na staveništi E1 stavba Metro V.A, II Etapa*. – Inst. Geol. AS CR, v. v. i. for Arcadis Geotechnika a. s.: 1–12. Praha.

PETRUŽÁLEK M., *SVITEK T.*, *LOKAJÍČEK T.*, FILLER V., *ERDINGEROVÁ J.* & NEMEJOVSKÝ V. (2012): Měření fyzikálních vlastností horninových vzorků.– Inst. Geol. AS CR, v. v. i. for Technical university Liberec.: 1–22. Praha.

ROHOVEC J. & *NAVRÁTIL T.* (2012): *Method of quantification of luminophore residual concentration in process of recycling of CRT TV monitors. Období: leden - prosinec 2012.*– Inst. Geol. AS CR, v. v. i. for Asekol s.r.o: 1–19. Praha.

ZAJÍC J. (2012): *Zoopaleontologie a ichnologie permokarbonu pro vysvětlivky ke geologické mapě list Vrchlabí (03-414). Závěrečná zpráva.* – Inst. Geology AS CR, v. v. i. for Czech Geological Survey: 1–17. Praha.

ŽÁK K., *MIKULÁŠ R.* & *BOSÁK P.* (2012): *Přehled významných geologických, paleontologických a gemorfologických lokalit a jevů Vojenského újezdu Brdy jako podklad pro navržení zonace, plánu péče a návrhu maloplošných zvláště chráněných území v připravované CHKO Brdy*. – Inst. Geology AS CR, v. v. i. for Agentura ochrany přírody a krajiny ČR: 1–79. Praha.

6. Organization of conferences and scientific meetings

International Conference: **Berriasian Working Group 8th meeting, Praha, October 26–29, 2012**. Organized by the Institute of Geology of the ASCR, v. v. i. and the Institute of Geology and Paleontology, Faculty of Science, Charles University in Prague. Organizing committee: Wimbledon W.A.P., *Pruner P.*, Košťák M., *Schnabl P.*, *Čížková K.* & *Šlechta S.*

Institute of Geology AS CR, v.v.i. and Institute of Geology and Paleontology, Faculty of Science, Charles University in Prague organized Berriasian Working Group meeting from October 26 to 29. The workshop, which took place in the Chlupáč Museum, was followed by excursions to the Bohemian Karst and Bohemian Paradise.

The main theme of the conference was a precise definition of the Jurassic / Cretaceous boundary, which is necessary to define GSSP (Global Boundary Stratotype Section and Point). 32 scientists and 6 students came from 11 countries and 4 continents. 22 scientists were from other countries. The working group is focused on sedimentary sequences across the boundary, which is distributed over the world. The task is bio- and magneto-stratigraphic correlation.

International workshop: **Bohemian Paradise (Berriasian Working Group 8th meeting), Central Bohemian Region, October 29, 2012**. Organized by the Institute of Geology of the ASCR, v. v. i. and the Institute of Geology and Paleontology, Faculty of Science, Charles University in Prague. Organizing committee: Košťák M., *Schnabl P.* & *Šlechta S.*

International workshop was organized for 9 foreign scientists. During the workshop, famous paleontological site Klokočí was examined: Middle to Upper Turonian shallow-water environment – bivalves, gastropods, serpulids, cephalopods. The Cenomanian/Turonian boundary was observed at Pantheon and Suché Skály. This place is also famous for the Lusatian Fault zone – major structural phenomenon of the Bohemian Massif. Cenozoic basaltic volcanism with porcellanite was observed in the abandoned Čeřovka Quarry in Jičín.

International workshop: **Excursion to the Barrandian (Berriasian Working Group 8th meeting), Central Bohemian Region, October 28, 2012**. Organized by the Institute of Geology of the ASCR, v. v. i. and the Institute of Geology and Paleontology, Faculty of Science, Charles University in Prague. Organizing committee: *Schnabl P.* & *Šlechta S.*

The international workshop was attended by 9 foreign geologists. The main goal was the visit of the first GSSP site at Klonk. The next stop was on the edge of the active Čertovy Schody Quarry and Koněprusy Cave where several structures (neptunian dikes, faults, cave deposits etc.) in Paleozoic limestones were observed. History of mining in the Bohemian Karst was explained by a specialist in the Solvay Quarry and, at the end, incised meanders were observed from Saint John view at Svatý Jan pod Skalou village. The workshop was terminated by the examination of Saint John travertine deposits.

International workshop: **Elastic anisotropy, fracturing mechanism and transport properties of loaded rock, Praha, October 11, 2012**. Organized by the Institute of Geology of the ASCR, v. v. i. Organizing committee: *Lokajíček T.*

About 20 people participated in the workshop. The aim of this workshop was to exchange knowledge in laboratory and field anisotropy determination. About 20 contributions from 6 different laboratories were presented. Possible future inter-institute collaboration was discussed.

International workshop: **Cathodoluminescence and laser-ablation ICP-MS as tools for understanding inner structure of minerals. Brno, November 14, 2012**. Organized by the Institute of Geology, AS CR, v. v. i. and Faculty of Science, Masaryk University Brno. Organizing committee: *Breiter K.*

About 48 geologists and graduate students participated in the workshop. Altogether 12 lectures covered a broad spectrum of practical use of both methods – from decsription of laboratory instruments available in labs in Praha and Brno to geological interpretation of measured data.

7. Undergraduate and Graduate Education

7a. Undergraduate and Graduate Courses at Universities given by Staff Members of the Institute of Geology of the ASCR, v. v. i.

ACKERMAN L.: *Geochemistry of endogenic processes* (MG431P02). Untergraduate (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.

BREITER K.: *Tin-bearing granites – experience from Erzgebirge.* Short course, Center of Geosciences, Federal University of Pará, Belém.

CAJZ V.: *Regional geology – field excursion* (KGEO-0109). Undergraduate (optional) Course, Faculty of Science, University of J. E. Purkyně, Ústí nad Labem.

CHADIMA M.: Magnetic anisotropy (G7891). Undergraduate (optional) Course, Faculty of Science, Masaryk University, Brno.

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.

KOPTIKOVA L.: *Carbonate Sedimentology* (MG421P16). Undergraduate and Graduate (optional) Course, Faculty of Science, Charles University, Praha.

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* (UAR/MGA). Graduate (optional) Course, Faculty of Philosophy, University of South Bohemia, České Budějovice.

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). Untergraduate and Postgraduate (optional) Course, Faculty of Science, Charles University, Praha.

NAVRÁTIL T. & *HOJDOVÁ M.*: *Heavy metals in the environment* (MG431P92). Graduate 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.
ROČEK Z.: *Morphology of animals* (MG422P54). Undergraduate (optional) Course, Faculty of Science, Masaryk University, Brno.
SKÁLA R.: *Advanced methods in processing of diffraction data* (MG431P70). Under/graduate (optional) course, Faculty of Science, Charles University, Praha.
SKÁLA R.: *Chemical crystallography* (MG431P64). Under/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). Under/graduate (optional) course, Faculty of Science, Charles University, Praha.
SKÁLA R.: *Principles of mineralogy* (MG431P52/ MG431P52U). Undergraduate course, Faculty of Science, Charles University, Praha.
ŠPAČEK P., ŠVANCARA J. & *CHADIMA M.*: *Physics of the Earth and Seismology* (G8311). Undergraduate and Graduate Course, Faculty of Science, Masaryk University, Brno.
VACH M.: *Air Pollution* (ZVX18E). Undergraduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.
VACH M.: *Air Protection* (ZVZ22E). Undergraduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.
VACH M.: *Environmental chemistry* (ZVL03E). Undergraduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.
VACH M.: *Environmental chemistry I* (ZVZ04E). Undergraduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.
VACH M.: *Modeling of Processes in Environment* (DZVX02Y). Graduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.
VACH M.: *Physicochemical aspects of processes in environment* (ZVZ09E). Undergraduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.
VACH M.: *Transport of contaminants in atmosphere* (ZVL24E). Undergraduate Course, Faculty of Environmental Sciences, Czech University of Life Sciences, Praha.

7b. Supervision in Undergraduate Studies

Open Science

KŘÍŽOVÁ M. Vyšší odborná škola a Střední zemědělská škola v Benešově, Czech Republic (*supervisor M. Filippi, 2011-2012*)
MELZEROVÁ E. Gymnázium Benešov, Czech Republic (*supervisor J. Rohovec, since 2011*)

BC. Theses

FIKAR L., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2012*)
GREŇOVÁ I., Faculty of Environmental Sciences, Czech University of Life Sciences, Praha (*co-supervisor/advisor J. Borovička, defended 2012*)
MÉSZÁROSOVÁ N., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2012*)
NÁBĚLEK L., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)
OBERSTEINOVÁ T., Faculty of Science, Charles University, Praha (*advisor J. Kadlec, since 2011*)

MSc. Theses

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*)
KOHOUTOVÁ I., Faculty of Science, Charles University, Praha (*supervisor L. Ackerman, defended 2012*)
KUČEROVÁ CHARVÁTOVÁ K., Institute of Geological Sciences, Faculty of Science, Masaryk University, Brno (*supervisor J. Hladil, since 2010*)
MÁLKOVÁ M., Faculty of Science, Charles University, Praha (*supervisor G. Kletetschka, since 2011*)
ŠNELLEROVÁ Z., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2012*)

7c. Supervision in Graduate Studies

PhD. 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*)
HOŠEK J., Faculty of Sciences, Charles University, Praha (*supervisor L. Lisá, since 2010*)
HERICHOVÁ I., Faculty of Arts, Charles University, Praha (*supervisor V. Cílek, since 2007*)
JANEČKA J., Faculty of Science, Masaryk University, Brno (*supervisor J. Hladil, since 2004*)
KALLISTOVÁ A., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2010*)
KOPTÍKOVÁ L., Faculty of Science, Charles University, Praha (*supervisor J. Hladil, defended 2012*)
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 J. Hladil, since 2005*)
MATOUŠKOVÁ Š., Faculty of Science, Charles University, Praha (*co-supervisor J. Rohovec, defended 2012*)
PETRUŽÁLEK M., Faculty of Science, Charles University, Praha (*co-supervisor T. Lokajíček, since 2006*)
SCHNABL P., Faculty of Science, Charles University, Praha (*supervisor Pruner P., since 2004*)
SIDORINOVÁ T., Faculty of Science, Charles University, Praha (*supervisor R. Skála, since 2009*)
ŠLECHTA S., Faculty of Science, Charles University, Praha (*co-supervisor J. Kadlec, since 2005*)
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*)
ŠTOR T., Faculty of Science, Charles University, Praha (*co-supervisor J. Kadlec, since 2011*)
SVITEK T., Faculty of Science, Charles University, Praha (*supervisor T. Lokajíček, since 2008*)
VALENTOVÁ J., Faculty of Science, Charles University, Praha (*supervisor L. Lisá, since 2011*)
VAŠKANINOVÁ KAŠPAR V., Faculty of Science, Charles University, Praha (*co-supervisor/advisor J. Zajíc, since 2010*)

7d. Membership in scientific and academic boards

ACKERMAN L.
Member, Committee for Finals of Doctoral Students in Geology, Faculty of Sciences, Charles University, Praha

BOROVIČKA J.
Member, Presidium, Scientific Secretary, Czech Mycological Society, Praha

BOSÁK P.
Member, Accreditation Commission of the Slovak Academy of Sciences for the 1st Department of Sciences (Slovak Academy of Sciences, Bratislava)
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–September 2013)
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 Academy of Sciences of the Czech Republic, Praha (since January 2012)
Chairman (until January 4, 2012) and Member of the Executive Board of Institute of Geology of the ASCR, v. v. i., Praha
Member, Academic Assembly of the Academy of Sciences of the Czech Republic, Praha (since June 2012)
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 PhD 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, PhD Study Program of Applied Geology, Faculty of Science, Charles University, Praha
Member, Committee for Defenses of Dissertations, PhD Study Program of Applied Geology, Faculty of Science, Charles University, Praha
Member, Committee for Defenses of Dissertations, PhD Study Program of Physical Geography and Geoecology, Faculty of Science, Charles University, Praha
Member, Committee for State Doctoral Examinations, PhD 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

CÍLEK V.
Member, Academic Assembly of the Academy of Sciences of the Czech Republic, Praha (until May 2012)
Member, Executive Board of the Institute of Geology of the ASCR, v. v. i. (until January 2012)

FILIPPI M.
Vice-Chairman, Executive board of the Institute of Geology of the ASCR, v. v. i.

GOTTSTEIN O.
Member, Executive Board of the Institute of Geology of the ASCR, v. v. i. (until January 2012)

HLADIL J.
Member, Committee for Degree of Doctor of Sciences (DSc.) in Geological Sciences at Academy of Sciences of the Czech Republic, Praha.
Member, Executive Board of the Institute of Geology ASCR, v. v. i. (since January 2012)
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 AS CR), 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 ASCR, v. v. i. (since May 2012)
Alternating Member of the Doctoral Examination Committee in Geology, Faculty of Sciences, Charles University, Praha
Deputy Chairman, Board for Popularization of Sciences, Academy of Sciences of the Czech Republic, Praha
Secretary, Czech National Geologic Committee, Praha
Member, Editorial Board of the Academy of Sciences of the Czech Republic, 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 Sciences, Charles University, Praha
Member of the Committee for Doctoral Thesis Defense in Applied Geology, Faculty of Sciences, Charles University, Praha
External Member, State Magisterium and Rigorosa Examinations in Geology, Faculty of Science, Charles University, Praha

PRUNER P.
Member, Executive Board of the Institute of Geology of the ASCR, v. v. i.
Member of the Board of the Graduate Studies in Geophysics, Faculty of Science, Charles University, Praha
Alternating member of the Commitee for degree of Doctor of Sciences (DSc.) in geological sciences at Academy of Sciences of the Czech Republic, Praha

SKÁLA R.
Chairman, Committee for Finals of Undergraduate Students in Geology, specialization Mineralogy and Crystallography, Faculty of Sciences, Charles University, Praha
Member, Committee for Finals of Undergraduate Students in Geology, specialization Geochemistry, Faculty of Sciences, Charles University, Praha

SKŘIVAN P.
Vice-Chairman, Advisory Board of the Institute of Geology of the ASCR, v. v. i. (until May 2012)

SLAVÍK L.
Alternating Member of the Doctoral Examination Committee in Geology, Faculty of Sciences, Charles University, Praha
Member, Academic Assembly of the Academy of Sciences of the Czech Republic, Praha
Member, Executive Board of the Institute of Geology ASCR, v. v. i. (since January 2012)

ŠTORCH P.
Chairman, Executive Board of the Institute of Geology ASCR, v. v. i. (since January 2012)
Alternating Member, Committee for Degree of Doctor of Sciences in Geological Sciences, Academy of Sciences CR, Praha
Vice-chair / Secretary, Czech Commission on Stratigraphy, Praha
Member, Earth Science Panel (geophysics, geochemistry, geology, mineralogy and hydrogeology) of Czech Science Foundation, Praha.

SVOBODOVÁ M.
Secretary of specialized board No. 3 (OR3): Earth and Space Sciences, Praha, Grant agency of the Academy of Sciences, Praha
Member, Executive Board of the Institute of Geology ASCR, v. v. i. (until January 2012)

SVOJTKA M.
Member, Committee for Finals of Undergraduate and Doctoral Students in Geology, Faculty of Sciences, Charles University, Praha
Member, Committee for Finals of Doctoral Thesis Defense in Geology, Faculty of Sciences, Charles University, Praha

ULRYCH J.
Member, Commitee for degree of Doctor of Sciences (DrSc.) in geological sciences at Slovak Academy of Science, Bratislava
Alternative member, Commitee for degree of Doctor of Sciences (DSc.) in geological sciences at the Academy of Sciences, Praha
Vice-chairman, Grant Commission of the Academy of Sciences, Council No. 3 (OR3) Earth and Space Science, 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

VACH M.
Member, Board of Graduate Studies in Environmental Modeling, Faculty of Environmental Sciences, Czech University of Life Sciences Praha

ZAJÍC J.
Member, Committee for the PhD Examination and Defence of Theses in Geology, Faculty of Sciences, Charles University, Praha
Member, Committee for the Master's and RNDr. Doctoral Examination in Paleontology, Faculty of Sciences, 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 of the Board of the Graduate Studies in Geography, 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 Sciences, 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 ASCR

PhD.

KOPTÍKOVÁ L. (2012): *The basic composite section in the Barrandian Lower Devonian succession of the beds using magnetic susceptibility stratigraphy.* – Ph.D. Thesis, .Faculty of Sciences, Charles University: 1–215. Praha (defended on May 29, 2012).

MATOUŠKOVÁ Š. (2012): *Vzdělávání v anorganické chemii v kontextu života současného člověka (Education in Inorganic Chemistry in Context of Common Life).* – Ph.D. Thesis, Faculty of Sciences, Charles University: 1–173. Praha (defended on September 13, 2012).

SCHNABL P. (2012): *Paleomagnetism and magnetomineralogy of rocks from the Bohemian Massif and Tethyan Realm.* – Ph.D. Thesis, Faculty of Sciences, Charles University: 1–76. Praha (defended on August 25, 2012).

WAGNER J. (2012): *Concept of species in bears (Ursidae): practical, historical, and theoretical viewpoint*. – Ph.D. Thesis, Faculty of Sciences, Charles University: 1–102 + 103–263 App. Praha (defended on September 5, 2012).

7g. Awards

ACKERMAN L.: Otto Wichterle Award, Academy of Sciences of the Czech Republic, Praha, award for the best young scientists

BOSÁK P.: Honorary member, Česká speleologická společnost, Praha

BOSÁK P.: Honorary Membership with rights of Life Member, The National Speleological Society, Huntsville

CÍLEK V.: Award for the Popular Science, Academy of Sciences of the Czech Republic, Praha

KOPTÍKOVÁ L.: Josef Hlávka Award, "Nadace Nadání Josefa, Marie a Zdeňky Hlávkových" Foundation, Praha

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 Racoviţa", 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, Academy of Sciences of the Czech Republic (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.: *Geologica Carpathica*, Co-editor, Geological Institute of the Slovak Academy of Sciences, Bratislava, Slovak Republic (2005–2012).
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 AS CR, v. v. i., Praha (since 1999)
LISÁ L.: *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 AS CR, v. v. i., Praha (since 1998).
Acta Musei Nationalis Pragae, Series B, Historia Naturalis, Member of Editorial Board, National Museum, Praha (since 2008).
PRUNER P.: *Acta Universitatis Carolinae, Geologica*, Member of Editorial Board, Charles University, Praha (since 2000).
Geolines, Member of Editorial Board, Institute of Geology of the ASCR, 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).
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).
SVOJTKA M.: *Geolines*, Editor-in-chief, Institute of Geology of the AS CR, v. v. i., Praha (since 1996).
ŠŤASTNÝ M.: *Acta geodynamica et geomateralia,* Member of Editorial Board, Institute of Rock Structure and Mechanics of the AS CR, v. v. i., Praha (since 1998)
Informátor, Editor, Česká společnost pro výzkum a využití jílů, Praha (since 1995)
ŠTORCH P.: *Bulletin of Geosciences*, Coeditor, Czech Geological Survey, Praha (since 2011)
Geolines, Member of Editorial Board, Institute of Geology AS CR, 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)
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)
HLADIL J.: Committee Member and Web Site Administrator, International Geoscience Programme of the UNESCO and IUGS – Czech National Committee for IGCP (since 1994).
Titular Member, Subcommission on Devonian Stratigraphy of the ICS and IUGS (since 2003).
KADLEC J.: Co-ordinator for the Czech Republic, IGBP – PAGES Project, (since 1998).
KOPTÍKOVÁ L.: Committee Member, International Geoscience Programme of the UNESCO and IUGS – Czech National Committee for IGCP (since 2010)
MIKULÁŠ R.: Czech Representative, International Paleontological Association (since 2005).
Working Group of the Treatise on Invertebrate Paleontology, Part W, Trace Fossils (since 2001)
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).
ŽIGOVÁ A.: Member of the Committee C – Soil and regolith morphology and genesis, Division on Soil System Sciences, European Geosciences Union (since 2006)

9. Institute structure and staff

9a. Organization units

The research potential of the Institute is divided into 6 units:

1. *Laboratory 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 methods, new, progressive laboratory approaches have been developed.
2. *Laboratory 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 and amphibians), palynology of Carboniferous and Cretaceous sediments, and paleoichnology in a broad stratigraphic range from the Ordovician to the Recent.
3. *Laboratory 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. *Laboratory 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.

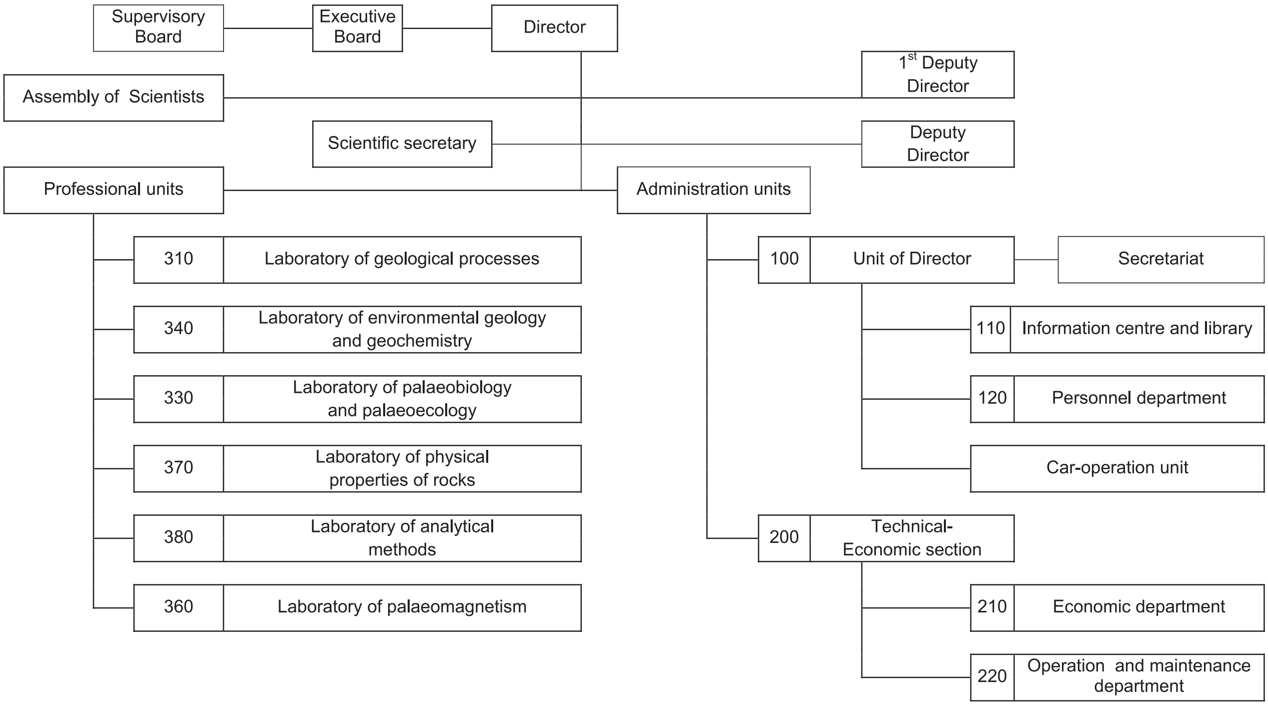
Specialized laboratories

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, PhD.).
4. Scanning electron microscope and electron microprobe laboratory (Supervised by RNDr. Roman Skála, PhD.).
5. Laboratory of rock processing and mineral separation (Head: RNDr. Martin Šťastný, CSc.).
6. Laboratory for thin and polished sections (Head: RNDr. Roman Skála, PhD.).
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, PhD.).
11. Mercury analysis laboratory (Head: RNDr. Tomáš Navrátil, PhD.).
12. LA-ICP-MS Laboratory (Supervised by Ing. Jana Ďurišová & Mgr. Šárka Matoušková)
13. Clean Chemistry Laboratory (Supervised by Mgr. Lukáš Ackerman, PhD.)
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

Information on the Institute of Geology is available on the Internet: http://www.gli.cas.cz
e-mail address book

Ackerman Lukáš	ackerman@gli.cas.cz	Juskovičová Klára	juskovicova@gli.cas.cz
Adamovič Jiří	adamovic@gli.cas.cz	Kadlec Jaroslav	kadlec@gli.cas.cz
Bek Jiří	bek@gli.cas.cz	Kallistová Anna	kallistova@gli.cas.cz
Bielská Sabina	bielska@gli.cas.cz	Kiššová Veronika	kissova@gli.cas.cz
Böhmová Vlasta	bohmova@gli.cas.cz	Kletetschka Günther	kletetschka@gli.cas.cz
Bosák Pavel	bosak@gli.cas.cz	Klímová Jana	klimova@gli.cas.cz
Breiter Karel	breiter@gli.cas.cz	Kohout Tomáš	kohout@gli.cas.cz
Cajz Vladimír	cajz@gli.cas.cz	Koptíková Leona	koptikova@gli.cas.cz
Coubal Miroslav	coubal@gli.cas.cz	Korbelová Zuzana	korbelova@gli.cas.cz
Čejchan Petr	cej@gli.cas.cz	Kořínková Dagmar	korinkova@gli.cas.cz
Čermák Stanislav	cermaks@gli.cas.cz	Langrová Anna	langrova@gli.cas.cz
Chadima Martin	chadima@gli.cas.cz	Lisá Lenka	lisa@gli.cas.cz
Chadrabová Alena	chadrabova@gli.cas.cz	Lisý Pavel	lisy@gli.cas.cz
Cílek Václav	cilek@gli.cas.cz	Lokajíček Tomáš	lokajicek@gli.cas.cz
Dašková Jiřina	daskova@gli.cas.cz	Matoušková Šárka	matouskov@gli.cas.cz
Dobešová Irena	dobesova@gli.cas.cz	Mikuláš Radek	mikulas@gli.cas.cz
Drahota Petr	drahota@gli.cas.cz	Momado Farid	momado@gli.cas.cz
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9c. Staff (as of December 31, 2012)

Advisory Board

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Doc. Ing. Richard Šňupárek, CSc. (Institute of Geonics of the ASCR, v. v. i. Ostrava) . . . . Member

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Doc. RNDr. Emil Jelínek, CSc. (Charles University, Praha) . . . . Member
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RNDr. Jan Pašava, CSc. (Czech Geological Survey) . . . . Member

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Mgr. Michal Filippi, PhD. . . . . 1st Deputy Director

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Unit of Director

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Michaela Uldrychová (assistant to the Director)

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Mgr. Václava Škvorová (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)
Veronika Kiššová (phone operator, mail service)
Alena Chadrabová (accountant)

Operation and Maintenance Department
Ing. Ottomar Gottstein, CSc. – Head
Antonín Čejka (technical service)
Petr Vachalovský (technical service)

Scientific laboratories

Laboratory of Geological Processes

Scientific Staff:

Mgr. Jiří Adamovič, CSc. – Head (basin analysis, tectonics)
Mgr. Leona Koptíková – Deputy Head (sedimentary petrology, metasediments, magnetic susceptibility)
Mgr. Lukáš Ackerman, Ph.D. (geochemistry, mantle petrology)
RNDr. Karel Breiter, PhD. (petrology, mineralogy)
RNDr. Vladimír Cajz, CSc. (volcanology)
RNDr. Miroslav Coubal, CSc. (structural geology, tectonics)
Ing. Jiří Fiala, CSc. (petrology and structure of lithosphere, western and northern)
Mgr. Jiří Filip, CSc. (fission track dating)
Doc. RNDr. Jindřich Hladil, DrSc. (Devonian environments, experimental sedimentology, dust deposition)
Mgr. Tomáš Hrstka, PhD. (petrology)
Mgr. Dagmar Kořínková (PhD. student, fission track methods)
Mgr. Lenka Lisá, PhD. (Quaternary sedimentology)
Mgr. Jiří Sláma (metamorphic petrology, isotope dating)
Mgr. Martin Svojtka, PhD. (petrology of deep crustal rocks, fission track methods, geochronology, geochemistry)
Doc. RNDr. Jaromír Ulrych, DrSc. (igneous petrology, geochemistry)

Technical Staff:

ing. Jana Ďurišová (analyst, mass spectrometry)
Mgr. Jiří Filip, CSc. (technician, fission track dating)
Mgr. Šárka Matoušková, PhD. (analyst, mass spectrometry)
Ing. Jaroslava Pavková (secretary, technician)
Jana Rajlichová (technician)
RNDr. Martin Štastný, CSc. (technician, chemical analyst)

Laboratory of Paleobiology and Paleoecology

Scientific Staff:

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. Petr Čejchan, CSc. (paleoecology, Radiolaria, mazuelloids)
RNDr. Stanislav Čermák, Ph.D. (Cenozoic vertebrate paleontology, small mammals)
RNDr. Jiřina Dašková, Ph.D. (Cenozoic palynology)
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:

Pavel Lisý (technician)

Laboratory of Environmental Geology and Geochemistry

Scientific Staff:

RNDr. Tomáš Navrátil, PhD. – Head (aquatic and environmental geochemistry)
RNDr. Jan Rohovec, PhD. – Deputy Head (analytical chemistry, ICP analyses)
Mgr. Jan Borovička (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, PhD. (mineralogy, environmental geochemistry)
Mgr. Jaroslav Hlaváč, PhD. (Quaternary geology, malacozoology)
RNDr. Maria Hojdová (environmental geochemistry)
Ing. Petra Sychrová (biogeochemistry)
Mgr. Marek Vach, PhD. (environmental geochemistry)
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 – Deputy Head (geophysics)
Mgr. Martin Chadima, PhD. (geophysics, paleomagnetism)
RNDr. Jaroslav Kadlec, Dr. (environmental magnetism)
RNDr. Günter Kletetschka, PhD. (paleomagnetism, geophysics)
Mgr. Tomáš Kohout, Ph.D. (physical properties of meteorites)
Mgr. Stanislav Šlechta (geophysics)
Mgr. Kristýna Šifnerová (geophysics)
RNDr. Daniela Venhodová (geophysics)

Technical Staff:

Jiří Petráček (technician)

Laboratory of Analytical Methods and Physical Properties of Rocks

RNDr. Roman Skála, PhD. – 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, PhD. (microprobe and scanning microscope analyst)
Mgr. Anna Kallistová (X-ray powder diffraction analyst)
Ing. Anna Langrová (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. Henri Maluski (Université Montpelier II, Montpelier, France)
Prof. Ronald Parsley (Department of Geology, Tulane University, New Orleans, USA)
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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.	PhD.
DrSc.	DSc
Doc.	Assoc. Prof.
Ing.	Dipl.-Ing.

Staff News

Left the Institute:

Caha Ondřej (economist)	March 31
Čejka Antonín (technician)	December 31
Dašková Jiřina (scientist)	December 31
Klímová Jana (accountant)	September 30
Nováková Marcela (technician)	June 30
Vach Marek (scientist)	December 31
Vachalovský Petr (technician)	December 31
Venhodová Daniela (technician)	December 31
Žítt Jiří (scientist)	December 31
Živor Roman (scientist)	February 28

Joined the Institute:

Juskovičová Klára (accountant)	August 13
Kiššová Veronika (technician)	June 15
Momado Farid (economist)	February 15

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 standoff 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 LynxEye. 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 & Mgr. Šárka Matoušková)

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 fumehood 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 ASCR	36 338
2.	From the Grant Agency of the ASCR (accepted research projects)	454
3.	From the Czech Science Foundation (accepted research projects)	6 358
4.	From the internal research projects of the ASCR	395
5.	From other public sources	693
6.	Applied research	2 685
7.	Investment (instruments)	7 913
8.	Investment (constructions)	0
TOTAL INCOMES		54 836
B. EXPENSES		
1.	Scientific staff (wages, insurances)	30 942
2.	Research and scientific activities	8 089
3.	Administration and technical staff (wages, insurances)	5 037
4.	General expenses (postage shipping, maintenance of buildings, energies, transport, office supplies, miscellaneous, etc.)	2 462
5.	Library	332
6.	Editorial activities	61
7.	Investment (instruments)	7 913
8.	Investment (constructions)	0
TOTAL EXPENSES		54 836