Academy of Sciences of the Czech Republic

Institute of Geology
Annual Report 2006

Praha, September 2007

Academy of Sciences of the Czech Republic

Institute of Geology
Annual Report 2006

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Editorial Note: This report is based on contributions of the individual authors; contents and scientific quality of the contributions lies within the responsibility of the respective author(s).
The report was compiled and finally edited by L. Slavík and P. Bosák. The English version was kindly revised by J. Adamovič.

KATALOGIZACE V KNIZE - NÁRODNÍ KNIHOVNA ČR

Geologický ústav (Akademie věd ČR)
Institute of Geology - annual report. 2005 / Academy of Sciences of the Czech Republic. -- Prague : Institute of Geology of the Academy of Sciences of the Czech Republic, 2006. – 88 s.
ISBN 978-80-903511-6-5

55 * 550.8 * (437.3)
- **geologie**
- **geologický výzkum -- Česko**
- **ročenky**

55 – Vědy o Zemi. Geologické vědy

Published by © the Institute of Geology of the Academy of Sciences of the Czech Republic
Praha, September 2007
Printed by VÍTOŠ, Ltd.
Suchdolská 13, Praha 6
ISBN 978-80-903511-6-5
200 copies

1. Preface

The year 2006 seemed to represent the usual “average” year for Czech science including geology. Nevertheless, an important novelty changed the scientific “playground”: all institutes of the Academy of Sciences of the Czech Republic started preparations for a transformation into a new type of scientific organisation. From December 2007 on, the former institutes became public research instititutions (in Czech *veřejné výzkumné instituce* or *v.v.i.*). Many internal documents had to adjusted to the new conditions, and the process has not been completed yet.

Besides geological “business as usual”, several important events took place including a joint speleological expedition with the Faculty of Science of Charles University to salt karst of Iran. The joint team prolonged the earlier discovered cave and documented the new tracts, making it the longest salt cave system in the world. It is difficult to name all achievements in this limited space but most of them are listed in the text of this report.

The structure and the staff composition of the Institute was subject to some minor changes. The only novelty was the establishment of the Laboratory of Physical Properties of Rocks as of January 1st 2006. The whole research unit (twelve employees), formerly belonging to the Institute of Rock Structure and Mechanics AS CR, was adjoined by delimitation to the Institute of Geology. Instrument equipment and laboratory building on Puškinovo náměstí 9, Praha 6, were also included in the delimitation. We have thus received not only a new team but also a new building that may help in the further development of the Institute.

Václav Cílek, Director

2. General Information

The Institute of Geology AS CR 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 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.
- Terrane identification.
- Paleogeography.
- Paleobiogeography (foscused on Variscan Europe).
- Paleoecology (incl. population dynamics, bioevents).

- Paleoclimatology as evidenced by fossil organisms and communities.
- Taxonomy and phylogeny of fossil organisms.
- Biostratigraphy and high-resolution stratigraphy.
- Basin analysis, sequence stratigraphy, and sedimentary petrology and geochemistry.
- Exogenic and environmental geochemistry.
- Exogenic and environmental geology, geomorphology, and (paleo)karstology.
- Quaternary geology and landscape evolution.
- Paleomagnetism, magnetostratigraphy, and petromagnetism.
- Physical parameters of rocks.

Scientific laboratories

The research potential of the Institute is divided into 8 units:

1. Laboratory of Terrane Architecture and Lithosphere Evolution.
2. Laboratory of Platform Evolution.
3. Laboratory of Paleoebiology and Paleoecology.
4. Laboratory of Environmental Geology.
5. Laboratory of Environmental Geochemistry.
6. Laboratory of Paleomagnetism.
7. Laboratory of Physical Methods.
8. Laboratory of Physical Properties of Rocks.

Specialized laboratories

The following specialized laboratories have been set up:

1. Paleomagnetic laboratory (Head: Ing. Petr Pruner, DrSc.).
2. Micropaleontological laboratory (Heads: RNDr. Jiří Bek, CSc. & RNDr. Ladislav Slavík, CSc.).
3. X-ray and DTA/TG laboratory (Head: RNDr. Roman Skála, PhD.).
4. Electron scanning and microprobe laboratory (Head: Ing. Anna Langrová).
5. Laboratory of rock processing and mineral separation (Head: Václav Sedláček).
6. Laboratory for thin and polished sections (Head: Ing. Anna Langrová).
7. Microscopic laboratory (Head: Mgr. Michal Filippi).
8. Sedimentary laboratory (Head: RNDr. Anna Žigová, CSc.).
9. Fission track laboratory (Head: Mgr. Jiří Filip, CSc.).
10. Laboratory of liquid and solid samples (Heads: RNDr. Jan Rohovec, PhD. & RNDr. Miloš Burian).
11. Laboratory of rock behaviour under high pressure (Head: RNDr. Vladimír Rudajev, DrSc.).

The scientific concept of the Institute of Geology and the evaluation of its results lie within the responsibility of the Scientific Council 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 paid to popularization of the most important scientific results in the public media.

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3. Contact information

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4. Staff (as of December 30, 2006)

Management

RNDr. Václav Cílek, CSc .	Director of the Institute
Prof. RNDr. Pavel Bosák, DrSc.	1st Deputy Director
Ing. Ottomar Gottstein, CSc.	Deputy Director (finances)
Doc. RNDr. Jindřich Hladil, DrSc.	Chairman of the Scientific Council

Administrative departments

Management Section

Michaela Uldrychová (assistant to the Director)

Information Centre and Library

Lenka Kulhavá – Head (librarian)
Mgr. Václava Škvorová (librarian)
Bc. Kateřina Lechnýřová (librarian)

Technical-Economic Section

Ing. Ottomar Gottstein, CSc. – Head
Alena Sokolová – Deputy Head, accountant

Mikuláš Balabán (computer specialist)
Antonín Čejka (technical service)
Magdaléna Čejková (janitor)
Jiří Dobrovolný (technician)
Karel Jeřábek (garage attendant, driver, storeman, janitor)
Jana Klímová (accountant)
Jaroslav Kratochvíl (technical service)
Martin Mráček (boiler operator)
Bc. Marcela Nováková (accountant, assistant)
Věra Štěrbová (human resources)
Božena Trenzeluková (phone operator, mail service)
Petr Vachalovský (technical service)

Scientific laboratories

Laboratory of Terrane Architecture and Lithosphere Evolution

Scientific Staff:

Doc. RNDr. Jindřich Hladil, DrSc. – Head (basins in orogens, terranes, carbonate sediments)
Mgr. Martin Svojtka, PhD. – Deputy Head (petrology of deep crustal rocks, fission track methods, geochronology, geochemistry)
RNDr. Karel Breiter, PhD. (petrology, mineralogy)
Ing. Jiří Fiala, CSc. (petrology and structure of lithosphere, western and northern Bohemian Massif)
Mgr. Jiří Janečka (structural geology, strain modelling)
Mgr. Leona Koptíková (sedimentary petrology, metasediments, magnetic susceptibility)
Mgr. Jiří Sláma (metamorphic petrology, isotope dating)
RNDr. Ladislav Slavík, CSc. (Silurian-Devonian stratigraphy, conodont biostratigraphy, paleogeography and global correlation)
RNDr. Petr Štorch, DrSc. (graptolite stratigraphy, general stratigraphy, sedimentary sequences, paleogeography)
RNDr. Zdeněk Vejnar, DrSc. (lithospheric units, metamorphic overprint, regional geology of the Bohemian Massif)

Technical Staff:

Ing. Jaroslava Pavková (secretary, data processing and preparation of outputs)
Josef Forman (topography, geodetic maps, GPS)

Laboratory of Platform Evolution

Scientific Staff:

Doc. RNDr. Jaromír Ulrych, DrSc. – Head (igneous petrology, geochemistry)
Mgr. Jiří Adamovič, CSc. – Deputy Head (basin analysis, tectonics)
Mgr. Lukáš Ackerman (geochemistry, mantle mineralogy)
RNDr. Vladimír Cajz, CSc. (volcanology)
Mgr. Jiří Filip, CSc. (fission track dating)
RNDr. Miloš Lang, CSc. (igneous petrology, mineralogy)
prom. geol. Jiří Novák, CSc. (petrology)

Technical Staff:

Ing. Jaroslava Pavková (secretary, technician)
Jana Rajlichová (technician)
Václav Sedláček (technician)

Laboratory of Paleobiology and Paleoecology

Scientific Staff:

RNDr. Radek Mikuláš, CSc. – Head (ichnofossils)
RNDr. Marcela Svobodová, CSc. – Deputy Head (Cretaceous palynology)
RNDr. Jiří Bek, CSc. (Devonian and Carboniferous spores)
RNDr. Petr Čejchan, CSc. (paleoecology)
Mgr. Jiřina Dašková (Cenozoic palynology)
prom. geol. Arnošt Galle, CSc. (Devonian corals and paleogeography)
RNDr. Magda Konzalová, CSc. (Proterozoic, Jurassic, Tertiary palynology)
Doc. RNDr. Zbyněk Roček, DrSc. (origin and evolution of the Amphibia, Tertiary Anura and Sauria)

RNDr. Miloš Siblík, CSc. (Mesozoic brachiopods)
RNDr. Milada Vavrdová, CSc. (Proterozoic, Paleozoic and Mesozoic palynology and plankton)
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:
Ing. Bronislava Vávrová (secretary, technician)
Josef Brožek (photographer)

Laboratory of Environmental Geology

Scientific Staff:
Mgr. Jaroslav Hlaváč – Head (Quaternary geology, malacozoology)
Mgr. Michal Filippi – Deputy Head (mineralogy, environmental geochemistry)
Prof. RNDr. Pavel Bosák, DrSc. (karstology, paleokarstology, basin analysis)
RNDr. Václav Cílek, CSc. (Quaternary geology)
Mgr. Eva Kadlecová (Cenozoic vertebrate paleontology)
Mgr. Lenka Lisá, PhD. (Quaternary sedimentology)
RNDr. Vojen Ložek, DrSc. (Quaternary geology, malacozoology)
RNDr. Karel Žák, CSc. (Quaternary geology, environmental geochemistry)
RNDr. Anna Žigová, CSc. (pedology, paleopedology)

Technical Staff:
Jana Macháčková (secretary, technician)

Laboratory of Environmental Geochemistry

Scientific Staff:
RNDr. Tomáš Navrátil, PhD. – Head (aquatic and environmental geochemistry)
RNDr. Jan Rohovec, PhD. – Deputy Head (analytical chemistry, ICP analyses)
Mgr. Petr Drahota (environmental geochemistry)
RNDr. Maria Hojdová (environmental geochemistry)
Ing. Petra Kubínová (biogeochemistry)
Ing. Luděk Minařík, CSc. (geochemistry)
Doc. Ing. Petr Skřivan, CSc. (exogenic and environmental geochemistry)
Mgr. Jitka Špičková (environmental geochemistry)
Mgr. Marek Vach, PhD. (environmental geochemistry)

Technical Staff:
Jana Macháčková (secretary, technician)
RNDr. Miloš Burian (chemical analyst)
Ing. Irena Dobešová (environmental monitoring)

Laboratory of Paleomagnetism

Scientific Staff:
Ing. Petr Pruner, DrSc. – Head (geophysics, paleomagnetism)
Mgr. Martin Chadima, PhD. – Deputy Head (geophysics, paleomagnetism)
RNDr. Jaroslav Kadlec, Dr. (Quaternary geology)
RNDr. Günther Kletetschka, PhD. (paleomagnetism, geophysics)
Mgr. Tomáš Kohout (physical properties of meteorites)

prom. fyz. Otakar Man, CSc. (geophysics)
Mgr. Petr Schnabl (geophysics)
Mgr. Stanislav Šlechta (geophysics)

Technical Staff:

Jana Drahotová (technician)
Jiří Petráček (technician)
RNDr. Daniela Venhodová (technician)

Laboratory of Physical Methods

Ing. Anna Langrová – Head (microprobe and scanning microscope analyst)
RNDr. Zuzana Korbelová – Deputy Head (microprobe and scanning microscope operator)
Ing. Vlasta Böhmová, PhD. (microprobe and scanning microscope operator)
Jiří Dobrovolný (X-ray and thermal analyses)
RNDr. Roman Skála, PhD. (X-ray and thermal analyses)
Jaroslava Jabůrková (preparation of thin/polished sections)
Ivana Konopáčová (preparation of thin/polished sections)

Laboratory of Physical Properties of Rocks

Scientific Staff:

RNDr. Vladimír Rudajev, DrSc. – Head (geophysics, seismics, geomechanics)
RNDr. Roman Živor – Deputy Head (geomechanics)
Ing. Tomáš Lokajíček, CSc. (seismic modelling)
Ing. Zdeněk Pros, CSc. (seismic modelling)
Mgr. Matěj Petružálek (geophysics, acoustic emission analysis)
RNDr. Ján Veverka, PhD. (geophysics, acoustic emission analysis)

Technical Staff:

Zdeněk Erdinger (technician, rock cutter)
Julie Erdingerová (technician)
Vlastimil Filler (technician, electrician)
Miroslav Grusman (mechanic)
Jarmila Straková (technician)

Scientific Council

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Mgr. Lenka Lisá, PhD. (Institute of Geology AS CR)
RNDr. Jan Krhovský, CSc. (Ministry of the Environment of the Czech Republic, Prague)
Doc. RNDr. Zdeněk Kukal, DrSc. (Czech Geological Survey, Prague)
Doc. RNDr. Martin Mihaljevič, CSc. (Faculty of Science, Charles University, Prague)
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RNDr. Tomáš Navrátil, PhD. (Institute of Geology AS CR)
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RNDr. Lilian Švábenická, CSc. (Czech Geological Survey, Praha)
Doc. RNDr. Jaromír Ulrych, DrSc. (Institute of Geology AS CR)

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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)
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Prof. Henri Maluski (Université Montpelier II, Montpelier, France)
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Prof. Henning Sørensen (Geological Institute, University of Kobenhagen, Denmark)
Prof. John A. Winchester (Department of Geology, University of Keele, Great Britain)

Note: Czech scientific and pedagogical degrees are equivalents of:

Czech degree	**Equivalent**
Bc.	BSc, BA
prom.geol., prom. fyz., Mgr.	MSc, MA
RNDr., PhDr.	no equiv.
CSc.	PhD.
DrSc.	DSc
Doc.	Assoc. Prof.
Ing.	Dipl.-Ing.

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5. Staff News

January	
Jan. 1, 2006	Zdeněk Erdinger
	Julie Erdingerová
	Vlastimil Filler
	Miroslav Grusman
	RNDr. Karel Klíma, CSc
	Ing. Tomáš Lokajíček, CSc.
	Ing. Zdeněk Pros, CSc.
	RNDr. Vladimír Rudajev, DrSc.
	Jarmila Straková
	RNDr. Ján Veverka, PhD.
	Doc. RNDr. Jan Vilhelm, CSc.
	RNDr. Roman Živor
	all joined the Institute
February	
Feb. 8, 2006	Věra Plešáková
	left the Institute
April	
Apr. 1, 2006	Věra Štěrbová
	joined the Institute
May	
May 9, 2006	Mikuláš Balabán
	joined the Institute
May 31, 2006	Lubomir Arandjelovič
	left the Institute
August	
Aug. 22, 2006	RNDr. Karel Klíma, CSc.
	died
Aug. 31, 2006	Mgr. Ondřej Zeman
	left the Institute
September	
Sept. 1, 2006	RNDr. Karel Breiter, PhD.
	joined the Institute
Sept. 25, 2006	RNDr. Václav Houša, CSc.
	died
October	
Oct. 1, 2006	Mgr. Matěj Petružálek
	joined the Institute
November	
Nov. 21, 2006	Bc. Marcela Nováková
	joined the Institute
Nov. 30, 2006	Ing. Kamila Křemenová
	left the Institute
December	
Dec. 31, 2006	Jana Macháčková
	Mgr. Karel Malý
	RNDr. Eliška Růžičková
	Mgr. Zuzana Vařilová
	all left the Institute

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6. Undergraduate and Graduate Education

Undergraduate and Graduate Courses at Universities given by Staff Members of the Institute of Geology AS CR:

Chvátalová A. & **Cajz V.**: *Geology for geographers.* Undergraduate Course, Faculty of Science, University of Jan Evangelista Purkyně, Ústí nad Labem.

Cílek V.: *Landscape and Memory*. Simon Fraser University, Vancouver: Field school.

Cílek V.: *The Singularity – orientation in the changing world*. Undergraduate Course, Faculty of Fine Arts, Technical University, Brno.

Cílek V.: *The prehistoric roots of contemporary landscape*. Undergraduate Course, Academy of Fine Arts, Praha.

Cílek V.: *Town and its environment*. Undergraduate Course, Faculty of Liberal Arts, Charles University – Erasmus and ECES Programme, two 5-days' excursions.

Čížková V. & **Roček Z.**: *Systematics and phylogeny of vertebrates.* Undergraduate Course, Faculty of Science, Charles University, Prague.

Dašková J.: *Micropalaeontology.* Undergraduate and Graduate (optional) Course, Faculty of Education, Charles University, Prague.

Faimon J. & **Hlaváč J.**: *Dating of karst sediments.* Undergraduate Course, Faculty of Science, Masaryk University, Brno.

Hojdová M.: *Principles of Geology.* Undergraduate Course, Faculty of Agrobiology, Food and Natural Resources, Czech University of Agriculture, Prague.

Kadlec J.: *Causes and consequences of the Quaternary climatic changes.* Undergraduate and Graduate Course, Faculty of Science, Charles University, Prague.

Kadlec J.: *Causes of the climatic changes.* Undergraduate Course, Faculty of Philosophy and Arts, Charles University, Prague.

Kadlec J.: *Causes of the climatic changes.* Undergraduate Course, Faculty of Philosophy, University of West Bohemia, Plzeň.

Melichar R. & **Hladil J.**: *Carbonate sedimentology and diagenesis.* Undergraduate (optional) Course, Faculty of Science, Masaryk University, Brno.

Musil R. & **Lisá L.**: *Methods of Quaternary research.* Undergraduate and Graduate (optional) Course, Faculty of Science, Masaryk University, Brno.

Musil R. & **Lisá L.**: *Loess of Euroasia.* Undergraduate and Graduate (optional) Course, Faculty of Sciences, Masaryk University, Brno.

Mikuláš R. in Holcová et al.: *Palaeoecology*, Undergraduate course, Institute of Geology and Paleontology, Faculty of Science, Charles University, Prague

Navrátil T. & **Hojdová M.**: *Heavy metals in the environment.* Undergraduate and Graduate Course, Faculty of Science, Charles University, Prague.

Navrátil T.: *Heavy metals in the environment.* Undergraduate and Graduate (optional) Course, Faculty of Science, Charles University, Prague.

Pruner P.: *Paleomagnetism in the plate tectonics.* Undergraduate Course, Faculty of Science, Charles University, Prague.

Roček Z.: *Comparative anatomy of vertebrates.* Undergraduate Course, Faculty of Science, Charles University, Prague.

Roček Z.: *Comparative anatomy of vertebrates.* Undergraduate and Graduate Course, Faculty of Science, Charles University, Prague.

Roček Z.: *Morphology of animals.* Undergraduate Course, Faculty of Science, Charles University, Prague.

Roček Z.: *Review of fossil vertebrates.* Undergraduate Course, Faculty of Science, Charles University, Prague.

Rudajev V.: *Physics of rock fracturing – selected topics.* Postgraduate Course, Faculty of Science, Charles University, Prague.

Rudajev V.: *Induced seismicity.* Postgraduate Course, Faculty of Science, Charles University, Prague.

Skála R.: *Impact process and shock metamorphism.* Undergraduate and Graduate (optional) Course, Faculty of Science, Masaryk University, Brno.

Šlechta S.: *Magnetic properties of rocks.* Undergraduate Course, Faculty of Mathematics and Physics, Charles University, Prague.
Štorch P.: *Principles and methods of stratigraphy.* Undergraduate (optional) Course, Faculty of Science, Charles University, Prague.
Ulrych J.: *Systematic mineralogy.* Graduate Course, Faculty of Chemical Technology, University of Chemical Technology, Prague.
Vach M. & **Navrátil T.**: *Environmental chemistry.* Undergraduate Course, Faculty of Forestry and Environment, Czech University of Agriculture, Prague.
Vach M.: *Air Protection.* Undergraduate Course, Faculty of Forestry and Environment, Czech University of Agriculture, Prague.
Vach M.: *Environmental Chemistry.* Undergraduate Course, Faculty of Forestry and Environment, Czech University of Agriculture, Prague.
Žigová A.: *Geography of soils and protection of soil resources of the Czech Republic.* Undergraduate Course, Faculty of Science, Charles University, Prague.

Supervision in Undergraduate Studies

Bokr P. (MSc. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***R. Mikuláš***).
Dobrý M. (MSc. thesis), Faculty of Science, Charles University, Prague (co-*supervisor* ***J. Adamovič***).
Doležalová L. (MSc. thesis), Faculty of Science, Charles University, Prague (co-*supervisor* ***J. Adamovič***).
Hlásková T. (MSc. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***L. Lisá***).
Kučerová K. (MSc. thesis), Faculty of Sciences, Masaryk University in Brno (*supervisor* ***J. Hladil***).
Macáková J. (MSc. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***M. Svojtka***).
Matoušková Š. (MSc. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***J. Rohovec***).
Svitek T. (MSc. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***T. Lokajíček***).

Supervision in Graduate Studies

Ackerman L. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***J. Ulrych***).
Altová V. (PhD. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***P. Bosák***).
Danko P. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***Z. Roček***).
Dašková J. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor O. Fatka and* ***M. Konzalová****)*.
Drábková J. (PhD. thesis), Charles University, Prague (*supervisor* ***J. Bek***).
Drahota P. (PhD. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***P. Skřivan***).
Ekrt B. (PhD. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***J. Zajíc***).
Geršl M. (PhD. thesis), Faculty of Sciences, Masaryk University, Brno (*supervisor* ***J. Hladil***).
Gilíková H. (PhD. thesis), Faculty of Sciences, Masaryk University, Brno (*supervisor* ***J. Hladil***).
Havelková P. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***Z. Roček***).
Hojdová M. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***T. Navrátil***).
Janečka J. (PhD. thesis), Faculty of Sciences, Masaryk University, Brno (*supervisor* ***J. Hladil***).
Jurková N. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***P. Bosák***).
Koptíková L. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***J. Hladil***).
Kubínová P. (PhD. thesis), Faculty of Forestry and Environment, Czech University of Agriculture, Prague (*supervisor* ***M. Vach***, co-*supervisor* ***P. Skřivan***).
Machado G. M. J. (PhD. thesis), Faculdade de Ciéncias, Universidade de Aveiro, Portugal (*co-supervisor* ***M. Vavrdová***).
Malý K. (PhD. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***J. Adamovič***).
Mikšíková L. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***V. Cílek***)
Petružálek M. (PhD. thesis), Faculty of Science, Charles University, Prague (co-*supervisor* ***T. Lokajíček***).
Piras S. (PhD. thesis), Dipartimento del Museo di Paleobiologia e dell Orto Botanico, Universita di Modena e Reggio Emilia (*co-supervisor* ***P. Štorch***).

Pokorný R. (PhD. thesis), Institute of Geology and Paleontology, Charles University, Prague (*supervisor* ***R. Mikuláš***).
Přikryl T. (Ph.D. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***J. Zajíc***).
Schnabl P. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***P. Pruner***).
Šlechta S. (PhD. thesis), Faculty of Science, Charles University, Prague (*co-supervisor* ***J. Kadlec***).
Špičková J. (PhD. thesis), Institute of Geology AS CR, Prague (*supervisor* ***P. Skřivan***).
Vacek F. (PhD. thesis), Faculty of Science, Charles University, Prague (*supervisor* ***P. Bosák***).
Živor R. (PhD. thesis), Faculty of Science, Charles University, Prague (co-*supervisor* ***V. Rudajev***).

Membership in scientific and academic boards

Prof. RNDr. Pavel Bosák, DrSc. – Vice-Chairman, Committee for degree of Doctor of Sciences (DSc.) in geological sciences at Academy of Sciences of the Czech Republic; Member, Committee for Interdisciplinary study of Quaternary at the Board of Graduate Studies in Geology, Faculty of Science, Masaryk University, Brno, Czech Republic; Member, Board of Graduate Studies in Geology, Faculty of Science, Charles University, Prague, Czech Republic; Supervisor for PhD studies, Faculty of Science, Masaryk University, Brno, Czech Republic; Member, Scientific Council of Faculty of Science, Masaryk University, Brno, Czech Republic; 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, Czech Republic, Member of the Academic Assembly of the Academy of Sciences of the Czech Republic.
RNDr. Václav Cílek, CSc. – Member of the Scientific Board, Faculty of Humanistic Studies, Charles University, Prague; Member of the Scientific Board of the Czech Geological Survey; Member of the Academic Assembly of the Academy of Sciences of the Czech Republic.
Doc. RNDr. Jindřich Hladil, DrSc. – Alternating Member of the Committee for Degree of Doctor of Sciences in Geological Sciences, Academy of Sciences CR; Member of the Board of Graduate Studies in Geology, Faculty of Science, Charles University, Prague; Member of the Board of Graduate Studies in Geology, Faculty of Sciences, Masaryk University, Brno; Member of the Committee for Finals of Undergraduate Students in Geology, Faculty of Sciences, Masaryk University; Member of the RNDr. Doctoral Examination Committee in Geology, Faculty of Sciences, Masaryk University.
RNDr. Jaroslav Kadlec, Dr. – Member of the Board of the Undergraduate and Graduate Studies in Geology, Faculty of Science, Charles University, Prague.
Ing. Tomáš Lokajíček, CSc. - Member of the Board of Graduate Studies in Applied Geology, Faculty of Science, Charles University, Prague.
Ing. Petr Pruner, DrSc. – Member of the Board of the Graduate Studies in Geophysics, Faculty of Science, Charles University, Prague; Alternating member of the Commitee for degree of Doctor of Sciences (DSc.) in geological sciences.
Doc. RNDr. Zbyněk Roček, DrSc. – Member, Committee for degree of Doctor of Sciences (DSc.) in geological sciences at Academy of Sciences of the Czech Republic; Member, Committee for degree of Doctor of Sciences (DSc.) in zoology and physiology at Academy of Sciences of the Czech Republic.
RNDr. Vladimír Rudajev, DrSc. – Member of Council for Sciences of Academy of Sciences of the Czech Republic; Vice-chairman of the Grant Agency of the AS CR: Department of Mathematics, Physics and Earth Sciences; Chairman of the Commission for defending Doctor of Sciences Thesis (DSc.) in Geological Sciences, Academy of Sciences of the Czech Republic; Member of the Commission for defending Doctor of Sciences Thesis (DSc.) in Geophysical Sciences, Academy of Sciences of the Czech Republic; Member of the Board of Graduate Studies in Applied Geology, Faculty of Science, Charles University, Prague; Member of the Board of Graduate Studies in Geophysics, Matematical Physical Faculty, Charles University, Prague.
Doc. Ing. Petr Skřivan, CSc. – Member of the Board of Graduate Studies in Applied and Landscape Ecology, Faculty of Forestry, Czech University of Agriculture, Prague.
RNDr. Marcela Svobodová, CSc. – Secretary of the Grant Agency of Academy of Sciences, Council No. 3 Earth and Space Sciences; Member of the Academic Assembly of the Academy of Sciences of the Czech Republic.

RNDr. Petr Štorch, DrSc. – Member of the Scientific council of the Geological Division, Faculty of Science, Charles University, Prague; Alternating member of the Committee for Degree of Doctor of Science in Geological Sciences, Academy of Sciences, CR; Vice-Chairman of the Czech Commission on Stratigraphy.
Doc. RNDr. Jaromír Ulrych, DrSc. – Member of the Board of Graduate and RNDr. Studies in Mineralogy and Geochemistry, Faculty of Science, Charles University, Prague; Member of the Editorial Commission of the Academy of Sciences; Member of the Grant Commission of the Academy of Sciences.
RNDr. Karel Žák, CSc. – Member of the Czech Science Foundation, Discipline Committees No. 2: Natural sciences, and No. 205: Earth and space sciences"; Member of Work Group Geology of the Accreditation Commission of the Czech Ministry of Education, Youth and Sports.
RNDr. Anna Žigová, CSc. – Member of the Board of Graduate Studies in Physical Geography, Charles University, Prague; Member of the Section of Soil Science of Scientific Council of the Research Institute of Ameliorations and Soil Conservation, Prague.

Membreship in foreign Academies

Bosák P.: Corresponding Member, Slovenian Academy of Sciences and Arts (elected 2005).
Ložek V.: Foreign Member, Polish Academy of Arts and Sciences (election approved by the Polish President in 1999).

Degrees obtained by the staff of the Institute of Geology AS CR

PhD.

Mgr. **Jaroslav Hlaváč**: *Holocene environmental history of the Bohemian Karst on the basis of malacostratigraphic analyses (in Czech)*. Unpublished PhD. thesis, 87 pp., Faculty of Science, Charles University, Prague (June 2006)

Doc.

Mgr. **Marek Vach**, PhD.: *Transport in atmosphere and others components of environment (in Czech)*. Unpublished inaugural dissertation, 120 pp., Faculty of Forestry and Environment, Czech University of Agriculture, Prague (October 2006)

7. Awards and Fellowships

Awards

Poster prize for one of the best poster presented – **Jiří Sláma**, Jan Košler, Urs Schaltegger, Mike Tubrett & Marcus Gutjahr: *New natural zircon standard for laser ablation ICP-MS U-Pb geochronology*. 2006 Winter Conference on Plasma Spectrochemistry, Tucson, Arizona, January 8-14, 2006.

Fellowships

Mgr. **Martin Chadima**, PhD.: 6 month Masaryk-Fulbright Fellowship (University of Hawaii at Manoa, USA)

Mgr. **Lenka Lisá**, PhD. 3 month Marie-Curie Fellowship (Cambridge University, England)

RNDr. **Petr Štorch**, DrSc.: 8 month Fulbright Research Fellowship (California State University, Long Beach, USA)

Scientific training of foreign students at the Institute of Geology

Krawczyk C., ENSIL, Université de Limoges, France, 3 month research stay *(supervisor T.* ***Navrátil****, co-supervisor* ***J. Rohovec****)*

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8. Positions in International Organizations and Editorial Boards

Bek J.: General Secretary-Treasurer, International Federation of Palynological Societies (since 2005).
Bosák P.: Vice-President & Treasurer, the International Union of Speleology (elected in 2005).
Bosák P.: Member, Commission on Paleokarst and Speleochronology, the International Speleological Union (since 1986).
Bosák P.: Member, Commission for Physico-Chemistry and Hydrogeology of Karst, the International Speleological Union (since 1978).
Dašková J.: Member, Organization of Czech and Slovak palynologists (since 2002).
Drahota P.: Member, Society for Geology Applied to Mineral Deposits (since 2002).
Drahota P.: Vice-president, Joint SGA Student Chapter Prague-Freiberg (since 2002).
Galle A.: Czech representative of the International Paleontological Association (since 1995).
Galle A.: Member, The Paleontological Society (USA).
Hladil J.: Web Administrator, Czech National Committee for IGCP (since 1994).
Hladil J.: Corresponding Member, Subcommission on Devonian Stratigraphy of the IUGS (since 1993).
Kadlec J.: Co-ordinator for the Czech Republic, IGBP – PAGES Project (since 1998).
Ložek V.: Member, Commission on Holocene, INQUA: Commission of Loess Studies (since 2003).
Mikuláš R.: Czech representative, International Palaeontological Association (since 2006).
Mikuláš R.: Working Group of the Treatise on Invertebrate Paleontology, Part W, Trace Fossils (since 2001).
Rudajev V.: Member of the International Society of Rock Mechanics (since 1991).
Rudajev V.: Member of the Seismological Society of America (since 1969).
Roček Z.: Member of the Executive Committee, International Society of Vertebrate Morphology (since 2001).
Roček Z.: Vice-President, Societas Europaea Herpetologica (elected in 1998).
Roček Z.: Member of the Executive Committee, World Congress of Herpetology (since 1994).
Siblík M.: Corresponding Member, Subcommission of Triassic stratigraphy (since 1981).
Skála R.: Member, European Crystallographic Association, Special Interest Group on Mineralogical Crystallography (since 1999).
Skála R.: Member, The Meteoritical Society (since 1992).
Slavík L.: Corresponding Member, Subcommission on Devonian Stratigraphy of the IUGS (since 1999).
Štorch P.: Titular Member, Subcommission on Silurian Stratigraphy of the IUGS (since 2004).
Ulrych J.: Member, Permokarboner Kreis (Würzburg, FRG).
Žigová A.: Member of Committee C: Soil and regolith morphology and genesis, Division on Soil System Sciences, European Geosciences Union (since 2006).
Žigová A.: Member, European Clay Groups Association (since 2000).
Žigová A.: Member, International Union of Soil Sciences (since 1995).

Editorial Boards

Bosák P.: *Geologica Carpathica*, Official Journal of the Carpathian-Balkan Geological Association; Member of the Executive Committee (since 2005).
Bosák P.: *International Journal of Speleology*, Official journal of the Union Internationale de Spéléologie and Societá Speleologica Italiana, L'Aquilla, Italy; Member of Advisory Board (since 1994).
Bosák P.: *Acta Carsologica*, international journal, published by Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia; Member of Advisory Board (since 2004).
Bosák P.: *Theoretical and Applied Karstology*, scientific journal published by Speleological Institute „Emil Racoviţa", Bucuresti – Cluj, Romania; Member of editorial board (since 2000).
Bosák P.: *Kras i Speleologia*, scientific journal published by Silesian University, Sosnowiec, Poland; member of editorial board (since 2004).
Bosák P.: *Geologos*, scientific journal published by Faculty of Geology, Adam Mickiewicz University, Poznań, Poland; Member of Editorial Board (since 2000).
Bosák P.: *UIS Bulletin*, information bulletin of the International Union of Speleology, Prague, Czech Republic; Editor-in-Chief (since 1993).
Bosák P.: *Speleo* (Praha), society bulletin published by the Czech Speleological Society, Prague, Czech Republic; Member of Editorial Board (since 1990).
Bosák P.: *Český kras* (Beroun), regional journal published by the Museum of the Czech Karst in Beroun, Czech Republic; Co-editor (since 1976).
Bosák P.: *Annual report of the Institute of Geology*, Academy of Sciences of the Czech Republic, Co-editor (since 1998).
Cílek V.: *Slovenský kras*, Liptovský Mikuláš, Slovakia; Member of Editorial Board (since 2000).
Cílek V.: *Geologica Carpathica*, Official Journal of the Carpathian-Balkan Geological Association; Co-editor (since 2005).
Cílek V.: *Vesmír*, Member of Editorial Board (since 2006).
Cajz V.: *Essentia*, member of Editorial Board (since 2003).
Hladil J.: *Geological Quarterly*, Warszaw, Poland; consulting editor (since 2004).
Hladil J.: *Geologica Carpathica*, Official Journal of the Carpathian-Balkan Geological Association; Member of the Executive Committee (since 2001).
Hladil J.: *Bulletin of Geosciences*, Prague, Czech Republic; Co-editor (since 2006).
Hlaváč J.: *Malacologica Bohemoslovaca* – electronical journal, Prague, Member of Editorial Board (since 2003) http://www.mollusca.sav.sk/index.html.
Ložek V.: *Studia Quarternaria*, Krakow, Poland; Member of Editorial Board (since 1999).
Mikuláš R.: *Geolines*, Institute of Geology, AS CR, Member of Editorial Board (since 1998).
Mikuláš R.: *GEO* – Czech Version, Prague, Member of Scientific/Editorial Board (since 2005).
Pruner P.: *Geolines*; member of Editorial Board (since 1997).
Rudajev V.: *Acta geodynamica et geomaterialia,* Institute of Rock Structure and Mechanics AS CR, Member of Editorial Board (since 1990).
Roček Z.: *Biota* (Slovenia); Member of the Editorial Board (since 2003).
Skála R.: *Journal of the Czech Geological Society*, Prague, Member of the Editorial Board (since 2005).
Slavík L.: *Annual report of the Institute of Geology*, Academy of Sciences of the Czech Republic, Editor-in-Charge (since 1999).
Svojtka M.: *Geolines*; Editor-in-Chief (since 1996).
Štorch P.: *Geological Journal*, Liverpool, Manchester, Member of the Editorial Board (since 1993).
Štorch P.: *Newsletters on Stratigraphy*, Berlin, Stuttgart, Member of the Editorial Board (since 1999).
Štorch P.: *Journal of the Czech Geological Society*, Prague, Member of the Editorial Board (since 1998).
Štorch P.: *Geolines*; Member of the Editorial Board (since 1995).
Štorch P.: *Bulletin of Geosciences*, Czech Geological Survey, Prague, Member of the Editorial Board (since 2001).
Ulrych J.: *Academia*, Member of Editorial Board (since 2004).

Zajíc J.: *Bulletin of Geosciences*, Czech Geological Survey, Prague, Member of the Editorial Board (since 2001).
Žák K.: *Bulletin of Geosciences*, Czech Geological Survey, Prague, Co-editor (since 2006).

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9. List of Grants and Projects undertaken in the Institute of Geology

Foreign Grants and Joint Projects

Czech-Slovenian Joint Programme "KONTAKT" , Ministry of Education, Youth and Sports of the Czech Republic, Project Code: 13/2005-06: Paleomagnetic studies of sediments in karst areas of Slovenia: implication for paleotectonic reconstruction. (***P. Pruner, P. Bosák, P. Schnabl****, N. Zupan Hajna & A. Mihevc, Karst Research Institute, SRC SASU, Postojna, Slovenia*)

Markov spodmol is 868 m long horizontal cave (Fig. 1) formed on the S edge of the blind valley on the southern rim of the Pivka basin. The cave is temporary ponor of the stream of Sajevščica, which drains about 2.4 km^2 large catchment area formed on Eocene flysch. The brook usually sinks several hundred meters in front of the cave, but several times a year it still flows into the cave. Water tracing test confirmed that it belongs to the catchment area of the Reka River.
The main part of the cave is horizontal. At the end of the cave there is a series of cascades to a terminal, more than 30 m deep sump. The modern brook transports sand or finer clastic sediments from the flysch into the cave. In the past, however, the brook has filled the cave with coarse gravel and finer sediments. Thick flowstone domes were locally deposited on these sediments. The old fill with pebbles up to 5 cm in diameter is now being eroded away, exposing some sections. Coarser, perfectly rounded pebbles are locally present, but finer sediments prevail in the entrance part of the cave.

Fig. 1: A plan of the Markov spodmol Cave

The studied section was situated in a side passage or a large niche of the main passage about 150 m from the entrance (Fig 1). The accessible thickness of the section is 4 m: further down, it continues under the level of a permanent lake.
The section consists of laminated to banded clays and silts, sometimes with an admixture of sand of ochreous, yellow and sometimes grey colour. This laminated/banded section overlies, with a distinct erosional boundary, varicoloured sandy clays with thick sand intercalations. Sediments are penetrated by vertical to subvertical bodies of darker, probably ferruginous sand. A flowstone cover nearly 1 m thick was deposited above the sediment, protecting it from erosion or infiltration of water. In the main passage, similar sediments were mostly eroded.
Totally 80 oriented laboratory samples were studied for their palaeomagnetic properties from both sections. The studied sediments are characterized by NRM intensities of 0.5 to 167 $mA.m^{-1}$ and the MS values from 79 to 1.070 x 10^{-6} SI units. The mean palaeomagnetic directions of the C-components are D = 352°, I = 41° for the normal polarity and D = 179°, I = -49° for reverse polarity.
Systematic acquisition of palaeomagnetic data within the studied section allowed the construction of a detailed magnetostratigraphic profile (Fig 2). The profile showed normal (N) palaeomagnetic direction with very short reverse excursions (R) or transient polarised zones (N-R) in a long normal magnetozone.
The obtained palaeomagnetic and magnetostratigraphic results showed that the section in the Markov spodmol Cave is composed of at least three different sequences. Interpretation of palaeomanetic and lithological features indicates that: (1) There are 4 different lithological units: (a) upper laminated clays, (b) varicoloured clays with a grey band at the top with a sandy band above the base, (c) sand to gravel, (d) lower laminated clays; (2) There are two prominent unconformities: a 2 cm thick varicoloured zone

(most probably weathered before the deposition of upper laminated sequence) and the base of bed c (sand to gravel).

In the upper part, the section shows normal magnetic polarity, but 3 prominent reverse magnetozones are present in the lower part. Reverse-polarity zones occur in the section of an abrupt lithoglogical change from uniformly laminated silty clays to varicoloured clays and sands with gravel fill of erosion channel in ochreous clays. The age of the fill can be interpreted as follows: upper laminated clay was deposited within normal Brunhes chron, varicoloured clays and sands/gravels were deposited in Matuyama or Gauss chrons, lower laminated clay is older than the middle sequence.

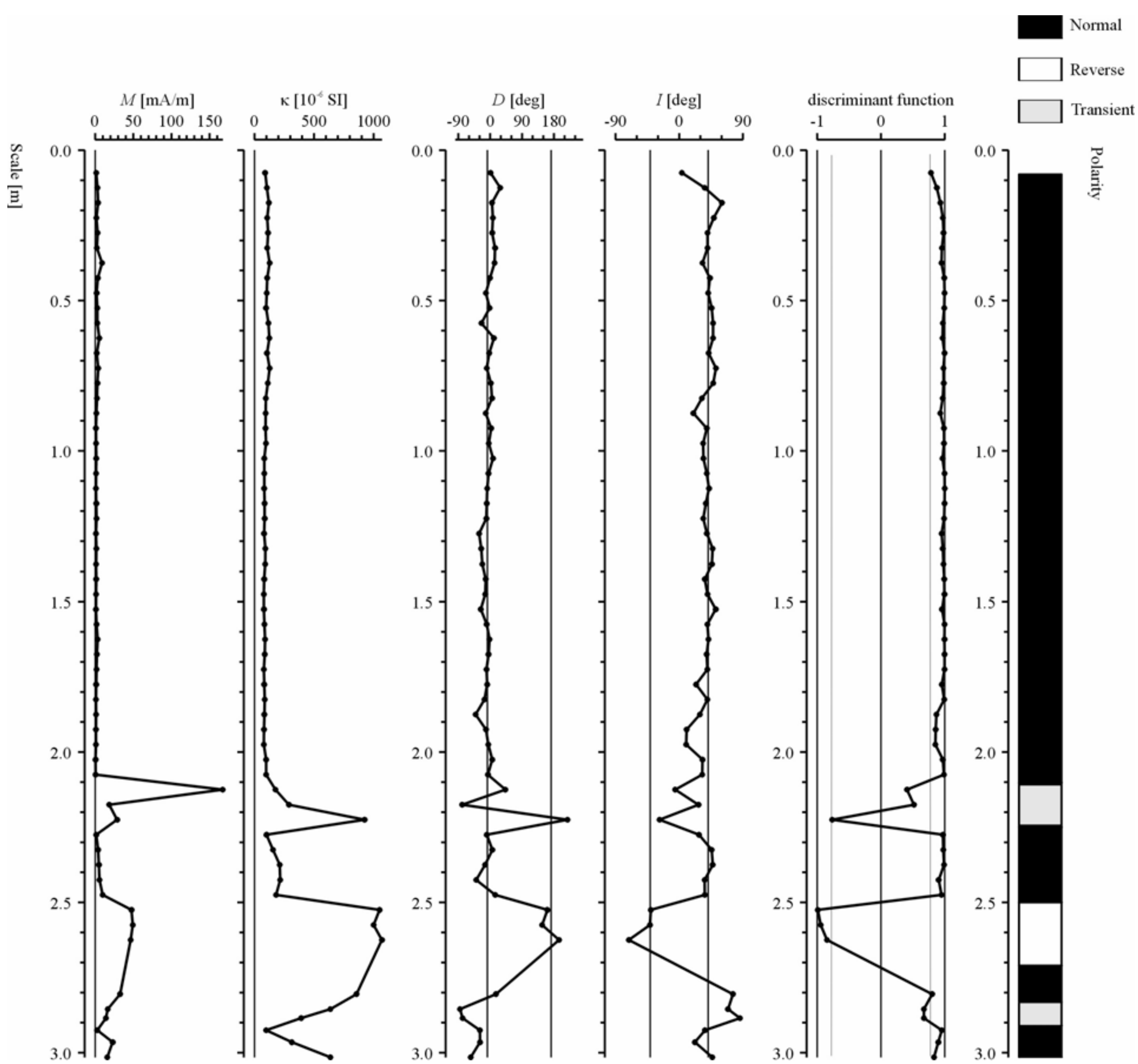

Fig. 2: Basic magnetic and palaeomagnetic properties, Markov spodmol

UNESCO, IGCP project 469: Late Variscan terrestrial biotas and palaeoenvironments. (*Leader of Project: Ch. Cleal, Galleries and museums of Wales, contributions by **J. Bek***)

The ultimate aim of the project is to get a better understanding of the events during the Variscan orogeny, especially the deterioration of tropical forests in the Cantabrian Age. The project is therefore focused on the Cantabrian and Westphalian D Stages. Bolsovian Stage was also studied: at this time, the area of the coal forest habitats showed the first signs of contraction across the Variscan Foreland, such as in the Pennines Basin of northern England. Three regions were studied (1) the Variscan foreland (Bulgaria, Upper Silesia, Poland, NE Germany, Ruhr, The Netherlands, Nord-Pas-de-Calais in France, Pennines Basin in UK, Sydney Coalfield in Canada; (2) Variscan Intramontane Basins in Romania, Czech Republic, Germany and France, and (3) Appalachian Foreland in West Virginia. In the Upper Silesian Coal Basin, changes in biotas and sedimentary environment were studied during the deposition of the Cracow Sandstone Series (Bolsovian–Westphalian D). Subsidence curves were derived for particular time intervals in all basins, including (1) idealised subsidence curves – derived from the maximum thickness of particular units, and (2) real subsidence curves – derived from thickness of particular units in actual boreholes. Sedimentary environments were interpreted for specific lithostratigraphic units/time intervals and petrological compositions of coal seams were characterized.

Joint project of the Joint Institute for Nuclear Research (Dubna, Russia) and Institute of Geology AS CR (2006-2008), No 07-4-1031-99/08: Neutron investigation of the structure and dynamics of condensed materials.

Subproject 1: Textures of deformed rocks and its importace for stress determinations. (*A.N. Nikitin, Joint Institute for Nuclear Research, Dubna* & ***T. Lokajíček***)

Five homologues from the KOLA supper deep borehole (KSDB3) area were studied under high hydrostatic stress up to 400 MPa. At five different values of confining stress applied, anisotropy of P-wave velocity was determined in spherical samples 50 mm in diameter. The obtained results were in good agreement with data measured by neutron diffraction. Homologues were also compared with samples from KSDB3 borehole (depth of 6,000 to 11,600 m). Borehole samples show significant change in stress/velocity dependence at low values of hydrostatic stress. This phenomenon is caused by closure of cracks created during the fast taking out process.

Subproject 2: Laboratory study of rock fracturing process under various p-T conditions by means of neutron diffraction and acoustic emission methods. (*T.I. Ivankina, Joint Institute for Nuclear Research, Dubna* & ***V. Rudajev***)

Fracturing of sandstones and marbles caused by their heating up to 250 °C was studied by the method of seismoacoustic emission analysis and ultrasound sounding. It was found that the course of seismoacoustic emission depends on rock structure. Rock structure was determined by the method of neutron diffraction. Only one maximum of seismoacoustically emitted signals was identified for sandstones corresponding to the maximum heating value (250 °C), while at marbles two maxima were identified – the first one for starting temperatures of max. 60 °C and the second one near the maximum heating value.

EU – INTAS Program, No. 03-51-4152: Subproject: Speleothems and other cave sediments from Siberia: an archive from the boreal climate zone with the potential for climate reconstruction on an annual to decadal basis (SPELEOARCH). (*H. Oberhänsli, GeoForschungsZentrum, Potsdam, Germany, S. Osintsev, Arabika Caving Club, Irkutsk, Russia,* ***J. Kadlec, M. Chadima*** & ***L. Lisá***)

Results of magnetic fabric, exoscopy of quartz grains and heavy mineral studies performed on the Botovskaya Cave (Cental Siberia) sedimentary fills were completed with frequency-dependant magnetic susceptibility, saturation remanence and anhysteretic remanent magnetization (ARM) measurements. The obtained data show the difference in magnetic mineralogy of the cave deposits. A basal portion of the cave fills is formed by quartz sands derived from the above lying Ordovician sandstone. The cave sediments reveal low values of both magnetic susceptibility (MS) and ARM. The upper portion of the cave fills shows higher MS and AMR values due to higher content of magnetite. The source of magnetite can be related to the pedogenic processes on the surface above the cave system. Meteoric waters later redeposited weathering soil products from the surface to the cave passages.

Czech – Polish Joint Programme. Agreement of scientific co-operation between Czech and Polish Academies of Sciences. Programme No 14: Correlation of the fossil floras of the Czech and Polish Republics: Investigation of differences in the development of fossil vegetation pattern in Poland and Czech Republic. (***M. Konzalová,*** *E. Zastawniak & L. Stuchlik, W. Szafer Institute of Botany, PAN, Kraków*)

Joint research of Tertiary deposits in the Czech and Polish territories enabled to reconstruct the vegetation changes and showed the development dynamics in the floristic pattern based on microfloristic assemblages (locally supported by fauna and macroflora, seeds and fruits), on the example of the Cheb Basin, western part of the Ohře Rift and basins in southwestern Poland. The time span covered the assemblages from the Middle Eocene 40.4 Ma to the Pliocene, 1.8 Ma. The main floristic composition, demonstrated by the characteristic features of the extinction and appearance of new taxa (and/or their frequency), was displayed in an ideal section, derived from several tens of borehole sections. Significant changes were shown in the angiosperm components in the Eocene/Oligocene and Oligocene by the onset of Arctotertiary Flora. Early and Middle Miocene microfloras are in many respects common in the compared Czech and Polish basins, some components are closely comparable with those in the Paratethys. Well comparable are the Pliocene spectra followed in the Cheb Basin (also in the Mariánské Lázně Graben) and southwestern Poland. The Eocene flora was well reflected in the assemblages of paleotropical/subtropical vegetation dominated by forest components, passing to Pliocene flora at the top of the ideal section, with predominance of deciduous trees and rich herbaceous plants. This testified the dynamic floristic development within more than 38 mil. years in the limited area of the respective basins.

Project of the Universities of Málaga and Granada (2004-2007), Ministerio de Educación y Cultura del Reinado Espaňol BTE 2000-1150 „Factors controlling low-grade metamorphic reactions in natural paragenesis (transition between the Maláguide and Alpujárride Complexes) and in experiments between 200°C and 450°C".

Subproject: Evidence of contrasting low-grade metamorphic conditions from clay mineral assemblages in Triassic Alpujárride – Maláguide transitional units in the Betic Cordilleras, Spain. (*M.D. Ruiz Cruz, F. Franco, C. Sanz de Galdeano, Universidades de Málaga y Granada, Spain &* ***J. K. Novák***)

A series of Triassic "intermediate units" characterized by transitional lithologies and metamorphic conditions separate the two terranes: a/ the lowermost Alpujárride and b/ the uppermost Maláguide ones (Betic Cordillera, southern Spain). In the Cesares area, the uppermost unit shows lithological characteristics similar to those of the Maláguide complex, changing progressively at increasing depth, towards lithologies typical to the Alpujárride Complex. From the bottom part to the top, four superimposed tectonic units were established: a/ Jubrique, b/ Rosalejo, c/ Albarrán, and d/ Crestallina.
They evidence important variations in metamorphic pressures, according to *b*-parameter of white micas: from low-pressure metamorphism (1.5–3 kbar, ~300 °C in the uppermost unit) to high-pressure facies (> 7 kbar, ~400–450 °C in the deepest one). The mean *b* values range from 8.988 Ǻ in the uppermost Rosalejo–Crestallina unit to 9.042 Ǻ in the Jubrique one. The lowest metamorphic grade is represented by mineral assemblage consisting of phengite + intermediate Na-K white mica, while the presence of pyrophyllite or chlorite-bearing mixed-layer minerals is subordinate. At increasing tectonic depth, intermediate Na-K mica and pyrophyllite disappear and the metamorphic assemblage consists of phengite ± paragonite ± margarite + Mg-chlorite ± trioctahedral chlorite-sudoite, which indicate

minimum pressure of 7 kbar and temperatures on the order of 400–450 °C. The Albarrán unit shows mineral assemblages corresponding to the low anchizone and the Rosalejo unit is characterized by occasional presence of paragonite, margarite, sudoite and chlorite-bearing mixed-layer phyllosilicates.

Bilateral cooperation between the Czech Geological Survey and Geologische Bundesanstalt Wien: Microbiostratigraphical study of the Lower Cretaceous sections in the Salzkammergut region. (*L. Hradecká, L. Švábenická, Czech Geological Survey, Prague,* ***M. Svobodová*** *& H. Lobitzer, Geologisches Bundesanstalt, Wien)*

Palaeoenvironmental and biostratigraphical investigations were carried out on the samples of dark grey to black marlstones of the Lower Cretaceous age from a gallery (1085–1053 m) of the classical locality of the "Ischler Brekzie" of Lauffener Erbstollen, Salzkammergut, Upper Austria. Benthonic and agglutinated foraminifers of *Marssonella oxycona, Dorothia turris* prevail. Specimens of *Psilocitharella truncata*, calcareous nannofossils *Watznaueria barnesae, Cretarhabdus conicus, Cruciellipsis cuvillieri* evidenced the Valanginian–Hauterivian age. The palynoassemblage consists of numerous pteridophyte spores (i.e., *Staplinisporites caminus, Contignisporites* sp.) and gymnosperm pollen (*Callialasporites dampieri, Corollina torosa*) which are commonly found in Lower Cretaceous deposits. Biostratigraphically important are dinoflagellate cysts of *Pseudoceratium pelliferum, Cymososphaeridium validum, Systematophora scoriacea* indicating the Valanginian–Hauterivian interval.

Czech Science Foundation

No. 205/05/0105: Peat swamp ecosystems of the Radnice Member (Westphalian) from Late Palaeozoic basins of the central and western Bohemia. (*S. Opluštil, Faculty of Science, Charles University, Prague,* ***J. Bek, J. Dašková****, J. Pšenička, West Bohemian Museum, Plzeň, M. Libertín, National Museum, Prague, J. Drábková & Z. Šimůnek, Czech Geological Survey, Prague)*

Excavations at the Ovčín locality helped to reconstruct coal-forming tropical forest 310 m.y. old. The whole area was covered by volcanic ash during two big eruptions of volcano near the Krušné hory Mountains. Volcanic ash preserved tropical forest with all plants in their original positions. Intensive excavations recovered a part of tropical forest and it is possible to reconstruct specific diversity and also original positions of all plants. The most abundant were extinct arborescent and sub-arborescent lycopsids and cordaites. Specimens of ferns, calamites and selaginellas were also found. Surprising are specimens of selaginellas climbing up along arborescent plants, because these plants were supposedto grow only as herbaceous forms in the undergrowth. Specific diversity of the tropical coal-forming forest was much higher than supposed earlier. Several specimens of plants from this locality belong to the largest specimens in the world. No comparable locality for the study of plants of coal-forming tropical forests in their original positions is known. The importance of these finds was stressed by the fact that the results of the research were included among ten greatest successes of the Czech science during the last decade.

Palaeoecological analysis of plant assemblage of the middle Westphalian age (Bolsovian) preserved in the tuff bed at the base of the Whetstone Horizon in the roof of the Lower Radnice Coal of the Štilec opencast mine in central Bohemia was performed. This plant assemblage represents peat-forming phytocoenose buried *in situ* by volcanic ash-fall as indicated by frequent occurrence of upright stems rooted in the underlying coal and large plant fragments at the base of the tuff bed. It is a low-diversity herbaceous assemblage dominated by small ferns and calamites with subdominant lycopsids not taller than about 1 and 1.5 m. Four fern species (*Kidstonia heracleensis, Dendraena pinnatilobata, Desmopteris alethopteroides* and *?Rhoda sp.*), *Calamites sp*. and small lycopsid *Sternbergites leismanii* comprise this unique herbaceous assemblage. It is interpreted as a pioneer phytocoenose, which colonized the shallowed pond or lake in the Lower Radnice Coal mire after flooding. Comparison of the phytocoenose preserved in the tuff bed at the base of the Whetstone Horizon in the Štilec opencast mine with coeval plant assemblages from the same bed of other localities revealed its unique character.

A comparison of the palynological record from the roof of the Lower Radnice Coal with the taphocoenose preserved in the “bělka” tuff bed overlying this coal and allochtonous taphocoenose of the laminated tuffite above the “bělka” indicates a close coexistence of this low-diversity herbaceous phytocoenose with the high-diversity lepidodendrid lycopsid-dominated assemblage.

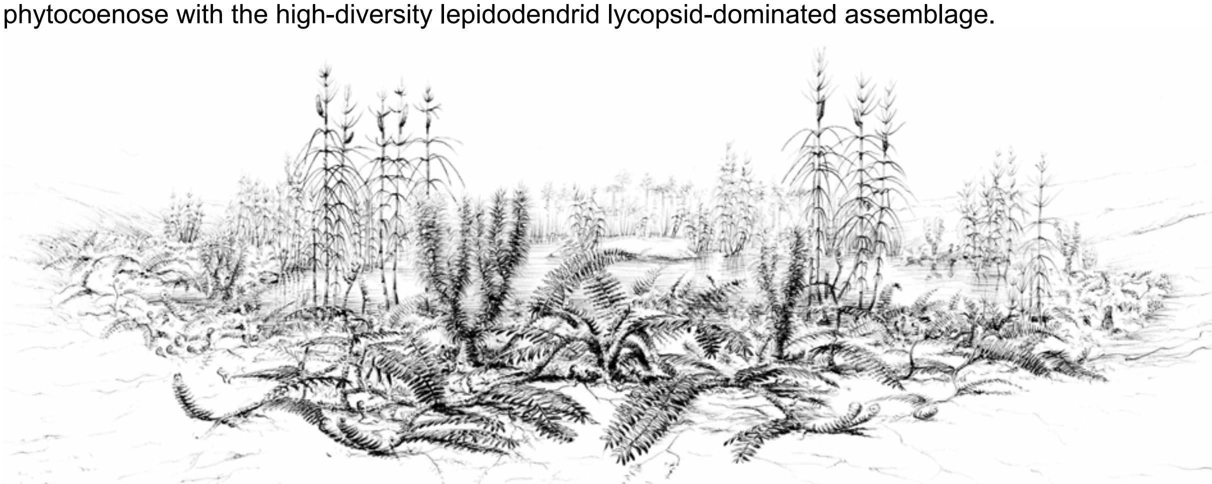

Fig. Reconstruction of the Middle Pennsylvanian pioneer plant assemblage (J. Svoboda, printed with permission)

No. 205/06/0395: Subproject Palaeoecology and trophic structure of selected Cambrian and Ordovician fossil assemblages in the Barrandian area. (*O. Fatka, Faculty of Science, Charles University, Prague* & ***R. Mikuláš***)

The ichnogenus of *Arachnostega* Bertling, 1992 represents dwelling and feeding burrows of minute in-fauna, specialized in exploitation of cavities inside shells of dead specimens of shelly-fauna. Though erected recently on the Jurassic material, their occurrence shows a maximum during the Late Ordovician of the Mediterranean province. However, no finds have been recorded from the Cambrian except the new material from the Middle Cambrian of the central Bohemia. This material confirms the assumption that the appearance of *Arachnostega* was contemporaneous with most of the "classical" Phanerozoic ichnotaxa.

No. 205/04/0151: Trace fossils and ichnofabrics of the Ordovician depositional sequences of St. Petersburg Region, Russia. (***R. Mikuláš***)

The ichnologic record of the Volkhov sedimentary sequence (early Middle Ordovician) provides objective criteria for the recognition of episodes of sedimentation and erosion. In the St. Petersburg region, several dozens sedimentation/erosion events can be recorded in the sequence. Diaganetic alterations in carbonate rocks are limited mostly to the secondary dolomitization; stylolitization structures are only sparsely present. The study of the Volkhov ichnofabric can be generalized to other, even Mesozoic units similar in rock composition and synsedimentary tectonic regime. The study of ichnofabrics of the Middle to Upper Ordovician shows that the already existing eustatic curves are in agreement with the ichnologic data. In the controversial case of the upper part of the Volkhov sequence, ichnofossil show a relative deepening of the basin. From the base of the Ordovician, large vertical, cylindrical, torpedo-like, flask-shaped to sub-spherical chambers became an important part of the ichnologic record. In specific strata, these chambers intersect carbonate bioclasts, and can be therefore considered boring (hard-substrate) traces. From the viewpoint of behaviour evolution, these camerate traces represent a uniquely preserved fossil record of radiation and specialization of exploitation of the substrate. In the Volkhov sequence, the ichnofabric was described bed-by-bed at several distant sites. The data obtained show that the lateral changes of individual beds are low and slow, and that the pattern of the change is unique for each bed. Despite the lateral changes, most beds or sets of beds can be correlated using their ichnofabric over the entire region, with a possible application to other Baltoscandian regions. This concerns not only the Volkhov, but nearly all the preserved (Lower to low Upper) Ordovician strata. The studies contributed to the theoretical background of ichnotaxonomy, e.g., by the view that the substrate hardness is a useful ichnotaxobase, but not for all ichnofossils: some ichnogenera can be best understood as substrate non-specific.

No. 205/05/0917: Upper Cretaceous oceanic red beds in the Czech part of the Outer Western Carpathians; biostratigraphy, sedimentology and geochemistry. (*P. Skupien, Z. Vašíček, D. Matýsek, Technical University Ostrava, L. Švábenická, M. Bubík, Czech Geological Survey, Prague and Brno* & ***R. Mikuláš***)

The Upper Cretaceous grey, greyish-green, exceptionally reddish shales at Choryně (N Moravia) represent a stratigraphic equivalent of "Cretaceous oceanic red beds" (CORB). The style of their bioturbation, characterized by low density and limited diversity, documents restricted conditions for in-fauna. However, colonization windows with *Chondrites* isp., *Planolites*/*Ophiomorpha* and *Phycosiphon* can be understood as short fluctuations of increased nutrition and/or oxygen content.
Typically developed "red beds" occur in the upper part of the Smradlavá Brook Valley at Bílá (N Moravia). Here, weak colonization windows with idiomorphic specimens of *Chondrites* isp., and low-intensity *Planolites* bioturbation augmented by stenomorphic *Chondrites* inside the tunnels, were ascertained. The original substrate must have provided very restricted conditions for in-fauna, nevertheless permitting episodes of existence of effective life strategies.

No. 205/04/0060: <u>Inorganic pollutants in selected types of precipitation and their impact on natural biogeochemical cycles in a model region</u>. (***M. Vach,*** *contributions by* ***T. Navrátil, P. Skřivan, M. Burian*** *&* ***J. Špičková***)

The main result of the project is a derivation of probably atmospheric transport trajectories of chemical elements surveyed in the falling precipitation. The systematic collection of the wet-only samples has been running since 2004 in the area of the Voděrady beech stands. This sampling locality is out of local air pollution influence.
The chemical compositions of precipitation events collected samples are statistically evaluated in connection with meteorological data available for a specific time of the precipitation event. The most significant parameter is the trajectory of a possible transport of contaminants. The trajectories are derived from meteorological satellite data by HYPSLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory model calculations http://www.arl.noaa.gov). The meteorological data of transport trajectories for various altitude levels of atmosphere obtained by this model are standard at present.
Examples include the derived most probable transport trajectories (draw out colour) of arsenic, lead, zinc and sodium at 1,500 m above the surface (at the sampling site).
The presented results document the fact that sea aerosol is the source of sodium in the precipitation above central Bohemia. On the other hand, arsenic and lead are transported probably from industrial areas of Poland. The research continues and the number of evaluated transport trajectories of surveyed chemical elements increases.

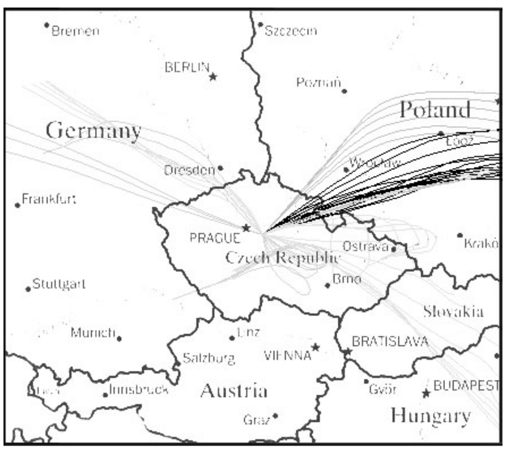

Fig. 1: Transport trajectories of As

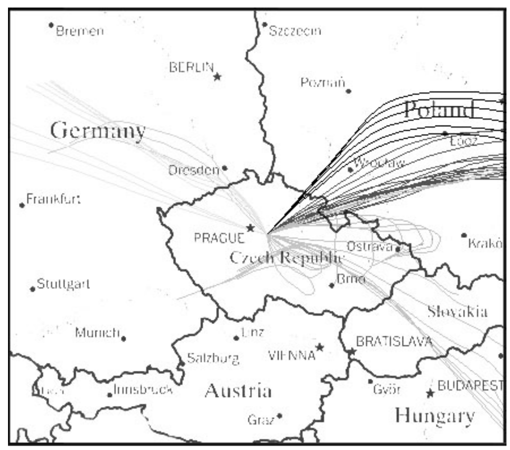

Fig. 2: Transport trajectories of Pb

Fig. 3: Transport trajectories of Cu

Fig. 4: Transport trajectories of Na

No. 205/05/2593: Chemical composition of moldavites from the Cheb Basin and their relationship to other tektites of the Central European strewn field. (***R. Skála***)

Basic macroscopic physical properties (weight, shape, colour and sculpture) were evaluated for over 350 individual finds of tektites from 4 different localities in the Cheb Basin. All these properties are similar to those observed for South Bohemian moldavites; particularly it is true for colour and weight distribution. Totally, 24 tektites from the Cheb Basin were characterized chemically using EPMA. For comparison, a set of moldavites from the South Bohemian and Moravian substrewnfields was measured as well. Contents of major elements overlap between the two sample sets covering a broad range; the most varying element is iron. The trends observed in the Harker plots, however, seem to differentiate several partial subgroups, some of them characteristic for the Cheb tektites only. These results are also substantiated by cluster analysis which reveals a tight agglomeration of a part of the tektites from the Cheb Basin forming two partial clusters whereas the rest of them cluster with South Bohemian samples. Minor and trace elements were measured with an LA-ICP-MS technique; CI-normalized REE patterns coincide with those observed for other moldavites. It has been found that many tektites, from Cheb and South Bohemia or Moravia, display considerable heterogeneity; they frequently show schlieren and fluidal fabric. Some of these samples even display layering. Such samples also showed considerable enrichment in volatile elements (e.g., Zn and Cu) which is typical for Muong Nong type Australasian tektites. Preliminary $^{40}Ar/^{39}Ar$ dating shows that the Cheb tektites are coeval with moldavites from South Bohemia and West Moravia. Finding of a new moldavite substrewnfield around Cheb substantiated the theory that moldavites were ejected from the Ries impact structure in a fan-shaped jet though it is not clear yet if continuous or composed of individual rays. In addition, chemistry of the Cheb moldavites suggests a significant target material inhomogeneity.

No. 205/06/0842: Taphocoenoses with echinoderms in the Upper Turonian of the Bohemian Cretaceous Basin: taphonomy, taxonomy, palaeoecology, biostratigraphy. (***J. Žítt**, **M. Svobodová**, **R. Mikuláš**, S. Čech, R. Vodrážka, L. Hradecká, Czech Geological Survey, Prague, M. Košťák, Faculty of Science, Charles University, Prague & J. Sklenář, National Museum, Prague*)

Possible impacts of the “cooling“ effect supposed for Xa –middle part of Xbα were studied in the Úpohlavy quarry. Composition of palynologic spectra as a reflexion of terrestrial vegetation cover is the most helpful source of data complicated only by the palynomorph scarcity and their poor preservation. Distribution of *Micraster* (spatangoid echinoids) seems to support environmental change on the base of Xbβ where a warming should start. For the cooling interval the small morph of *M. leskei* (Desmoulins, 1837) is typical alternated by large morphs when the water temperature increased. Taxonomic works continue to test whether two size morphs of one species are involved or belong to two successive species. Asteroid and ophiuroid studies of the Úpohlavy section (Xbα-β) supplemented by older collections from Lány na Důlku, Uhlířská Lhota, Všejany, Oškobrh and Opočnice (Poděbrady, Kolín, Pardubice and Nymburk regions), mostly of similar age, revealed interesting communities with several new forms. New finds of disarticulated skeletal parts of *Bourgeticrinus* cf. *fischeri* (Millericrinida) and very rare isocrinids and comatulids from Úpohlavy illustrate the diversified echinoderm community and very interesting, often monospecific concentrations of their remains in scour depressions and infaunal burrows in Xbα-β. Sedimentary environment, the character of substrate and firmground formation are well documented by several burrowed horizons, from which sixteen ichnotaxa including the burrowed fills of *Eutrephoceras* were described. Palaeogeography, palaeoecology and taxonomy of *Guettardiscyphia* Fromental (Porifera) from Úpohlavy, Kystra and Koštice were studied. Rich and unique, chemically prepared material will be used for the genus revision. Sedimentation of the Teplice Formation with two basal condensed horizons in the area of Úpohlavy was found to be strongly reduced near Býčkovice some 15 km to the NW: units Xa – Xbβ from Úpohlavy have the character of relatively thin deposit with allogenic phosphates (phosphatic intraclasts, reworked concretions). This is evidenced by interesting fauna of foraminifers, sponges, bivalves and brachiopods. In the area of shallow-water siliciclastic sedimentation near Jičín (Kněžnice locality), new ammonite taphocoenose was documented, important for correlations with the hemipelagic development at Úpohlavy (Xbα) and in northwestern Germany.

No. 205/04/0088: Effect of rock microfabric on the brittle failure process of rocks stressed under simulated laboratory conditions. (*R. Přikryl, Faculty of Science, Charles University, Prague & **T. Lokajíček***)

During the study of high-order statistic moments, which were originally applied for first arrival time determination of ultrasonic signals, it was found that above mentioned moment can be used not only for arrival time determination, but also for the determination of the sign of signal first onset. Empirical equations were designed:

$$S_5 = \frac{\sum_{i=1}^{N}(Y_i - \bar{Y})^5}{(N-1)\sigma^5} \text{ and } S_6 = \frac{\sum_{i=1}^{N}(Y_i - \bar{Y})^6}{(N-1)\sigma^6} - 15.$$

S_5 uses the moment of the fifth order and S_6 uses the moment of the sixth order, and are divided by the relevant power of standard deviation. Y_i are univariate data points, $\tilde{Y}$ is the mean value and N is the number of data points. It was found that odd parameters (moments) can be effectively used for arrival time and signal sign determination. On the contrary, even parameters (moments) can be used for arrival time determination only. AE_1 represents a strong signal with negative sign of signal arrival. AE_4 shows a very weak signal (at noise level) with a positive sign of signal arrival. This new approach can be applied in automatic determination of the time and sign of seismic, acoustic, and ultrasonic signals.

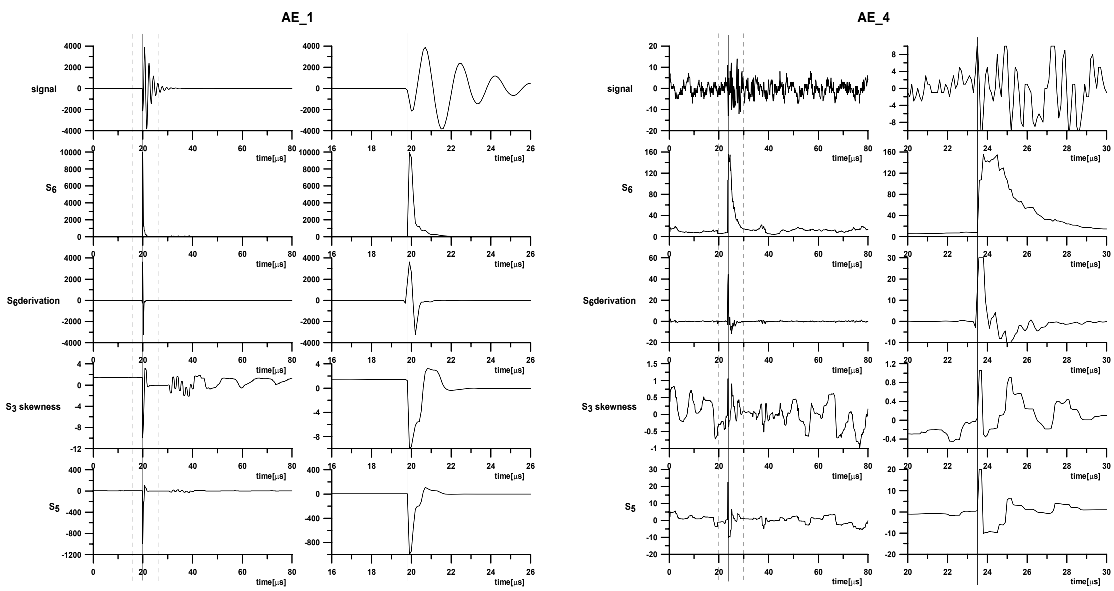

Fig.: Course of seismoacoustic signals and S_5 and S_6 parameters dependence

No. 205/06/0906: Laboratory study of rock sample failure under long-term loading with stress and strain control. (***J. Vilhelm** & **V. Rudajev***)

The space of microfracture clustering (nucleation centra) was determined by the method of ultrasonic signals location. The application of autocorrelation analysis proved that the fracturing process in individual nucleation centres runs independly. Changes of autocorrelation parameters have, however, precursory character with regard to total rupture of rock sample. This result is important for the application of statistical prediction methods of mining rockbursts.

The results of fractal analysis of acoustic emission, induced by loading of rock samples, show that the value of fractal dimension decreases before the total rupture of rocks. This decrease means a transition from accidental occurrence of microfractuing to a correlated deterministic process. The result obtained can serve for the evaluation of the deformation state of rocks and for the evaluation of increasing danger of seismic event origin.
Laboratory experiments were aimed at the determination of deformation behaviour of rocks, which were took out from potetional regions of radioactive wastes (Rožínka-Skalka). Rock samples were loaded by various loading regimes (acting force, acting deformation) and in various mutual directions of loading and rock foliation. Ultrasound emission and changes of transmission properties of rocks were monitored, too.

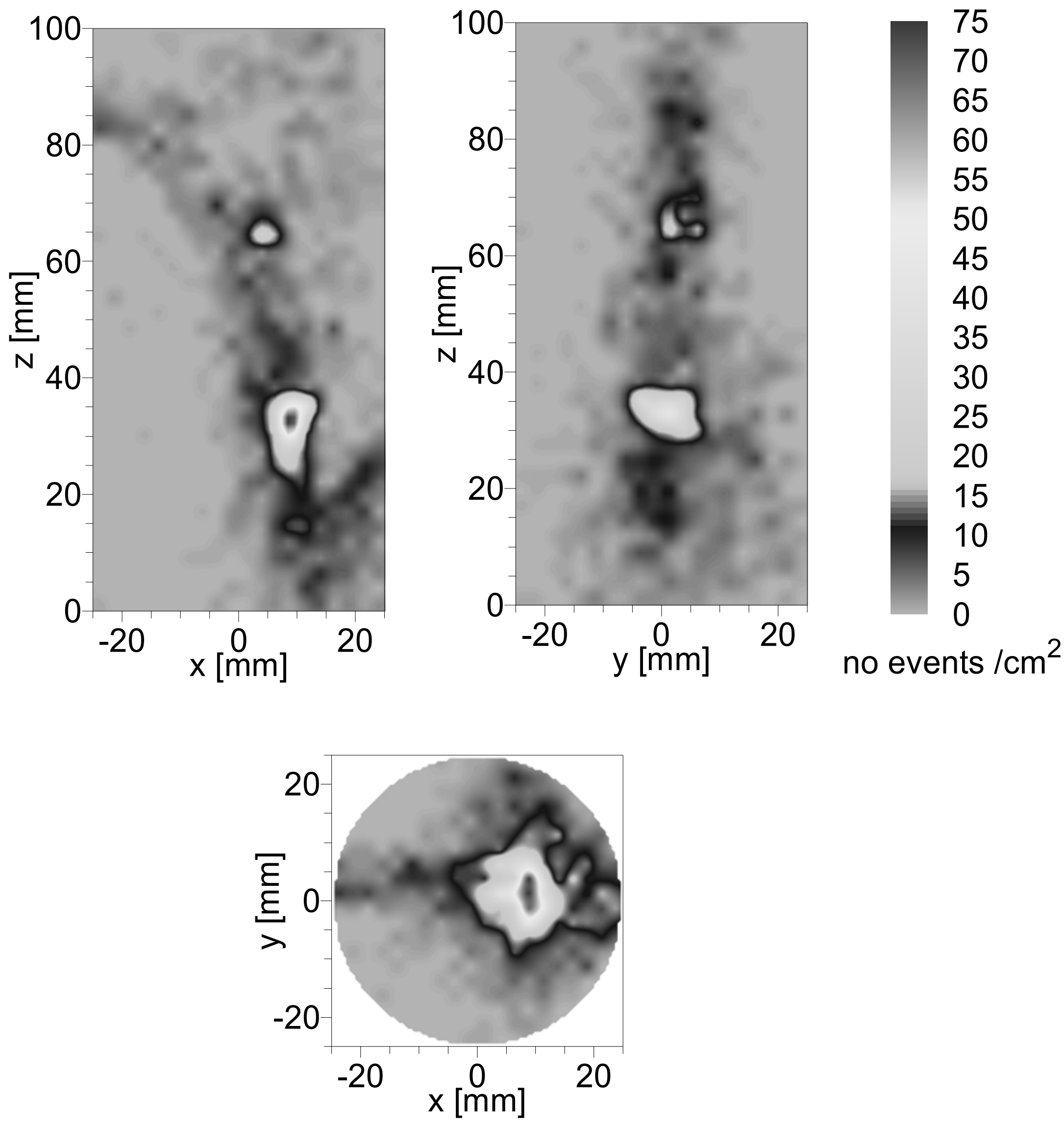

Fig.: Nucleation centres of ultrasound events (microfractures)

No. 205/06/1823: Record of tectonic processes and sea-level change during inception of an intracontinental basin: Cenomanian of the Bohemian Cretaceous Basin. (*L. Špičáková, Geophysical Institute AS CR, Prague, R. Grygar, Technical University Ostrava* & ***M. Svobodová***)

Dark grey pelitic sequences of the Peruc-Korycany Formation from the NW part of the Bohemian Cretaceous Basin (boreholes Jištěrpy, Dolní Vysoké and Dubičná) yielded rich organically-walled microfossils of the Late Cenomanian age. It corresponds with the occurrence of biostratigraphically important plant microfossils – triporate angiosperm pollen grains from the Normapolles group and dinoflagellate cysts. Fluviolacustrine environment in basal sample of the borehole Dubičná (J-63, depth of 613 m). was characterized by the prevalence of pteridophyte spores and the presence of zygnematacean green algae *Lecaniella* sp. First marine influence was indicated by acritarchs, prasinophytes, agglutinated foraminifers and dinocyst species tolerating the salinity changes. Rising diversity, quantity and the appearance of open-marine, mostly chorate dinocyst types, i.e., *Callaiosphaeridium, Achomosphaera, Florentinia, Oligosphaeridium* document a gradual transgression and sea deepening. Prevalence of agglutinated foraminifers, occurrence of scolecodonts and organic amorphous matter in some samples evidenced dysoxic conditions during sedimentation.

Grant Agency of the Academy of Sciences CR

No. KJB300130612: Platinum-group element geochemistry of strongly differentiated magmatic complexes: examples from the Bohemian Massif. (***L. Ackerman***)

Unique Re-Os isotopic analyses of the massive sulphides from the ultrabasic-basic Ransko massif and other ultramafic rocks for comparison were accomplished. The Os-model ages (T_{MA}) of the Ransko massif gives a range from 646 to 485 Ma, suggesting Proterozoic to Early Paleozoic formation of Ni-Cu-PGE mineralization.

No. 300130612: Combined magnetostratigraphic studies of Cenozoic volcanics, Bohemian Massif. (***V. Cajz, P. Pruner, M. Chadima, P. Schnabl, J. Ulrych, M. Konzalová****, F. Hrouda, F. Holub & V. Rapprich, Faculty of Science, Charles University, Prague*)

Sampling for magnetic properties was performed from 33 individual sites from the České středohoří Mts. The rocks include olivine basalt, basanite, bostonite, camptonite, monzodiorite, phonolite, tephrite, trachybasalt, and trachyte.
The nature of the magnetic carriers was investigated using different rock magnetic techniques. Magnetic susceptibility (*k*), low-field variation of magnetic susceptibility (k_{HD}), NRM, SIRM were measured for each specimen. Later, several specimens representing each sampling site and/or particular rock type were analyzed using temperature variations of magnetic susceptibility, IRM acquisition and back-field demagnetization, thermal demagnetization of the tree-component IRM, and hysteresis parameters. In most of the specimens the low-coercivity ferrimagnetic mineral corresponding to titinomagnetite with variable Ti-content was identified. In some cases minor amounts of hematite and/or pyrrhotite may be present. The increasing amount of substituted Ti in titanomagnetite, as revealed by low-field variation of magnetic susceptibility, decreases the Curie temperature of the studied rock and may influence some hysteresis parameters. Consequently, the unblocking temperature (when TRM was acquired) varies significantly according to the rock type studied.
Stable characteristic remanent magnetization (CRM) directions were obtained by stepwise alternating field (AF) and thermal (TD) demagnetization methods and subsequent principal component analysis. In most cases both methods yielded comparable results. The mean direction was calculated by combining the means from 24 sites (715 specimens). The site selection was based on the following criteria: number of specimens with stable CRM greater than 10, precision parameter K >10.0, and α_{95} < 10.0º. Both normal- and reverse-polarity sites were present, the angle between respective means is 170.34º. After transposition of reverse-polarity sites, the common mean direction is: D = 3.9º, I = 64.6º, k = 41.32, A_{95} = 4.7º. This gives a virtual geomagnetic pole (VGP) of 85.09ºN, 160.88ºE (d_p = 6.06º, d_m = 7.55º) with a corresponding paleolatitude of 46.48º, which agrees well with the Late Tertiary apparent polar wander path (APWP) for Europe (see Figure).
For the purpose of the anisotropy of magnetic susceptibility we studied 23 individual sites yielding more than 500 oriented specimens. The studied rock types included olivine basalt, bostonite, camptonite, phonolite, tephrite, trachybasalt. Quantitative parameters of magnetic anisotropy (k_{mean}, P, T) were evaluated with regard to individual sites and different rock types. Magnetic susceptibility values, k_{mean}, vary according to rock type from about 3,000 × 10^{-6} (phonolites) to more than 120,000 × 10^{-6} SI (camptonite). The degree of anisotropy, P, is generally relatively low, P < 1.10, except for some phonolite specimens where P reaches the maximum values of 1.25. This fact reflects the differences in viscosities. Consequently, different mechanisms orienting magnetic minerals should be expected in various rock types studied. The shape of anisotropy ellipsoid ranges from slightly prolate to neutral and oblate.
Several different orientations of the principal AMS directions in relation to dike or sill orientation can be found. An inverse fabric with magnetic lineations and magnetic foliations perpendicular to the dike margins was found in the camptonite dike. Normal magnetic fabric with magnetic foliations and magnetic lineations subparallel to the dike margins was found in trachybasalt and bostonite dikes. Magnetic lineations are subvertical in the former whereas subhorizontal magnetic lineations can be

observed in the latter. Comparing all studied sites it seems that the type of magnetic fabric is lithology-dependent (e.g., bostonite possessing normal fabric and camptonite possessing inverse fabric). Whether predominant occurrence of normal/inverse fabric reflects the presence of MD/SD grains or results from different orientation mechanism of magnetic minerals remains unclear. This question must be answered before any successful geological interpretation of magnetic fabric can be made.

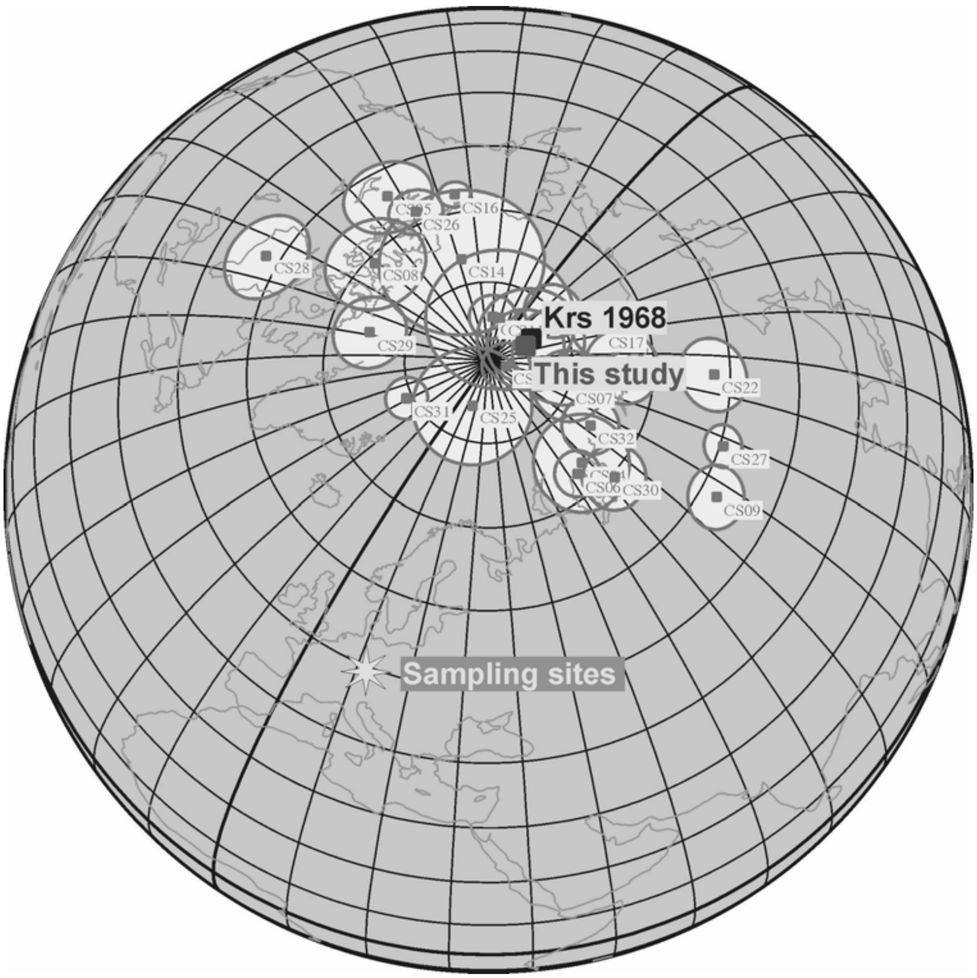

Fig. Late Tertiary apparent polar wander path (APWP) obtained from the České středohoří Mts. volcanics and compared with older data of Krs.

Subproject: Plant microfossils investigation, carried out in the České středohoří Mts. at the locality of Kučlín brought several new records of highly temperate ferns from the groups of the cicatricose spores and paleosubtropical / tropical ferns growing on salty soils; their representatives were found in the basal deposits underlying the diatomites. The rare find of the marine dinoflagellate cyst *Palaeocystodinium* Alberti coincides well with the spores. Both groups, ferns and algal remains, have palaeoenvironmental implication. The possibility of redeposition and the habitats ecology of the ferns will be studied in more detail.

In the Cheb Basin, the key microfossil *Boehlensipollis* W. Kr. representing the first and significant record in the basin, points to the Rupelian–Eochattian age of several relicts referred to the lower sand–clay strata. *Boehlensipollis* disappeared from the pollen spectra before the onset of the Miocene flora and is commonly considered as the correlative element for the European Paleogene basins as well as for deposits within the neovolcanics in our territory.

No. A3013302: Tectonic and volcanic controls on hydrothermal silicification in marginal zones of the Ohře Rift. (***J. Adamovič, J. Ulrych, V. Cajz, J.K. Novák, R. Mikuláš, K. Malý*** *& J. Zachariáš, Faculty of Science, Charles University, Prague*)

Final stages of the study of newly formed silica cement in sands and sandstones in the Ohře Rift region concentrated on the relation of silica minerals to other cementing mineral phases (fluorite, barite, sulphides), on geochemistry of both silica and non-silica cement, and the parameters of the mineralizing fluids. In the central part of the Ohře Rift graben, this allowed to discriminate between earlier fault-driven fluid circulation (Pliocene to Middle Pleistocene) and later topography-driven fluid circulation (Mid Pleistocene to Holocene) involving also Tertiary sediments of the graben fill. These two low-temperature hydrothermal stages are superimposed on vast silcretization products (Paleogene), on which four case studies were performed within the Rift area (Křemencový vrch and Stránce near Most, Rokle, Krásný Dvůr). Alpha-track detection in barites associated with late stages of silicification in the Ohře Rift graben confirmed their very young age (10–15 ka) and a source of ^{226}Ra in basement granites and rhyolites.
Silica mobility along contacts with young intrusive bodies was studied in shoulder blocks of the Ohře Rift graben. The observed effect of both primary heat sources (dyke contacts) and secondary heat sources (high-permeability planes in sandstone) on columnar jointing in sandstone suggests a convective rather than conductive heat transfer around the dyke, and implies water-saturated host rock. Columnar jointing can be explained by explosive activity of overheated vapour, rather than by cooling-induced contraction.

No. IAA300130505: Carboniferous fructifications and their spores from the Upper Silesian Basin (Namurian–Westphalian D) from the Czech Republic and Poland. (***J. Bek***)

The research is concentrated on the spore and plant fossil assemblages of the Czech part of the Upper Silesian Basin. Most palynological samples come from over thirty boreholes drilled here during last fifty years. Coal samples from the Jaklovec, Poruba, Saddle, Lower and Upper Suchá members of Namurian (Arnsbergian) to Westphalian (Langsettian) age were palynologically studied. Changes in the dominance of the two principal miospore groups, lycospores and densospores is the most significant criterion for the determination and characterization of dispersed miospore assemblages. Samples for *in situ* spores and new, yet unpublished specimens of fossil plants were taken from the museum collections from Ostrava, Sosnowiec, Cracow and Berlin. Results of Polish palaeobotanists and mainly palynologists were used for the comparison of the Polish and Czech parts of the basin.

No. A 300460602: Upper crustal model of the Ohře Rift and its vicinity. (*J. Málek, O. Novotný, J. Brokešová, Institute of Rock Structure and Mechanics AS CR, Prague, M. Novotný, J. Mrlina, Geophysical Institute AS CR, Prague,* ***V. Cajz, J. Adamovič****, Z. Skácelová & B. Mlčoch, Czech Geological Survey, Prague*)

The tectonic studies inside the Ohře (Eger) Rift structure continued with a detailed survey in the southwestern marginal area of the České středohoří Mts. (CS) volcanic range. Here, the rocks of the Tertiary volcanic complex meet with the sedimentary fill of the Most Basin. The continuation of previously described faults in the central CS was followed in direction to the Most Basin fill and faults detected during several decades of lignite mining can be compared with the “intravolcanic“ ones. The tectonic style and the segmentation of the inner part of the OR into rhombic blocks of different sizes and elongations was detected again. The dominance of shear stress over the graben structure rather than pure extension in the synvolcanic and postvolcanic periods is documented in this area, too. Greater frequency of west–east-striking faults in the area closer to the Most Basin was discovered, compared to the central part of the CS.

No. IAA300130505: The erosional, accumulational and postdepositional processes in flood plain after great flood 2002. (***V. Cílek***)

The basic research in this year can be classified according to the three most important topics as follows:
1. The unusual cold winter 2005/06 has created large ice barriers that have often led to local floods in the past. We measured the thickness and type of ice (slush-ice, frazil-ice) and documented the gradual melting of ice, local intrusions of ice into the overbank part of floodplain and the transport of driftblocks.
2. The Litavka River represents one of the smaller Central Bohemian rivers, but due to the vicinity of Příbram polymetallic deposit it represents an extremely important source of heavy metals. The river of almost mountainous character is known for recurrent floods. The flood suspension transported up to 71 kg Pb/hour, that is more than 1,5 t Pb per 24 hours. The Litavka River represents the source of major contamination (besides Pb also Zn, Cd, As and other elements) for the Berounka River and possibly the whole Elbe River catchment.
3. The Slavic settlement in Roztoky close to Prague represents one of the major thoroughly studied Early Slavic (approx. A.D. 550–570) settlements of Central Europe. Some 200 object are located on the sandy Late Glacial–Early Holocene river terrace close to the river. The major archeological question is whether the large number of huts can be attributed to the flood activity of the river. The architecture of the river sedimentation was studied on a strip 20 m wide and more than 1 km long that enabled the reconstruction of Early Holocene river terrace that was never flooded during the Neolithic–Early Middle ages period, but was covered by 2–3 m of water during 2002 due to the river bed aggradation.

No. KJB301110501: Subproject: Evolution and dynamics of the salt karst in Zagros Mts., Iran: Denudation rates, age of karst forms, governing factors. (***M. Filippi*** *& J. Bruthans, Faculty of Science, Charles University, Prague*)

Salt exposures and weathering residua on several salt diapirs located at different geographic/climatic settings were studied. Anhydrite, gypsum, hematite, calcite, dolomite, quartz, and clay minerals are the main constituents of the weathering residuum covering the salt diapirs in various thicknesses. Erosion rates of the residuum as well as of salt exposures were measured at selected sites for the period of 5 years by plastic pegs as benchmarks. Recorded data were standartized to a horizontal surface and to long-term mean precipitation.
For the salt exposures, long-term denudation rates were determined at 30–40 mm a^{-1} for coastal diapirs and up to 120 mm a^{-1} for mountain salt diapirs. Long-term mean superficial denudation rate measured on weathering residua of low thickness reached 3.5 mm a^{-1} on coastal diapirs. The total denudation rate estimated for the thin residuum is close to 4–7 mm a^{-1} based on apparent correlation with the uplift rate on Hormoz and Namakdan diapirs. Denudation of salt exposures is much faster compared to parts of diapirs covered by weathering residua. The extent of salt exposures is an important factor in the morphological evolution of salt diapirs as it can inhibit further expansion of the diapir. Salt exposures produce huge amounts of dissolved and clastic load, thus affecting the surroundings of the diapir.

No. KJB300130615: Mercury distribution and speciation in soils at three contrasting sites: comparative study. (***M. Hojdová****, contributions* ***T. Navrátil, J. Rohovec, J. Špičková*** *&* ***I. Dobešová***)

Within the scope of the project, three sites with different levels of Hg concentrations in topsoil horizons were chosen. The first site, Lesní potok catchment, is located 30 km SE of Prague (capital of the CR) and it is affected by prevailing winds containing urban emissions (dust, emissions from incinerator facilities etc.). The second site, in the vicinity of the town of Příbram, was loaded for centuries by emissions from metal mining and Pb, Ag smelting. The third site is the experimental catchment Na Lizu in the Bohemian Forest and it served as a reference site. Moreover, the waste material from mine damps in central Bohemia was sampled to investigate the extent of Hg contamination in the vicinity of two major abandoned Hg mines in the CR.

At three studied sites soil profiles, tree assimilatory organs and stream sediments were sampled. Litterfall and throughfall in the Lesní potok catchment are regularly sampled to quantify the input of Hg to soils. All samples are gradually analysed at the Inst. Geol. AS CR. Concentrations of total Hg are determined by CV-AAS (AMA-254). In soil samples, Hg speciation analysis is carried out using a thermo-desorption method (TDA) based on specific thermal stability of different Hg containing species at various temperatures.
Thermo-desorption properties of standard Hg compounds (such as $HgCl_2$, HgS, HgO) were evaluated at first in order to obtain an optimum experimental setup. For comparative purposes with natural soil samples, Hg^{2+} and Hg^0 were adsorbed onto standard materials such as clay minerals, Fe-oxyhydroxides and humic acid.
The release temperatures of clay minerals (montmorillonite and kaolin) ranged between 336–347 °C. Surprisingly, the TD curves of the Fe-oxyhydroxides (goethite and lepidocrocite) permit two different peaks to be distinguished. The first peak (~300 °C) indicated probably Hg weakly bound to surface of Fe-oxyhydroxides. Higher releasing temperature (~500 °C) reflected strong Hg binding in the crystal structure of Fe oxides. Mercury bound to humic acid was released at higher temperatures than that bound to mineral soil components (373 °C). The achieved results of TDA should help to interpret the results obtained from natural samples.

No. KJB307020602: Subproject: The effect of the Basal Choteč Event on faunistic communities of the Prague Basin. (*S. Berkyová, J. Frýda, Czech Geological Survey, Prague,* ***L. Koptíková, J. Hladil*** *&* ***L. Slavík***)

The field gamma-ray spectrometric measurements (GRS; using the GR-320 instrument, Exploranium) was conducted after the laboratory measurements of magnetic susceptibility MS (on Kappabridge KLY-2 device). Densely spaced rows of the measured targets (0.25 m instead of 0.50 m) were used because of the relatively condensed stratigraphic successions of the Emsian/Eifelian boundary strata and also because of the densely spaced samples for magnetic susceptibility in these sections (0.05 m). For example, in the Prastav quarry (Prague-Holyně), the average GRS values for potassium displayed only a slight variability, with almost insignificant differences between in the Třebotov and Choteč limestones. The GRS detected amounts of uranium involved in these rocks are, however, more than three times lower in the Třebotov Mb. limestones than in the Choteč Mb. limestones. For the Třebotov Mb. limestones, the shape patterns on the total radioactivity curve seem to be preferentially controlled by wide fluctuations in increased thorium amounts. This provides a great contrast to the GRS characteristics of the Choteč Mb. limestones where the total radioactivity variations are apparently controlled by amounts of the GRS detected uranium.
A synopsis about the Emsian/Eifelian (and Choteč Event) GRS–MS records suggest the following successions: A rapid increase in GRS values, but negatively correlating with the MS values, is the first observable consequence of environmental changes in this stratigraphic interval. This tends to be best manifested in the direct proximity of the boundary between the Třebotov and Choteč Mb. limestones, whereas a consecutively occurring increase in MS values is almost immediately accompanied by high-amplitude, fast variations in both the MS and GRS records.

No. A304130601: Subproject: The biodiversity of the Šárka Formation (Ordovician of the Prague Basin): faunal analysis, palaeoecologic, biogeographic, and stratigraphic aspects. (*P. Kraft, Faculty of Science, Charles University, Prague &* ***R. Mikuláš***)

Most assemblages of trace fossils from the black shales of the Šárka Formation (Llanvirnian, Czech Republic) are strongly affected by a “taphonomic filter“, which was not fully puzzled out by previous research. The ichnofabric study, however, showed that the degree of biogenic mixing of the substrates, expressed by the ichnofabric index (ii) reaches the medium values of 2–3. This is an important statement, as stratigraphic equivalents of the Šárka Formation in different parts of the world (North America, Baltic Shield and Siberia) are considered to record the “revolutionary” increase in the density and diversity of bioturbation. The results from the studied area show that also dysoxic conditions (as they are presumed for the Šárka Formation) were colonized during the Middle Ordovician.

No. IAA3013403: The character of mantle/lower crust beneath the Bohemian Massif based on geochemical signatures of (ultra)mafic xenoliths in Cenozoic volcanics. (***J. Ulrych, J.K. Novák, M. Lang, J. Adamovič, V. Cajz, M. Fillipi, L. Ackerman***, *E. Jelínek & M. Mihaljevïč, Faculty of Science, Charles University, Prague*).

Subproject: Upper mantle xenoliths from the Pliocene Kozákov volcano (NE Bohemia): P-T-fO2 and geochemical constraints (***J. Ulrych,*** *Z. Řanda, Nuclear Physics Institute, AS CR, Řež, P. Schovánek, Czech Geological Survey, Prague, P. Konečný, Geological Survey of the Slovak Republic, Bratislava & M. Huraiová, Comenius University, Bratislava, Slovakia*).

Upper mantle xenoliths are abundant in the basanites of the Pliocene (6–4 Ma) Kozákov volcano. The studied samples of spinel lherzolites come from the depth of about 50–75 km. Their mineral assemblage preserved subsolidus temperatures of 1165–1052 °C from the time of xenolith entrapment. Oxygen fugacity varies from +0.46 to +0.93 log unit relative to fayalite-magnetite-quartz buffer. Major bulk-rock oxides and variations in mineral chemistry indicate a continual depletion trend mainly associated with extraction of basaltic melt from the mantle. Mineralogical features and the absence of highly oxidized lherzolites suggest a negligible degree of modal metasomatic overprint. On the contrary, the LREE upward patterns and U-shaped REE patterns of clinopyroxenes, as well as of the bulk lherzolite compositions are indicators of cryptic metasomatic event(s) in the upper mantle. The U-shaped REE patterns corroborates to enrichment mechanism in the mantle by reactive porous flow and chromatographic fractionation. A possible cryptic metasomatic event(s) could have occurred in pre-Cenozoic times, probably during the Variscan orogeny.

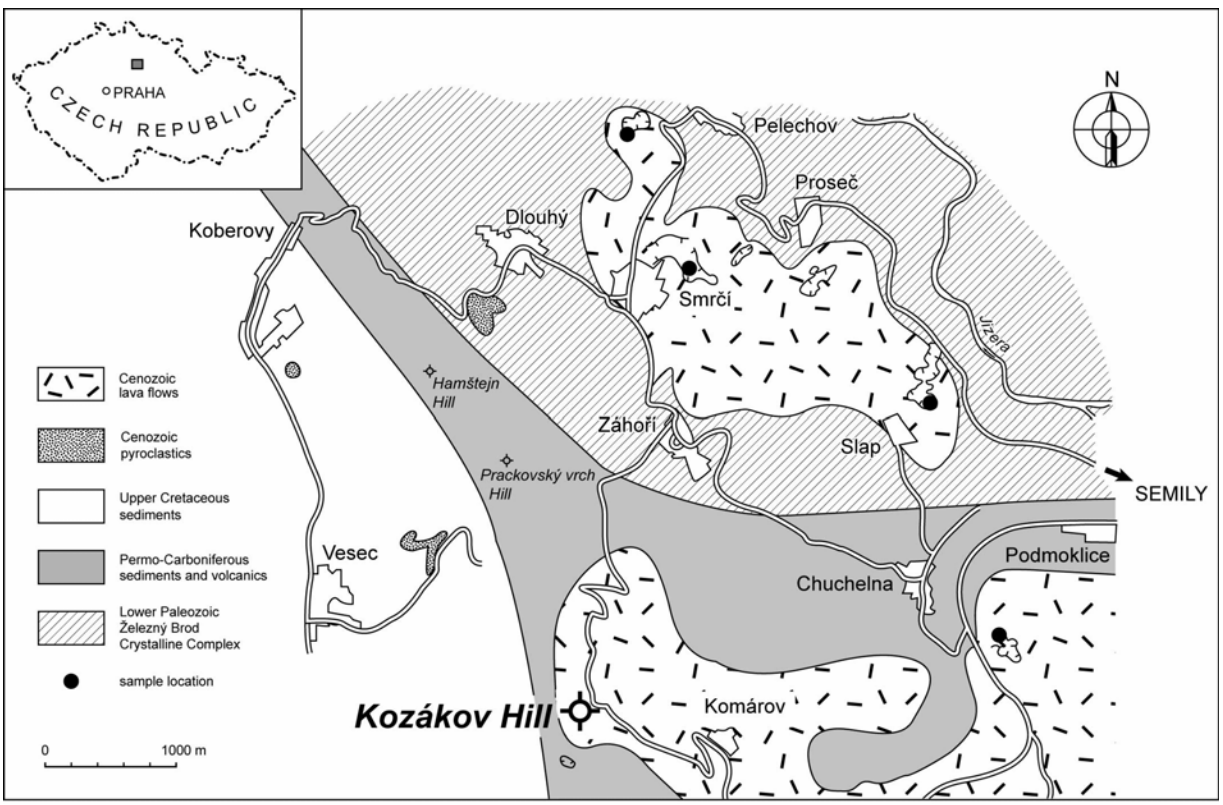

Fig.: A sketch of the geological setting of the Kozákov volcano lava flows.

No. A3013405: Lower Silurian of the Hlinsko Zone (E Bohemia): graptolite record, biostratigraphy and palaeogeographical links. (***P. Štorch***)

Recent taxonomic study on newly collected material was supplemented by a revision of the museum material housed in the Czech Geological Survey (collected by B. Bouček) and National Museum, Prague (collected by R. Horný). In sum, 112 graptolite taxa and fourteen graptolite biozones ranging from early Llandovery *vesiculosus* Zone to late Llandovery *spiralis* Zone have been identified in the Mrakotin Formation. Deep water, black shale succession resembles those of Thuringia and Sardinia in having common phosphatic cherty nodules and thin lenticular beds. As opposed to apparently shallower Barrandian succession, no oxic beds were recorded in the upper Llandovery succession of the Mrakotin Formation. Also graptolites *Monoclimacis* cf. *lunata, Dimorphograptus* n.sp., and *Pseudostreptograptus* cf. *williamsi* have not been recorded in the Barrandian. TOC values do not exceed 2.5 % in black cherts and siliceous shales of the Mrakotin Formation, that is remarkably less than in other Silurian black shale formations in Europe. Much of the organic matter, however, has been destroyed by the Variscan metamorphic processes.

No. IAA3013406: Structural and paleotectonic development of the Barrandian Prague Basin. (***P. Pruner****, R. Melichar, Faculty of Science, Masaryk University, Brno & P. Kraft, Faculty of Science, Charles University, Prague)*

Objective: Paleomagnetism, rock-magnetic and multicomponent analyses, paleogeographic implications.

Issue Group: ***P. Pruner, P. Štorch, P. Schnabl, M. Chadima, G. Kletetschka*** & ***O. Man****, P. Kraft, Faculty of Science, Charles University, Prague, and others.*

The Paleozoic evolution of the Prague Basin (Czech Republic) before its synformal deformation has been a new topic of interest for several years. Many results previously obtained thanks to tectonics, sedimentology and paleontology now contradict the most recent data. It is now considered that the evolution of the Prague synform was mainly controlled by allochtonous units. The Rheic Ocean, the existence of which has been demonstrated in Eastern America, is still widely debated in Western Europe mainly because its width cannot be estimated using paleomagnetic data since we are dealing with a NW–SE oriention. The use of the Anisotropy of Magnetic Susceptibility (AMS) to constrain the mode of opening of the dykes combined with the paleomagnetic technique which can be used for dating the fabrics represent useful tools to check the direction of the stress existing at the same time. Consequently, the direction of the displacement of the nappe is possibly related with the closure of the Rheic Ocean if the latter really existed. Since dykes are good stress indicators, we will first check these two techniques on our two dykes which are both supposed to be Silurian in age.

The Prague Synform (PS) which is preserved in the central part of the Barrandian area (Bohemian Massif) comprises a pile of Ordovician, Silurian and Devonian rocks over 2.5 km thick. Two dykes of alkaline basalt showing well developed feldspar phenocrysts were found, cropping out in a small gorge associated with the steep slope of the left bank of the Kačák Creek between the villages of Sedlec and Svatý Jan pod Skalou. These two dykes were sampled in detail.

In a previous interpretation, the evolution of the present Prague synform during the Silurian was characterized by the movement of individual segments along deep synsedimentary faults. The sedimentation and the widespread volcanism were considered to be controlled by three main faults (the Prague Fault, the Tachlovice Fault and the Koda Fault) which delineated three main stripes (the northern segment, the central segment and the southern segment; Fig. 1). The latter two faults were, however, interpreted by R. Melichar as planes of detachment, i.e. thrust faults separating different thrust units. The original orientation of these faults was not considered as typical of the Paleozoic but was thought to reflect the orientation of some deep Cadomian structures. This interpretation suggests that the predominant vertical movements recorded along the N65° faults (Fig. 1; reaching 1,000 m and even 2,700 m between the Cambrian and the Lower Devonian) did not result from a general extension of the lithosphere which controlled Ordovician–Devonian rock units of the Barrandian area but rather from a compressional regime.

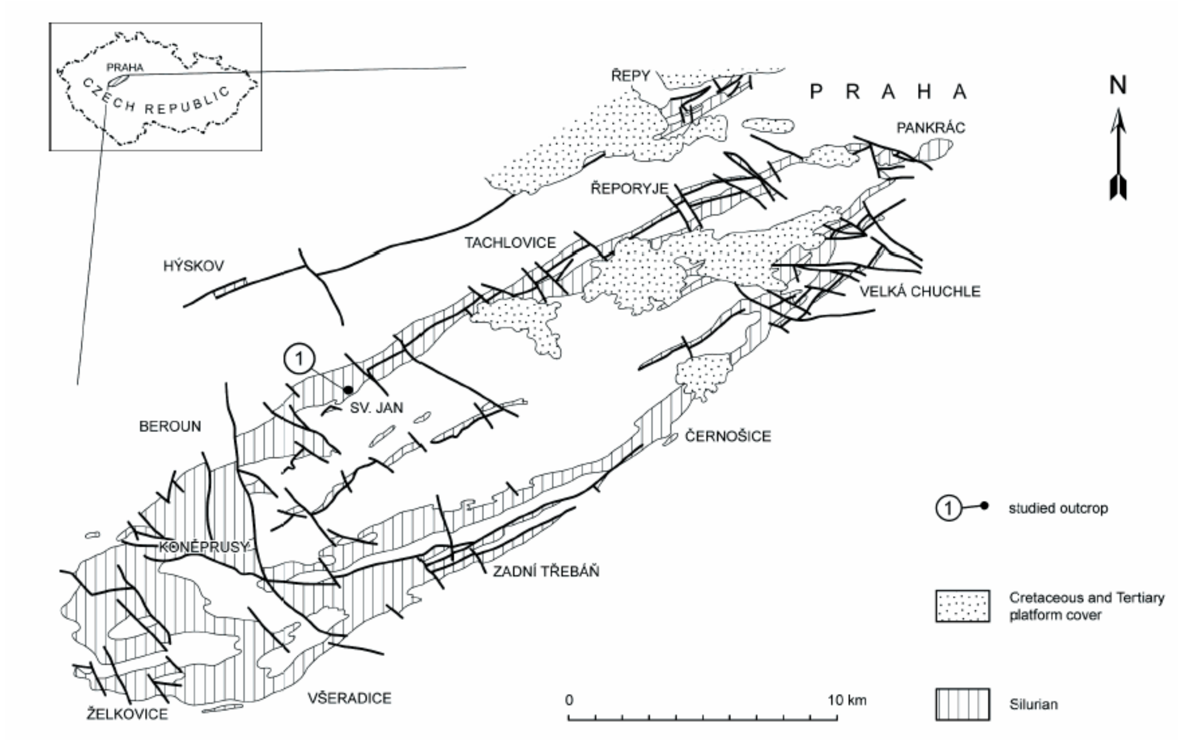

Fig. 1: Geological map of the Prague synform (PS) showing the main structural features and the location of the main mapped faults, Cretaceous, Tertiary and Silurian outcrops. The studied outcrop is numbered 1: Svaty Jan Pod Skalou.

It is along these faults and along some N10°W faults that the calc-alkaline and sub-alkaline Silurian volcanism was supposed to merge. On the contrary, the late shearing episode previously described along these faults, even if limited, now appears to be out of date after the most recent structural data. The general picture which can be given of the PS during Silurian times strongly suggests the existence of a generalized piano-touch tectonics generated in a northeast–southwest compressional regime and followed by a general thrust and nappe tectonics. According to Melichar regarding the question of vergence in the PS, field evidence agrees with asymmetrical indicators of tectonic movement on fault planes or in proximal zone of simple shear. If we adopt this way of thinking, we can bring, with our AMS and paleomagnetic data, fresh information on the direction of displacement of the nappes in the PS. This fits our results of asymmetrical opening of the Svatý Jan pod Skalou dykes.

As indicated by the calculation between the direction of the two different stresses based on the AMS data, the regional stress suffered a counter-clockwise rotation of around 40° between the emplacement of dyke 1 and that of dyke2. This result explains why these dykes display a different inclination. Our data do not provide any evidence as to whether the Rheic Ocean existed or not, but we can observe that the counter-clockwise rotation of stress as a function of time was also almost necessarily responsible for the modification of the direction of the displacement of the nappes. This counter-clockwise rotation of the nappe emplacement strongly suggests that the Rheic Ocean, if really supported by other data, should have changed its azimuth of subduction between the emplacement of the two dykes or closed following a sinistral shearing. This observation suggests that, at that time, the Sudetes were already collided to Baltica and that the Saxothuringian and the Tepla-Barrandian plates were already welded. As far as the subduction of the Rheic Ocean is concerned, our AMS data suggest two solutions (Fig. 2): (1) possible modification of the direction of this azimuth of subduction during the closure of the Rheic Ocean, (2) counter-clockwise rotation of the Silurian shortening direction during the collision. Because the transtensional opening of the two dykes remains dextral during Silurian and Carboniferous times, this implies a counter-clockwise rotation of the shortening direction and a late-stage sinistral transpressional collision (Fig. 2).

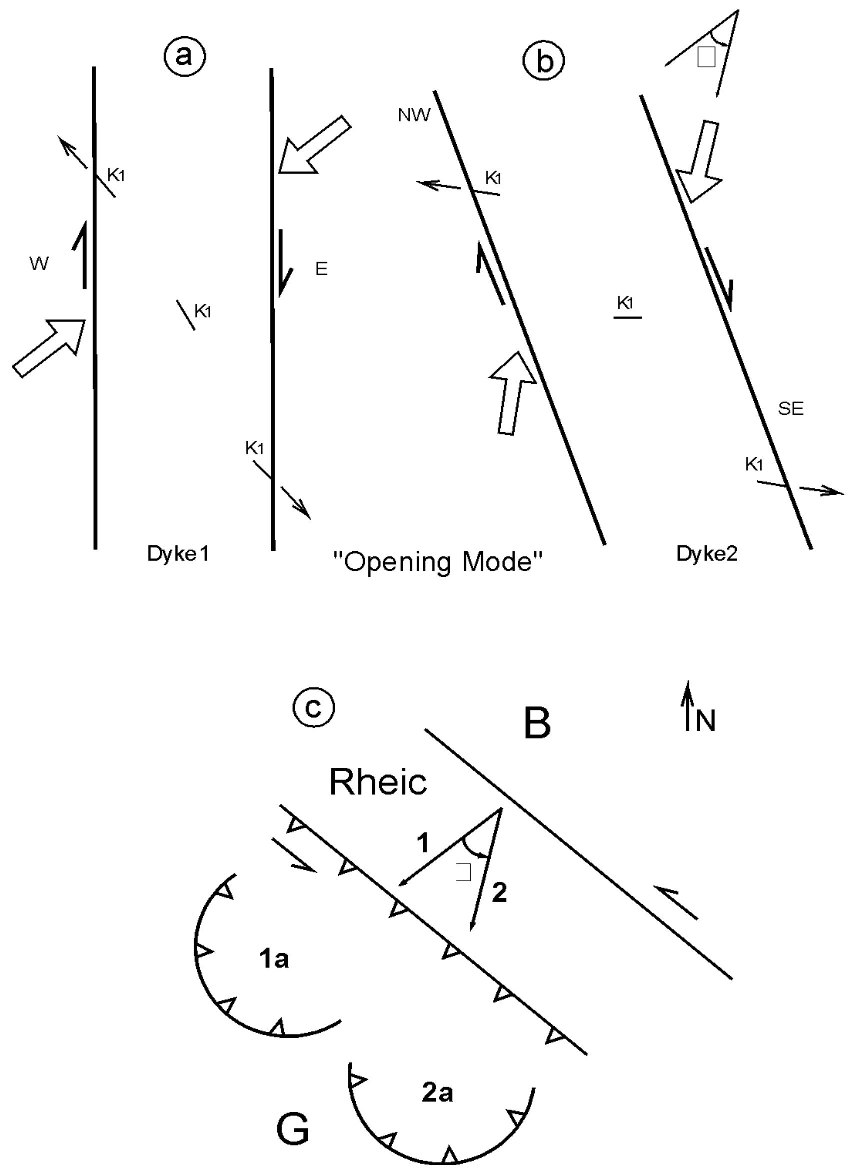

Fig. 2: Reconstitution of the tectonic evolution of the Svatý Jan pod Skalou dykes: the orientations of the AMS lineations (K1) close to the border of the dyke are oblique, they show that the emplacement of the magma resulted from a dextral transtensional opening mode. Large open arrow: Regional shortening direction; Small open arrows: Direction of counter-clockwise rotation/extension. Solid line arrows: Sense of shearing angle (around 40°) between the Middle to Late Silurian (a) and the Middle to Late Carboniferous (b), represented by the shortening directions. (c) Hypothetical diagram showing the possible evolution of the Rheic Ocean between the Middle to Upper Silurian and the Middle to Upper Carboniferous times. Two solutions are possible: (1) modification of the direction of the azimuth of the subduction plane during the closure of the Rheic Ocean, and (2) counter-clockwise rotation of the shortening direction during collision. Middle–Late Silurian shortening direction (1), Middle–Late Carboniferous shortening direction (2) and the emplacement of their respective nappes (1a, 2a), B: Baltica, G: Gondwana. If solution 2 is valid, it implies a counter-clockwise transpression for the closure of the Rheic Ocean.

No. KJB300130613: Integrated biostratigraphy of the Lower Devonian of Central Bohemia matched against magnetic susceptibility and gamma-ray logs in outcrops. (***L. Slavík, J. Hladil, L. Koptíková, M. Chadima***, *in cooperation with P. Carls, C. Dojen, Institut für Umweltgeologie, TU Braunschweig, Germany & J.I. Valenzuela-Ríos, Departamento de Geología, Universitat de Valéncia, Spain*)

Subproject: Assessment of the role of conodont zonation in stratigraphic correlation, present conodont zonal concepts vs. preliminary conodont data from the Lochkovian of the Požáry section. (***L. Slavík,*** *P. Carls, J.I. Valenzuela-Ríos,* ***J. Hladil, L. Koptíková*** *&* ***M. Chadima***)

The fundamental task for global conodont stratigraphy is to produce a kind of simplified instrument – a standard conodont biozonation. In essence, the conodont zonation is a formalism which is used in order to facilitate communication in geosciences regarding age determination. Geoscientists, who personally do not study conodonts themselves, must rely on the accuracy of conodont correlations and must believe that an elaborate and correctly proposed conodont biozonation can guarantee reliability. Some conodont zones might be, however, rather misleading due to difficulties in taxonomy, interpretation of the zonal type and other problems. In some cases we can see even exact numbers indicating ages in millions of years assigned directly to zonal boundaries between unfunctional or unsatisfactorily defined zones. The discrepancies are revealed often only randomly when additional biostratigraphic or even radiometric data become available. The situation caused by inconveniently established zonation may become extremely complicated. We have a fitting example in the Lower Devonian – where the Pragian stage is drastically reduced due to the currently defined GSSP of the Pragian/Emsian boundary. We are aware that the development of any well working conodont zonation can be extremely complicated; stratigraphers usually face an array of constraints: (1) natural constraints (e.g., environmental aspects, provincionalism, endemism, faunal differences, etc.), and (2) personal scientific approach and the role of "human factor" in mistake generation (there are controversies among authors on conodont taxonomy, authors have different measure for determination of species, etc.). It is obvious that only if we cope with all these difficulties, we can arrive at a really working zonal scale. In many cases, however, we simply cannot propose a good zonation, because it is not always possible due to the above mentioned difficulties. The question remains: Shall we provide a kind of partially working substitute or rather rely mostly on a detailed correlation of individual taxa of different faunal groups?

We present the first results from sampling in the Lochkovian of the Požáry section (Požár 2) in the Barrandian, Bohemia (approximate thickness 80 m). Global correlation of the Lochkovian Stage that has been defined in the Barrandian area is not fully satisfactory as regards conodont biozonation as it bears many problems. Former "global", or "cordilleran" zonation involving *hesperius*, *eurekaensis*, *delta* and *pesavis* Zones is not applicable in many European sections. The more recent zonation for middle and upper part of the Lochkovian has not yet been tested in many regions (its testing in the Barrandian area is now in progress by our team). Preliminary results indicate that in the Barrandian some index taxa of the recent zonation (e.g., *A. eleanorae* and *Ped. gilberti*) are missing. The first possibly Devonian conodont is the fragment of *Icriodus* ex.gr. *woschmidti* that is used herein as a reference datum. Immediatelly above (1.8 m below first Devonian trilobite *Warburgella rugulosa*), *Icriodus hesperius* enters. 1.25 m above, *Zieglerodina remscheidensis* s.s. enters; here the *I. woschmidti* group radiates toward *I. transiens* and *I. angustoides*. *I. woschmidti* s.s. appears at 10.7 m as a side branch, and *Delotaxis cristagalli* suggests a correlation with the type stratum of *I. woschmidti*. From 16.5 m onward, in Pa elements elsewise reminding of *Z. remscheidensis*, the formation of terraces on the basal lobes leads toward *Lanea*. At 23–24 m, primitive *Lanea*, *Wurmiella* aff. *wurmi* and *Pedavis breviramus* are present. *Ped. breviramus* overlaps with sporadic *Ancyrodelloides* aff. *assymmetricus* at 27–28 m and then fades. From 35 m to 41 m *Anc. carlsi* is frequent; it ends beside "*Ozarkodina*" *boucoti* and first embryonal bulbs of *Dacryoconarida*. *Anc. carlsi* occurs closely below the *Acastella tiro* trilobite Zone, in the Celtiberian type stratum of *I. transiens*, *I. bidentatus*, and *I. rectangularis* through which the *postwoschmidti* Zone was characterized, whereas the Podolian namegiving index conodont begins in the early radiation during the *Acastella heberti trilobite* Zone. At 56 m, *Anc. transitans enters*; at 63 m its transition to *Anc. trigonicus* begins; near 66 m *Anc. trigonicus* and *Anc. kutscheri* join with the youngest morph of *Pelekysgnathus elongatus* indicating late *Acastella tiro* trilobite Zone. Near 70 m, *Anc. transitans* still may indicate Middle Lochkovian. Hardly 10 m thickness remains for the late

Lochkovian. This indicates a serious discepancy between the suggested global zonations and the conodont record in the Požáry sections.
For detailed control of conodont data obtained in the Požáry section (Požár 2), we are processing 28 additional samples in a meassured and well documented section (Požár 3) that will be matched against the magnetic susceptibility and gamma-ray logs.

No. A300130504: Soil cover of the protected areas of Prague as an indicator of environmental changes. (***A. Žigová, V. Ložek****, M. Šťastný & V. Šrein, Institute of Rock Structure and Mechanics AS CR, Prague).*

The structure of soil cover in Prague and its changes are defined on the basis of the study of soils in protected areas and localities with different types of anthropogenic load. Conditions of pedogenesis are determined on the basis of grain-size distribution, mineralogy of clay component, chemical and micromorphological analyses.
The character of pedogenetic processes was affected by anthropogenic factor to a variable degree. A lower influence on soil development was encoutered in sequences with soil profiles buried beneath a landfill layer.
The values of pH correspond with the character of the parent material, and are predominantly weakly acid to neutral. In the case of soils on spongilitic marlstones (opukas), upper part of profiles showed weakly acid values in agricultural landscape, and very acid values in protected areas.
Preliminary data from a protected areas with karst landscape indicate several cycles of pedogenesis.

Grants of the state departments

Ministry of Environment of the Czech Republic, Project No. ISPROFIN No. 215124-1, partial project: Slope movement hazards in the České středohoří Mts. (*P. Kycl, Czech Geological Survey, Prague* & ***V. Cajz***)

Subproject: *Scientific research of neovolcanics*. (***V. Cajz***)

The area is approximately limited by the Bílina River in the west, villages of Libčeves, Milá and Bečov in the south and the city of Teplice in the north. It is connected with areas in the E and SE, investigated in previous years. Volcanic rocks were subjected to a new detailed geological survey and to a basic research oriented at their ability to help or stabilize the slope movement activities. Results of this basic research are intended to be used for specialized maps of hazards. These maps are prepared for local authorities and for the Ministry of the Environment of the Czech Republic. Volcanic rocks participate in the slope movement hazards directly by rock-falls and together with the other non-volcanic rock types by yielding the material for landslides. The slope movement hazards are more frequent in areas where the base of the Tertiary volcanic complex is exposed. In this area, however, solitary volcanics prevail. Nevertheless, volcanics are the principal rock causing the slope movement hazards. Their primary jointing, tectonic imprint and their morphology as a result of selective erosion, are some of the most important controls on the generation of slope movement activities.

Ministry of Environment of the Czech Republic, No. VaV660/1/03: Antarctic Research Program. (*P. Mixa, D. Nývlt, B. Mlčoch, J. Košler, P. Klan, O. Lexa, J. Žák, P. Jeřábek, Czech Geological Survey, Prague,* ***M. Svojtka, J. Kadlec*** & *F. Holub, Faculty of Science, Charles University, Prague*)

In order to reconstruct the timing of possible heating or denudation event, the zircon fission-track analysis was applied to sediments from James Ross Island, Antarctica. Zircon ages range between 75 ± 5 and 194 ± 15 Ma. Most of the measured track length distributions are characterized by unimodal, slightly negatively-skewed distribution. Two zircon samples from the Gustav Group pass the χ2-test; the age should therefore represent a well-clustered single-grain age of unreset samples (T_{max} <~230 °C). Detrital zircons reflect contribution of inherited component from different age sources. In case of two samples the Gustav Group that failed χ2-test, a significant number of ages younger than depositional ages can be explained either by slow cooling after the heating above the ZPAZ or alternatively, by heating into the ZPAZ. Preferably, these samples have been only weakly annealed (T_{max} <~250–320 °C), and the grains retain slightly reduced provenance ages. Zircons from the Kotick Point Formation yielded two potential groups of ages, which are approximately less than ~100 Ma (with the range of 80–100 Ma) and more than ~130 Ma. In case of zircons from KKP01, two groups of ages are recognized. The first one is a younger spectrum of Upper Cretaceous ages (3 grains; ~94 ± 15 Ma) and the second group yielded Lower Jurassic ages (20 grains; ~186 ± 15 Ma). The distributions of two sets of ages are similar for the Kotick Point and Hidden Lake Formations. These two samples are more or less slightly annealed to the PAZ as indicated by the appearance of a proportion of short tracks between 7–8 μm in length.
Three samples were taken from Santa Marta Fomation, the basal formation of the Marambio Group. While sample KSM-1 represents basal α Member of the Santa Marta Formation (Upper Coniacian–Lower Santonian depositional age), sample KSM-2 is the middle β Member of this formation without direct applicability between both members. The last sample was collected from the γ Member of this formation and is dated to the Campanian based on microfossils. These samples show FT ages that range from Middle/Lower Jurassic age (155.9 ± 7.8 Ma, 148.9 ± 8.8 Ma) to Lower Cretaceous (137.0 ± 7.4 Ma), overlapping within their 1 σ errors. Track lengths distributions vary from the unimodal character to a bimodal pattern, characterizing mixed ages. Single-grain ages in each of these three slightly annealed samples have two to five grains with ages about ~80 Ma, which lie close to the depositional age. The rest of the grains have individual ages of ~90–350 Ma and probably represent their different source age component.

Four zircon ages were obtained from the Seymour Island (Marambio and Seymour Island Group). These ages plot in the wide range of Lower Jurassic, Upper Jurassic to Lower Cretaceous fission-track ages. Most of samples passes the $\chi 2$-test at 5% level, indicating that the measured mean ages may represent the time of cooling across the closure temperature of the FT zircon system.

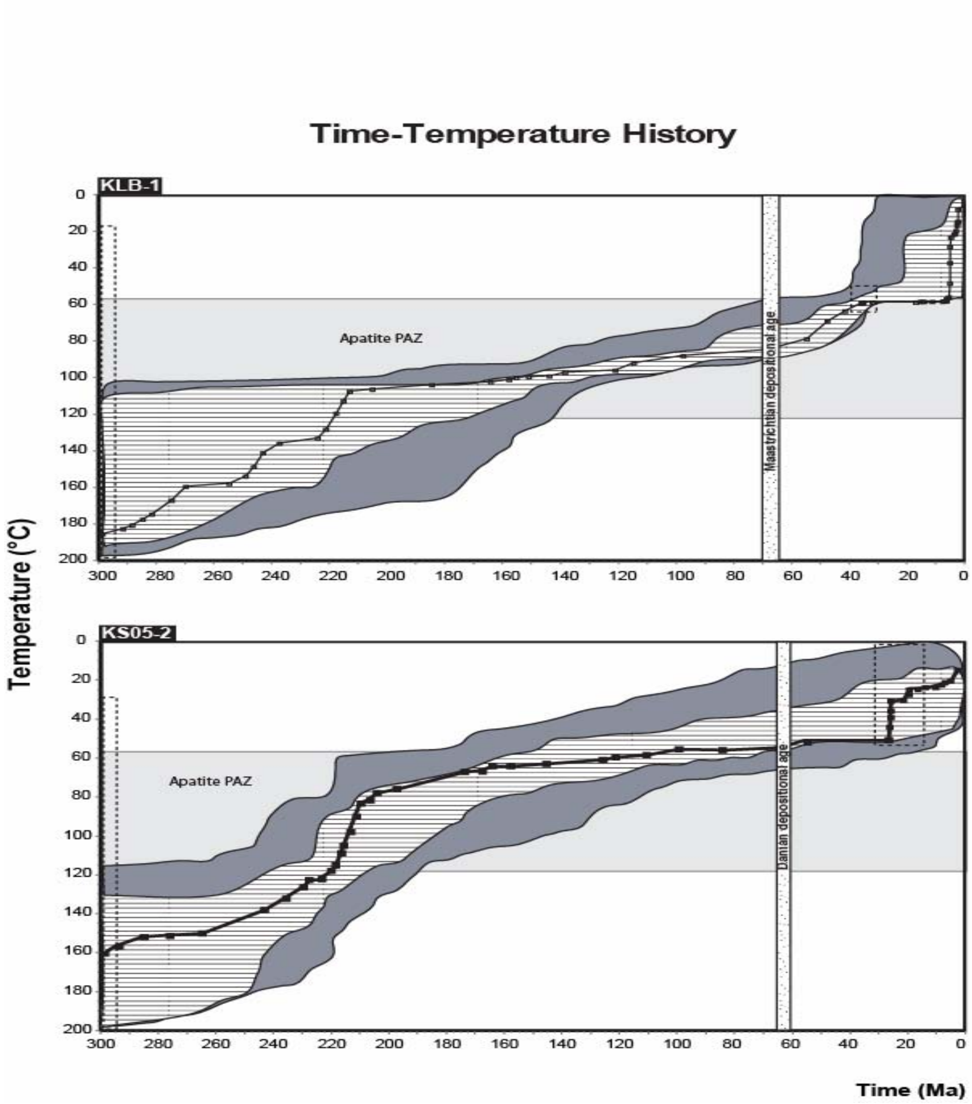

Fig. "Best-fit" thermal histories obtained from modelling of fission-track data (samples KLB1 and KS05-2, see text for details) by HeFTy software. Modelled results in the T-t diagram are indicated by three different reliability levels: (A) grey envelope as acceptable fit; (B) horizontal hatching envelope as good fit; and (C) black line is the path with best fitting. Independent geological constrains are indicated by a dashed-line rectangle.

Ministry of Industry and Trade of the Czech Republic, Project No. 1H-PK/31: Subproject: Methods and tools for the evaluation of the effect of engineered barriers on the distant interactions in the environment of deep repository facility. (*M. Vaněček, Isatech Ltd., Prague* & ***T. Navrátil***)

Migrational and hydrodynamic tests in field and in laboratories were performed at this stage. The field work took place at the test site near Panské Dubénky in the Českomoravská vrchovina Highland. The test quarry was selected especially due to its simple fracture system. A detailed description and knowledge of the fracturing was necessary to perform all the field measurements and experiments.

Hydraulic and migrational test performed on granite model objects (rock block) were simulated by means of selected software NAPSAC and FEFLOW. The results validated the ability of models to simulate the fractured environment, instrumentation and progress of the laboratory tests. A very good match of the measured and modelled curves was obtained for all the simulated hydraulic tests. Further project works will be aimed on proposing and verification of methods for evaluation of the efficacy of applied engineering barriers in the fractured system of the non-sedimentary rocks and on the testing of the ability to predict the effect of applied engineering barriers in the migrational parameters of water-bearing fractured systems of non-sedimentary rocks.

Industrial Grants

Czech–Moravian Cement, Inc., Project No. 7001: Project NAMAK – Investigation of salt karst in the Zagros Mts., Iran: denudation rates of the salt plugs, age and evolution rate of the karst phenomena. (***M. Filippi***)

Several tens of salt diapirs with well-developed salt karst are present in the Zagros Mountains and on the Iranian coast of Persian Gulf. Project NAMAK (in 2006) was focused mainly on sampling, field measurements and documentation of karst features. The principal achievement of cave documentation was the interconnection of the Big Ponor Cave with the Cave of Tří Naháčů (Cave of Three Naked Man). The resulting world's longest salt cave was named 3N Cave: together with the newly mapped parts, it reaches the total length of 6580 m. It is some 900 m longer than the Malham Cave (5685 m, Mt. Sedom, Israel), now ranking second.

Czech–Moravian Cement, Inc., Project No. 7003: Study of the Cenozoic sediments in caves in the southern part of Moravian Karst. (***J. Kadlec***)

Two sections in cave sediment fill located in the Ochozská Cave were sampled in detail for paleoenvironmental mineral magnetic analyses. Based on volume magnetic susceptibility variations, the upper portions of the studied sections can be mutually correlated. Directions of the anisotropy of magnetic susceptibility indicate changes in underground flow controlled by local hydrological conditions. Blue clay deposited at the base of the first section reveals elevated magnetic susceptibility. The sediments represent a relic of a cave fill older than the fluvial sediments filling other parts of the Ochozská Cave.

Czech–Moravian Cement, Inc., Project No. 7031: Documentation of reclamation activities at the Koněprusy deposit. (***P. Bosák***)
Reclamation activities in the Velkolom Čertovy schody Quarry (Koněprusy Devonian, Barrandian, Bohemian Karst) contributed to the understanding of sedimentological models of the area. It was proved that blocks of the Kotýs Limestone (Lower Devonian, Lochkovian) situated in the northern wall of the quarry, interpreted as tectonic blocks originated during the Variscan Orogeny, represent the original morphology of sea bottom and seashore with morphologically complicated cliffs, which were tectonically modified only later. This kind of the shore reflected the structural plan of active dextral transpression tectonic zone (now Očkov Overthrust). Flat surface of blocks of the Kotýs Limestone represent the abrasion surface cutting limestone at an angle of 2 to 3^{o}. The morphology of tops of the cliffs is affected by eustatic sea-level oscillations and related abrasion processes. The special development of this zone is imprinted already in the lithology of the upper part of the Kotýs Limestone with tidalites and shallow marine lagoonal deposits.
New lithofacies of the Koněprusy Limestone is the talus in front of the cliffs built by the Kotýs Limestone. Sedimentary breccias with abundant clasts of the Kotýs Limestone prevail closer to the cliff and sometimes form a layer up to 5 m thick. Here, the content of bryozoan-crinoidal grainstone matrix is small, and cements and internal sediments can appear. Farther from the cliff, clasts become less abundant. Clasts of the Kotýs Limestone are mostly angular. Clast of other lithologies, mostly variable light-coloured calcilutites, are semiangular to oval. Traces of deposition of unconsolidated limestone clasts are locally visible. A single clast of stromatolite was found, too. The material represents a mixture produced by the destruction of vertical cliffs (especially clasts of the Kotýs Limestone) and by erosion of sediments deposited in backreef lagoonal environments on flat abraded surfaces of the Kotýs Limestone. The size of the clasts is 0.5 to 100 cm.
The unsusual lithofacies of the upper part of the Kotýs Limestone, the character of cliff morphology and the newly defined lithofacies of the Koněprusy Limestone all result from the position of the area on a transpression fault. Complicated morphology of the Kotýs Limestone originated during about 2.5 m.y. lasting depositional break between the Lochkovian and the Pragian in this part of the Barrandian synform, reflecting the combination of sea-level drop and active tectonic movements. Movements,

especially along W–E-striking faults, dissected the original flat marine bottom to cliffs with step-like morphology. The uplift caused a differential erosion of upper parts of the Kotýs Limestone, more intensive close to the centre of the tectonic zone. In addition to tectonic movements, the cliffs broke along tensional structures close to cliff edges. Deep Neptunian dykes, sometimes tens of metres wide, were formed and later filled by sediments of the Koněprusy Limestone in several generations.

GET, Ltd., Prague
Subproject No.7052/1: Petrography of Devonian limestone from the MVS-10 hydrogeological borehole (Hvozdečko-Rachava block of the Javoříčko Karst). (***J.K. Novák*** & ***P. Bosák***)

The quarry at Hvozdečko (the Javoříčko Karst, northern-central Moravia) is predominantly composed of the Vilémovice microsparitic limestone which is either light-grey or dark grey in colour and locally shows a laminated to banded fabric. Carbonate rocks from the borehole indicate a relatively higher degree of metamorphic overprint and epigenetical veining by several generations of calcite and chalcedony. The brecciated and "pseudoconglomerate" variants are present as a result of local faulting.

Subproject 7052/2*:* Petrography of kaolinitic raw materials from the deposit of Břežany II. (***J.K. Novák, P. Bosák, Z. Korbelová, J. Pavková*** & ***J. Dobrovolný***)

Mutual relationships between mineralogy, texture, and selected physico-chemical properties of the Cenomanian refractory raw materials were studied. Based on standard laboratory methods, the set of samples can be divided into (1) refractory silty claystone with well-ordered kaolinite, (2) low-plasticity illite-kaolinite claystone, and (3) mudstone conglomerate.

Subproject:7052/3: Petrography of Lower Cretaceous volcanic and pyroclastic rocks from the Benbow Inlier-west, central Jamaica. (***J.K. Novák, P. Bosák, J. Pavková, Z. Korbelová*** & ***V. Böhmová***)

The Benbow Inlier resulted from tectonic uplift and/or erosion of Tertiary carbonate platform. Two principal volcanic groups were distinguished. The mafic igneous group, mostly composed of high-Al_2O_3 basalt (HAB), subalkaline andesite, spilitized trachyandesite and mafic dacite, are dominant in the lowermost interval of the Devil´s Race Course Fm., along with arc basaltic and andesitic tuffs. Upper felsic succession of sodic rhyodacite and rhyolite welded tuffs is interbedded with the Barremian limestone strata, containing rudist fossils. The presence of coherent but fragmented rhyodacite flows is also suggested. Although it is a difficult task to find the appropriate rock types subjected to a low degree of weathering and alternation in Jamaican tropical climate, we recommended the high-Al basalt and spilitized trachyandesite as acceptable sources for use as skid-resistant crushed aggregates.

Subproject No. 7052/4: Petrography of high-grade limestones from the Santa Cruz Mts., SW Jamaica. (***J.K. Novák, J. Pavková*** & ***P. Bosák***)

The Oligocene–early Miocene calcirudite and calciarenite of the Newport Fm. exposed in the Santa Cruz Mts. can be placed among the raw materials which are appropriate for the manufacture of white cement or micro-ground limestone fillers. The imprint of diagenetic processes had no negative influence on carbonate quality (95–98 wt. % $CaCO_3$, 1–3 wt. % dolomite, <0.25 wt. % Fe_2O_3). No siliciclastic admixture is present as a potential deleterious impurity. Concerning the whiteness of the studied samples, the colour is in the wavelength of cream. All collected samples are thought to refer to differently uplifted carbonate platforms, such as Pedro Bank, in the continuation of the Nicaragua Rise.

Subproject No. 7071: Petrography of crushed rocks from the Fuchsmeier´s quarry near Eferding, the South Bohemian batholith. (***J.K. Novák, P. Bosák*** & ***V. Böhmová***)

The rock types exposed by quarrying near Eferding (Austria) consist of meta-tonalite with scattered feldspar porphyroclasts, augen and banded diatexitic types ("pearl" gneisses), and lepidoblastic gneisses. Because of thermal solidification under a regime of elevated heat flow along the Danubian

Fault Zone and low pressure as well as local silicification, the diatexites show a considerable resistance to weathering. Therefore, they serve as roadbase construction materials. In contrast, the lepidoblastic gneiss could adversely affect the performance or cost of the concrete, due to an increasing amount of the fine mica fraction.

Subproject No. 7052/5: Dolostones from the Jamaica south-central coast. (***J.K. Novák, P. Bosák** & **J. Pavková***)

The examined clastic dolostones occurring in the vicinity of Old Harbour are texturally divided into (1) pebble dolrudite, and (2) dolarenite, having a dolomite content in the range of 82–86 mol. % and 65–80 mol. %, respectively. The sum of SiO_2 + TiO_2 + Al_2O_3, considered as acid-insoluble residuum, ranges from 0.39 to 0.64 mol. %, and siderite admixture is very low (<0.34 mol. %). However, the value-added dolostone for refractory purposes has not been found in this area yet.

Subproject No. 7052/6: Petrology of Miocene volcanic rocks from Low Layton site, Jamaica. (*V. Štefek, B. Brož, GET Ltd. Prague*, ***J.K. Novák** & **P. Bosák***)

The Low Layton locality represents an exposed portion of the Miocene submarine volcano (9.5 Ma in age) at northeastern Jamaican coast. It consists of alkali basaltic breccias, agglomerate, hyaloclastite, and pillow lava. The use of these rock types is problematic in the production of manufactured rock aggregates, due to the presence of volcanic glass, vesicularity and sensitivity to chemical weathering. Nevertheless, the emphasis in this report is upon the use of material as the value-added pozzollana additive to portland cement mixtures or for the production of the heat-insulating lightweight concrete.

GEKON, Ltd., Prague
Subproject No. 7050: Kaolin raw material from the deposit of Kaznějov-south. (***J.K. Novák, P. Bosák, V. Sedláček** & **J. Dobrovolný***)

Sedimentary kaolin with illite admixture, coming from a newly investigated portion of the Kaznějov-south deposit, possesses worse mineralogical and technological properties, specifically the degree of whiteness and chemical purity. Nevertheless, clayey matter of sandstones can be utilized as value-additive material to Portland concrete mixtures, when thermal treatment to metakaolin will be accomplished (artificial pozzollana, geopolymers).

Lafarge Cement a.s., Čížkovice
Subproject No. 7057: Petrography of cement-producing raw materials from the Úpohlavy open-pit, as related to the origin of cement clinker nodules. (***J.K. Novák, P. Bosák, Z. Korbelová, J. Pavková, M. Svobodová** & **J. Dobrovolný***)

Belite-bearing nodules from Úpohlavy were studied. They deteriorate the grindability of clinker due to their toughness, and petrographic properties of two kinds of Upper Cretaceous marlstones, which are used in a raw mixture with pure limestone. In comparison to soft alite-dominated clinker, these nodules indicate (1) a marked differences in the proportion of ß-belite (C_2S), ferrite (C_4AF), and celite (C_3A), and (2) the nucleation of ß-belite clusters on opal silicisponge spicules and/or single quartz pebbles after thermal treatment.

Lassesberger a.s. Plzeň
Subproject No. 7061: Mineralogical composition of selected grain-size fractions from the building sand, the locality of Ledce near Židlochovice. (***J.K. Novák, P. Bosák, J. Pavková** & **J. Dobrovolný***)

A petrographic description of feldspar-bearing fluvial sand provided useful information on potentially harmful substances in the fraction of 0.12–0.25 mm, such as phlogopite and muscovite micas, sericitized plagioclase, and a small amount of smectitized amphibole. The amounts of mica flakes and altered plagioclase are low and would contribute alkalies to the pore solutions of the cement paste. In result, they may be alkali-reactive in concrete, enhancing its potential expandability. All these particles are also susceptible to frost.

Stavební geologie - GEOTECHNIKA, a.s., Prague
Subproject 1: General review of the natural geological risks for underground constructions in the Prague Synform, with special attention to limestones and to the planned high-speed railway tunnels between Prague and Beroun. (***K. Žák, P. Bosák, V. Cílek, J. Hladil, P. Štorch*** & ***J. Janečka***)
Subproject 2: Review of longitudinal sections along the planned high-speed railway tunnel between Prague and Beroun. (***P. Bosák, J. Hladil, P. Štorch*** & ***K. Žák***)

These two subprojects were concentrated on geological aspects of the planned high-speed railway tunnels in sedimentary rocks of the Prague Synform, between Prague and Beroun. Two parallel tunnels should be almost 28 km long. The first subproject evaluated general geological risks for underground constructions in this lithologically and tectonically very complex Synform. Special attention was given to the discussion of different models of the tectonic structure of the Synform, to the existence of deep weathering and karstification of limestones and to the karst hydrogeology. The report prepared within the first subproject was one of the reasons, why an alternative tunnel routing, located mostly in Silurian sediments and volcanic rocks, started to be also considered.
In the second subproject two alternative longitudinal geological sections along the planned tunnels were reviewed. One of these geological sections was constructed by a group of geologists of the Czech Geological Survey, Prague, and the second by Dr. P. Röhlich. Both alternative geological sections were evaluated from the viewpoint of their reliability, and the differences between them were discussed.

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Programmes of Institutional Research Plan

Institutional Project No. AV0Z30130516: Earth system at the intersection of geological processes, evolution of life, climatic and anthropogenic impacts. (*Co-ordinator* ***V. Cílek***)

SUBPROJECT (Code 9100): Complex insight on the development of the environment in the period from the Neogene to the youngest geological history with special respect to the present era (interactions and development of processes).

(*Co-ordinator* ***M. Filippi,*** *contributions:* ***I. Dobešová, P. Drahota, J. Hlaváč, M. Hojdová, J. Kadlec, P. Kubínová, L. Lisá, L. Minařík, T. Navrátil, J. Rohovec, E. Růžičková, P. Skřivan, S. Šlechta, J. Špičková, M. Vach, Z. Vařilová, O. Zeman, K. Žák, A. Žigová*** *&* ***R. Živor***)

SELECTED RESULTS OF THE LABORATORIES:

Laboratory of Environmental Geology
Malacological research continued in several regions of the Czech Republic, mainly the Bohemian Karst and Polabí Region. Based on the malacostratigraphical analyses, the paleoenvironmental conditions of these regions during the postglacial period were reconstructed.
Paleoenvironmental conditions were also evaluated using a morphological study of quartz grains in samples form the Laka lake area (Šumava) and a study of the Holocene fluvial sediments in sands of the upper floodplain terrace along the middle reach of the Labe River.
Progress was accomplished also in the study of cryogenic minerals in caves, when theoretical and experimental data about the mineral precipitation during the freezing of mineralized water were tested in ice caves of Bihor Mts., Romania. Based on field studies and analyses of samples from Borțig and Focul Viu ice caves, two modes of cryogenic mineral precipitation were confirmed, with rapid and slow water freezing. While the rapid water freezing produces cryogenic carbonate powder characterized by kinetic fractionations of C and O stable isotopes, slow freezing results in larger mineral grains produced in (or close to) stable isotope equilibrium. A new locality with the occurrence of abundant cryogenic cave carbonates formed during the Glacial period was discovered in the Jaskyňa studeného vetra in Low Tatras, Slovakia, within the cooperation with the Slovak Museum of Nature Protection and Speleology.

Laboratory of Environmental Geochemistry
Chemistry of bulk precipitation and throughfall was monitored at 5 localities in the Kostelec nad Černými Lesy area, central Bohemia. The monitoring involves approx. 20 chemical elements/ions. The as yet available analytical results serve for the calculation of the input fluxes of monitored components, expressed in mg Me/m^2/day. The completed deposition data will serve for the evaluation of input/output balances of the components. Recently acquired data were compared with those obtained in the past 15 years and with data from the reference localities in NW Bohemia. This comparison will serve for the assessment of anthropogenic and natural impacts on the migration of monitored elements/ions.
This research is recently focused also on the monitoring of various element fluxes in the experimental area of Lesní potok, including filtration study, membrane dialysis, ion-exchange chromatography, etc.
Speciation of mercury in samples of soils and materials from mercury mining (Jedova hora, Pribram) was studied, using the approach TD-ICP-EOS, developed and verified in the last year.

Laboratory of Paleomagnetism
Temperature-dependent magnetic susceptibility was measured in the Morava River floodplain sediments collected in the sections exposed along the river channel with the aims of identification of magnetic phase. Magnetic susceptibility measured in the section excavated in the test pit in the floodplain forest has shown a magnetic enhancement in the upper portion of the section. Datings based on POP and ^{137}Cs showed that this bed was deposited during the last 60 years.
Dating of soils, cave sediments and loess in the Mokrá quarrry near Brno also continued. New data were statistically evaluated.

Laboratory of Physico-mechanical Properties of Rocks
Changes of velocities of ultrasound waves were studied in relation to increasing stress in the rock mass. The problems were simulated under laboratory conditions on rock samples with the help of a conventional triaxial apparatus during loading up to 150 MPa.
The main activity was related to completing, final editing and emendation of publication concerning a termination of underground coal mining and its impact on the environment. The publication was published in Czech and Enlish versions within the publication grant project GA AS CR No. E 300860601 (principal investigator Prof. Ing. Petr Martinec, CSc. from IGN AS CR in Ostrava) in late 2006. R. Živor is one of the main co-authors and was dealing with the area of the Kladno coal district.

SUBPROJECT (Code 9200): History of the Bohemian Massif before and after its consolidation.

(*Co-ordinator* ***V. Cajz,*** *contributions:* ***J. Fiala, J. Filip, M. Chadima, L. Koptíková, M. Lang, K. Malý, J. Novák, Z. Vejnar, P. Schnabl*** & ***M. Svojtka***)

Geochronological project dealing with the methods of zircon fission-track analysis developed and improved the laboratory routine procedure for fission-track dating including separation, mounting, grinding/polishing, chemical etching, thermal neutron irradiation in a nuclear reactor, counting and determination of individual zeta constant. The mean zeta value used for age calculation and applied under laboratory conditions at the Institute of Geology, Academy of Sciences of the Czech Republic, has been determined at 184.3 ± 3 (1s) against a dosimeter glass standard IRMM 540 R.
Post-Carboniferous low-temperature history of the Krkonoše Piedmont Basin was reconstructed by using apatite fission-track dating method (AFTA). The heating of basinal sediments above the apatite fission track annealing temperature (~120 °C) in the Late Permian was succeeded by four significant cooling/uplift periods: Early Jurassic (190–197 Ma), Late Jurassic (148–156 Ma), Early/Late Cretaceous (97–118 Ma) and Late Cretaceous/Paleogene (61–66 Ma). The study area was finally rapidly uplifted in the Oligocene and Miocene (5–30 Ma).
Magnetic separation with a magnetic needle and ultrasound bath used to separate magnetic minerals from Devonian limestones proved insufficient. Therefore, the rocks were dissolved by hydrochloric and acetic acids. The thermomagnetic curves (measured in the interval of -192 °C and +20 °C) and hysteresis loops show paramagnetic behaviour. Thermomagnetic curves for samples dissolved by acetic acid show formation of pure magnetite with a Curie temperature of 580 °C. Samples dissolved by hydrochloric acid show formation of pyrrhotite with a Curie temperature of 320 °C.
Using a new method of processing, developed in our laboratory and based on the pattern recognition technique, sedimentary sections formed by sufficiently long continuous deposition between 166 Ma (Middle Jurassic) and 124.5 (Early Cretaceous) or from 80 Ma (Late Cretaceous) onwards can be dated by the polarity of their primary natural remanent magnetization alone, without complementary information; this is permitted by the very specific pattern given by the alternating polarity of geomagnetic field imprinted in these sections worldwide.
The major and trace element compositions of most of the solitary nephelinite-tephrite bodies in the Central Erzgebirge Mts. (in the vicinity of Kryštofovy Hamry, Kovářská, Boží Dar, Jáchymov, Abertamy, and Potůčky) are comparable to those of high-Ti basaltic rocks of the Continental flood basalts, with relatively high TiO_2 contents (3.40–5.83 wt%), CaO/Al_2O_3 ratio (2.15–2.72), and Ti/Y > 500.
The pre-Alpine basement of eastern Crete forms a part of the Phyllite-Quartzite Unit, which underwent HP-LT metamorphic overprint related to the Alpine orogeny. This unit is composed of four sub-complexes, which differ in their protolith age, type and age of metamorphism, and post-metamorphic cooling history. A preliminary tectonic model is presented, which invokes south-directed subduction, collision and accretion of the crystalline complexes to the northern margin of Gondwana.

SUBPROJECT (Code 9300): Study of fossil ecosystems and their dependence on global climatic and paleogeographic changes (interaction and development of processes).

(*Co-ordinator* ***M. Svobodová,*** *contributions:* ***P. Čejchan, A. Galle, V. Houša, M. Konzalová, M. Siblík, Z. Roček, M. Vavrdová, J. Zajíc*** & ***J. Žítt***)

Department of Paleobiology and Paleoecology

Attention was focused on the study of different faunal and floral fossil records in sediments including Paleozoic cryptarchs and corals, Mesozoic brachiopods and crinoids and Tertiary palynomorphs and frogs.
Sphaeromorphs, synaploids and ribbon-shaped threads of vendotaenids dominate in the cryptarchs from the Precambrian/Cambrian transition (Měnín-1 borehole, southern Moravia). The composition of microbial associations indicates a relationship to southern Poland and Baltic area. Irrespective of the possibility of reworking (i.e., *Arctocellularia tetragonala*, *Bavlinella faveolata*), the existence of extensive Proterozoic marine deposits in southern Moravia was documented.
Coarse septal trabeculae with a double bend of charactophyllids is displayed by the rugose coral of the genus *Spinophyllum* Wedekind, 1922, which occurs in Moravia. *Spinophyllum* sp. cf. *conicum* Kettnerová, 1932, known from the Koněprusy Acanthopyge Lst. of the Prague Basin, has its slender septal trabeculae arranged in a half-fan or an asymmetrical fan and probably does not belong to *Spinophyllum.*
Rich Liassic brachiopod fauna of the Hierlatz type with prevailing terebratulids and rhynchonellids (rare spiriferids) was identified in the western part of the Totes Gebirge (Bad Mitterndorf, Austria). This spectrum corresponds to that of the classical Hierlatz locality on Dachstein Plateau.
A complex of taphonomically and taxonomically interesting roveacrinid crinoids (provisionally classified as *Roveacrinus* sp. 1 and *Orthogonocrinus* sp. 1 and sp. 2) was identified in the coprolite deposits (basal Lower Turonian) at Plaňany near Kolín. The unique ichnospecies *Terebella phosphatica* was found associated with phosphatic crusts.
Giant palaeobatrachid fossil tadpoles of the pipid-frog genus *Palaeobatrachus* were described from the Miocene of Randecker Maar, Germany. Both ecological and pathological conditions are to be considered as conducive to the development of gigantism in tadpoles. Tadpoles that lack a thyroid gland become exceptionally large. Environmental factors (pond size and permanence, predators, duration of the growing season) contribute to tadpole gigantism in certain extant anuran species.
The special amorphous particles of organic detritus and morphologically defined palynomorphs were extracted from the Tertiary clayey and siliciclastic deposits of the Sarawak, Malaysia. Among them, the Pteridophytes provided good tools for the recognition of different habitats and limnic, fluvial and salty environments. Fossil material was used for the interpretation of environment in the deposits within the volcanic complex by the analogous finds in the Bohemian Massif.
Fern spores, planktic algal microfossils assigned to green algae, algal sheets and different types of fungi were recognized as locally significant components in different types of clayey and siliciclastic deposits in the boreal Neogene basins and tropical areas in particular. They were studied, along with other microfossils in Malaysia, for taxonomical assignment and palaeoenvironmental assessment. The floating water fern *Salvinia,* lianas of *Lygodium,* halophytic *Acrostichum* and terrestrial peat bog ferns with predomination of Polypodiaceae were recorded. Noteworthy are also *Concentricystes,* planktic green algae, rather frequent in fluvial deposits and estuaries. Fungi were also revealed to be a significant component. Their heterogeneous spores, hyphae and microhyriaceous remains, known from warm temperate to humid tropical areas, are a useful tool for paleoenvironment reconstruction. Among hyphae and spores, the saprophytic types thriving in the environment rich in organic litters, are striking. Water ferns such as *Salvinia* and *Azolla* point to rather calm waters, where they live till present: for example, *Azolla nilotica* Decne in Africa, recognizable also in fragments of its barbed massulae (Fig.1). All the selected groups, some of them known also from the Bohemian basins (*Salvinia*, *Lygodium*, Microthyriaceae among others) point to terrestrial, limnic and fluvial deposits Cretaceous to Pleistocene in age.
The new extensive and wide-ranging list of non-marine Permo-Carboniferous fauna of the Czech Republic (apart from the paralic Upper Silesian Basin) was prepared together with the Museum of eastern Bohemia in Hradec Králové. The final book will contain all known taxa with abbreviated

synonymy, locations, and type numbers. A complete list of localities and fossil-rich boreholes and mines with biostratigraphic and lithostratigraphic data and the formerly used names will be included. A complete list of relevant references and extensive photodocumentation will be added. Reconstructions of Permo-Carboniferous vertebrates were performed in collaboration with J. Svoboda (Figs. 2–3). The "Acanthodian web" (www.gli.cas.cz/acanthodians) was gradually filled as a part of the IGCP 491 Project (Middle Palaeozoic Vertebrate Biogeography, Palaeogeography and Climate). A compilation of the world acanthodian database with the help of the PaleoTax program (http://www.paleotax.de) is still in progress.

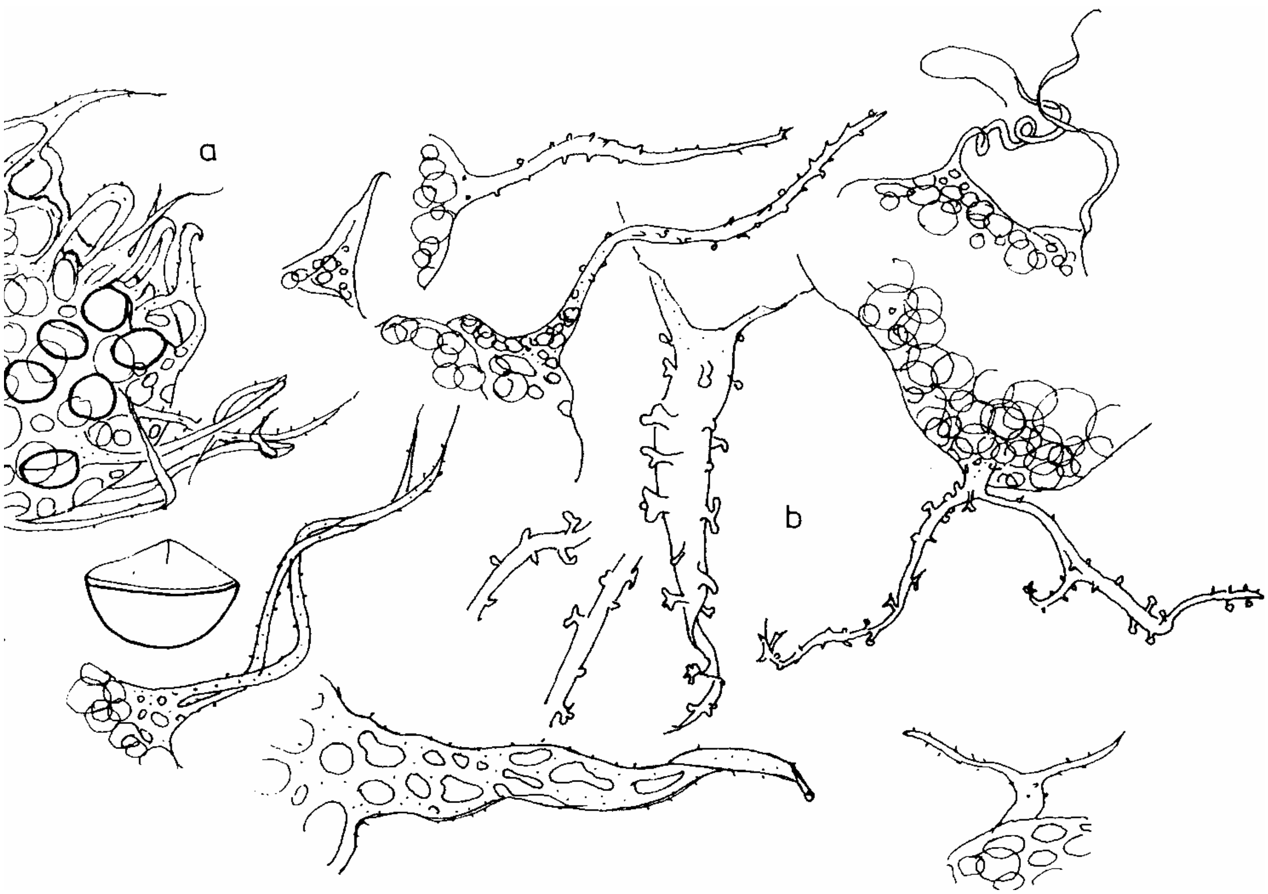

Fig.1. *Azolla nilotica* Dacne, herbarium material (macerated at Inst. Geol. AS CR); A. microsporangium (x200) microspora (x1000); B. glochidia (x900) (M. Konzalová)

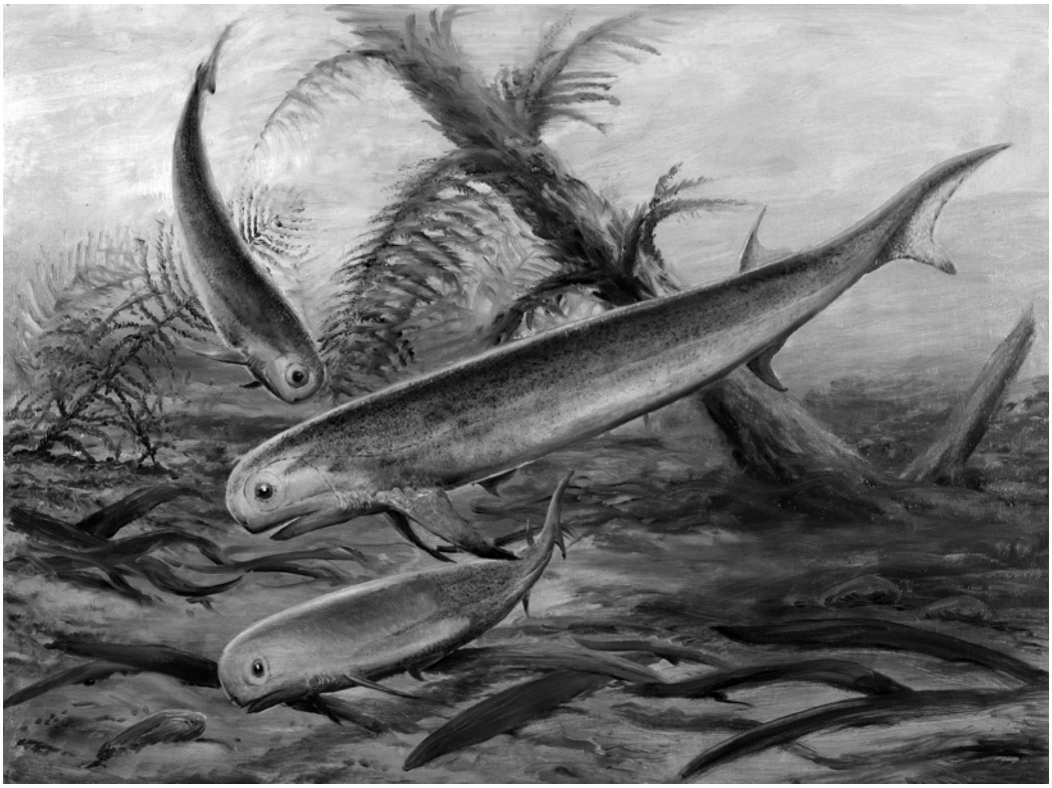

Fig. 2. Reconstruction of three ontogenetic stages of the Permian species *Acanthodes gracilis* (Beyrich, 1848) by Jiří Svoboda (painter) in cooperation with J. Zajíc (printed with permission).

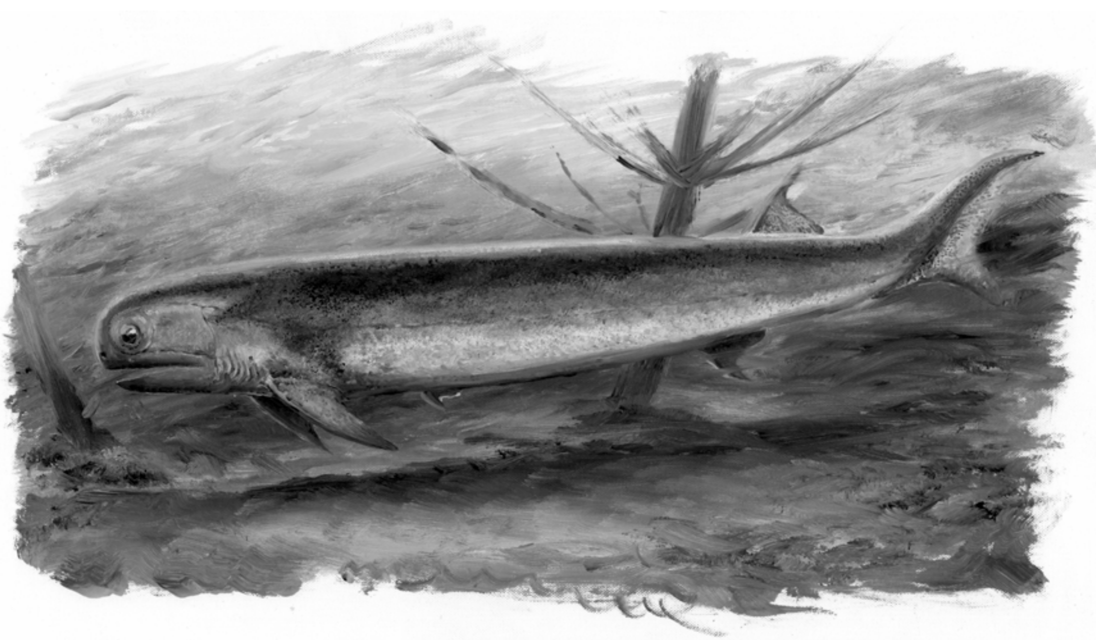

Fig. 3. The restoration of an adult specimen of *Acanthodes gracilis* (Beyrich, 1848), Lower Permian. Mr Jiří Svoboda (painter) in cooperation with J. Zajíc (printed with permission).

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10. Organization of conferences and scientific meetings

Conferences and Symposia organized in 2006

7th European Palaeobotany–Palynology Conference, Prague, September 6–11, 2006. International Meeting focused on Palaeobotany and Palynology. Number of participants: 343, worldwide. Organized by Faculty of Science, Charles University, Prague, National Museum Prague, Institute of Geology AS CR, Czech Geological Survey, Museum of West Bohemia in Pilsen, Institute of Archaeology ASCR. Organizing committee: Z. Kvaček, S. Opluštil, **J. Bek**, E. Břízová, **J. Dašková**, O. Fatka, J. Kvaček, M. Libertín, P. Pokorný, J. Pšenička, J. Sakala, Z. Šimůnek & V. Teodoridis.

Commission Internationale de la Microflore du Paléozoïque General Meeting 2006, Palaeozoic palynology in space and time, Prague, September 2–6, 2006. International Meeting focused on Palaeozoic palynology. Number of participants: 71, worldwide. Organized by Institute of Geology AS CR, Faculty of Science, Charles University, Czech Geological Survey, Senckenberg Research Institute, Germany. Organizing committee: **J. Dašková**, **J. Bek,** O. Fatka, R. Brocke & J. Drábková.

Training Course: ***Middle Paleozoic Limestone Sequences in the Prague Synform, Facies and Cycles – Supporting Maurice Tucker IAS Special Lecturer Tour (Durham University, U.K.), Prague, Barrandov, Řeporyje, Radotín, April 30–31, 2006***. Organized by the Institute of Geology AS CR. Organizing committee: **J. Hladil**, **L. Slavík** & **L. Koptíková.**

Conference: ***Vliv klimatu a člověka na říční procesy s hlavním akcentem na nové poznatky vývoje nivy Moravy ve Strážnickém Pomoraví. Seminář v rámci projektu PAGES, Mikulčice, May 11, 2006***. Organized by the Institute of Geology, Academy of Sciences of the Czech Republic. Organizing committee: **J. Kadlec**.

Workshop: ***Pohlednice z našich karbonských pralesů (výstava), Prague, June 15–January 15, 2006***. Organized by the National Museum in Prague. Organizing committee: M. Libertín & **J. Dašková**.

Workshop: ***Micro and macroworld of Karlovy Vary travertines – exposition, Brno, Prague, Karlovy Vary, June 7, 2006***. Organized by the Institute of Geology AS CR. Organizing committee: **L. Lisá**.

International Conference: ***Workshop on Ichnotaxonomy – III, Prague, Jevíčko,*** September 4–9, 2006. Organized by the Institute of Geology AS CR. Organizing committee: **R. Mikuláš**. Number of participants: 20, worldwide.

Special publications:
Mikuláš R. (ed., 2006): Trace fossils in the collections of the Czech Republic (with emphasis on type material). A special publication for the Workshop on Ichnotaxonomy – III, Prague and Moravia September 2006. Institute of Geology, Academy of Sciences of the Czech Republic, Prague. ISBN 80-903511-1-5, 137 pp.
Abstract Book (R. Mikuláš & A. Rindsberg, Eds.). Institute of Geology, Academy of Sciences of the Czech Republic, Prague.
Conference Report: Mikuláš R. & Rindsberg. A. (2007): Third International Workshop on Ichnotaxonomy (WIT-III). Episodes, March 2007, pp. 58-59.
Prepared: Special Issue of Lethaia covering the presented results.
Conference web: http://www.gli.cas.cz/GLU_AV/WIT_2006/WITannouncement_III.htm

Conferences and Symposia under preparation

XXXI. Czech – Polish – Slovak Symposium on mining and enviromental geophysics, September 2007. Organized by the Institute of Geology AS CR, Institute of Rock Structure and Mechanics AS CR, Scientific Guarantees **V. Rudajev** & W. Zuberek (Poland)

11. Publication activity of the Institute of Geology

In 2006, the Institute of Geology published two issues of **GeoLines**. GeoLines is a series of papers and monothematic volumes of conference abstracts published by the Institute of Geology, Academy of Sciences of the Czech Republic. GeoLines publishes articles in English on primary research in many field of geology (geochemistry, geochronology, geophysics, petrology, stratigraphy, palaeontology, 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.

GeoLines 20 (2006)

This volume (**GeoLines 20**) contains proceedings of the Meeting of the Central European Tectonic Studies Group/Meeting of the Czech Tectonic Studies Group/Carpathian Tectonic Workshop that was held in Zakopane, Poland, on April 19-22, 2006. An integral part of this volume is the excursion guide.

Two field excursions are mainly concerned on the median portion of the Outer West Carpathians. One of these trips, ***"Structural development of the Magura Nappe (Outer Carpathians): From Palaeogene-Neogene subduction to Neogene-present-day collapse"***, is devoted to the structural evolution of the Outer Carpathian accretionary wedge, including such topics as: early, soft-sediment deformation, succession of thrusting, large-scale Neogene rotations reconstructed from palaeomagnetic data, progressive vein mineralization, subduction-related(?) andesite intrusions and late Neogene to present-day deformation based on the analysis of fractured pebbles.

The second trip, *"**Late Cretaceous–Neogene evolution of the Polish Carpathians**",* is focused on the Late Cretaceous – Neogene tectonosedimentary evolution of the Pieniny Klippen Belt and Outer (Flysch) Carpathian accretionary wedge, addressing: syntectonic evolution of the sedimentary basins, olistoliths, source areas, main tectonic units along the Zakopane-Kraków geotraverse, as well as timing and periodicity of thrusting.

The volume was edited by M. Svojtka.

GeoLines 21 (2006)

This volume of GeoLines is published as a monograph by Adamovič J., Mikuláš R. & Cílek V.: Sandstone Districts of the Bohemian Paradise: Emergence of a Romantic Landscape. pp 1-100. Institute of Geology AS CR. Prague.
The publication was edited by M. Svojtka.

Volume 21 of the GeoLines journal summarizes the present knowledge of geological and geomorphological evolution of the most diverse sandstone region in the Czech Republic – the Bohemian Paradise. Complete characteristics are provided for each of the twelve districts and six geo-educational trails are proposed. The volume also includes a list of previous literature related to geology and geomorphology of the region, a glossary of terms, and a set of 16 photographic plates. The texts, the photos and comparative tables illustrate scientific significance of the Bohemian Paradise in global context, and were taken as key documents to justify the inclusion of the Bohemian Paradise in the Network of European Geoparks of UNESCO in 2005.

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

12a) Papers published in 2006

publications in journals included in the ISI Web of Science (IF value according to a list from 2005)

2.576* **Roček Z.**, Böttcher R. & Wassersug R. (2006): Gigantism in tadpoles of the Neogene frog Palaeobatrachus. - *Paleobiology*, 32, 4: 663-672.

2.498* Shull R.D., Provenzano V., Shapiro A.J., Fu A., Lufaso M.W., **Kletetschka G.** & Mikula V. (2006): The effects of small metal additions (Co, Cu, Ga, Mn, Al, Bi, Sn) on the magnetocaloric properties of the Gd5Ge2Si2 alloy. - *Journal of Applied Physics*, 99, 8: 8-8.

2.224* **Drahota P.**, Pačes T., Pertold Z., Mihaljevič M. & **Skřivan P.** (2006): Weathering and erosion fluxes of arsenic in watershed mass budgets. - *Science of the Total Environment*, 372: 306-316.

2.072* **Roček Z.** & Havelková P. (2006): Transformation of the pectoral girdle in the evolutionary origin of frogs: insights from the primitive anuran Discoglossus. - *Journal of Anatomy*, 209: 1-11.

2.034* **Kletetschka G.**, Fuller M.D., **Kohout T.**, Wasilewski P.J., Herrero-Bervera E., Ness N.F. & Acuna M.H. (2006): TRM in Low Magnetic Fields: a minimum field that can be recorded by large multidomain grain. - *Physics of the Earth and Planetary Interiors*, 154, 2-3: 290-298.

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2.011* **Skála R.**, Císařová I. & Drábek M. (2006): Inversion twinning in troilite. - *American Mineralogist*, 91, 5-6: 917-921.

1.974* Lüning S., Loydell D.K., **Štorch P.**, Shahin Y. & Craig J. (2006): Origin, sequence stratigraphy and depositional environment of an Upper Ordovician (Hirnantian) deglacial black shale, Jordan-Discussion. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, 230, 3-4: 352-355.

1.974* Grygar T., **Kadlec J.**, **Pruner P.**, Swan G., Bezdička P., Hradil D., Lang K., Novotná K. & Oberhansli H. (2006): Paleoenviromental record in Lake Baikal sediments: Enviromental changes in the last 160 ky. - *Palaeogeography, Palaeoclimatology, Palaeoecology*, 237: 240-254.

1.732* **Chadima M.**, Hrouda F. & Melichar R. (2006): Magnetic fabric study of the SE Rhenohercynian Zone (Bohemian Massif): Implications for dynamics of the Paleozoic accretionary wedge. - *Tectonophysics*, 418, 1-2: 93-109.

1.732* **Chadima M.**, **Pruner P.**, **Šlechta S.**, Grygar T. & Hirt A.M. (2006): Magnetic fabric variations in Mesozoic black shales, Northern Siberia, Russia: Possible paleomagnetic implications. - *Tectonophysics*, 418: 145-162.

1.732* Ellwood B.B., García-Alcalde J.L., El Hassani A., **Hladil J.**, Soto F.M., Truyóls-Massoni M., Weddige K. & **Koptíková L.** (2006): Stratigraphy of the Middle Devonian boundary: Formal definition of the susceptibility magnetostratotype in Germany with comparisons to sections in the Czech Republic, Morocco and Spain. - *Tectonophysics*, 418, 1: 31-49.

1.732* **Kletetschka G.** (2006): Comment to a paper "The origin of high magnetic remanence in the fault pseudotachylites: Theoretical considerations and implication for coseismic electrical currents". - *Tectonophysics*, 419: 99.

1.732* **Murakami M.**, Košler J., Takagi H. & Tagami T. (2006): Dating pseudotachylyte of the Asuke Shear Zone using zircon fission-track and U-Pb methods. - *Tectonophysics*, 424, 1-2: 99-107.

1.568* **Hladil J.**, Geršl M., Strnad L., Frána J., **Langrová A.** & Spišiak J. (2006): Stratigraphic variation of complex impurities in platform limestones and possible significance of atmospheric dust: a study with emphasis on gamma-ray spectrometry and magnetic susceptibility outcrop logging (Eifelian-Frasnian, Moravia, Czech Rep.). - *International Journal of Earth Sciences*, 95, 4: 703-723.

1.562* Bertling M., Braddy S., Bromley R., Demathieu G., Genise J., **Mikuláš R.**, Nielsen J., Nielsen K., Rindsberg AndrewK., Schlirf M. & Uchman A. (2006): Names of trace fossils - a uniform approach. - *Lethaia*, 39, 3: 265-286.

1.500* Bruthans J., **Filippi M.**, **Geršl M.**, Zare M., Melková J., Pazdur A. & **Bosák P.** (2006): Holocene marine terraces on two salt diapirs in the Persian Gulf, Iran: age, depositional history and uplift rates. - *Journal of Quaternary Science*, 21, 8: 843-857.

1.400* **Bek J.** & Opluštil S. (2006): Six rare Lepidostrobus species from the Pennsylvanian of the Czech Republic and their bearing on the classification of lycospores. - *Review of Palaeobotany and Palynology*, 139, 139: 211-226.

1.400* Kvaček J., **Dašková J.** & Pátová R. (2006): A new schizaeaceous fern, Schizaeopsis ekrtii sp nov., and its in situ spores from the Upper Cretaceous (Cenomanian) of the Czech Republic. - *Review of Palaeobotany and Palynology*, 140, 1-2: 51-60.

1.400* Zodrow E., Šimůnek Z., Cleal C., **Bek J.** & Pšenička J. (2006): Taxonomic revision of the Palaeozoic marattialean fern Acitheca Schimper. - *Review of Palaeobotany and Palynology*, 138, 3-4: 239-280.

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1.086* Nolze G., Wagner G., Neumann R.S., **Skála R.** & Geist V. (2006): Orientation relationships of carlsbergite in schreibersite and kamacite in the North Chile iron meteorite. - *Mineralogical Magazine*, 70, 4: 373-382.

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0.881* Vojtíšek P. & **Rohovec J.** (2006): Preparation and structural characterization of the intermediate complex $[Er\{H_2C_8H_{16}N_4(CH_2COO)_3(CH_2(Ph)PO_2)\}(H_2O)2]2Cl_2.xH_2O$ in the reaction of Er^{3+} and the dota-type ligand. An interesting example of two stereoforms of a lanthanide complex. - *Collect. Czech Chem. Commun.*, 71, 2: 264-278.

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0.612* **Ulrych J.**, **Novák J.K.**, **Lang M.**, Balogh K., Hegner E. & Řanda Z. (2006): Petrology and geochemistry and K-Ar ages for Cenozoic tinguaites from the Ohře/Eger Rift (NW Bohemia). - *Neues Jahrbuch für Mineralogie, Abhandlungen*, 183, 1: 41-61.

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0.397* **Malý K.D.**, **Cajz V.**, **Adamovič J.** & Zachariáš J. (2006): Silicification of quartz arenites overlain by volcaniclastic deposits: an alternative to silcrete formation. - *Geologica Carpathica*, 57, 6: 461-472.

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0.280* **Ulrych J.**, Pešek J., **Štěpánková-Svobodová J., Bosák P.**, Lloyd F.E., Seckendorff V., Lang M. & **Novák J.K.** (2006): Permo-Carboniferous volcanism in late Variscan continental basins of the Bohemian Massif (Czech Republic): geochemical characteristic. - *Chemie Erde, Geochemistry*, 66: 37-56.

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0.020* Vasin R.N., Nikitin A.N., **Lokajíček T.** & **Rudajev V.** (2006): Acoustic emission of quasi-isotropic rock samples initiated by temperature gradients. - *Izvestiya, Physics of the Solid Earth*, 42, 10: 815-823.

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13. Laboratories

Laboratories of the Institute are not independent units. They are incorporated within the structure of scientific departments and within the unit of Service Laboratories of Physical Methods. The chapter summarizes the list of the most important laboratory equipment.

Paleomagnetic laboratory (Head: Ing. Petr Pruner, DrSc.)
The Magnetic Vacuum Control System MAVACS 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 variationfree 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 palaeomagnetic 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 – the most sensitive and accurate instruments for measurement of remanent magnetization of rocks. All functions are microprocessorcontrolled.
The KLY-4S KAPPABRIDGE, CS-23 and CS-L FURNANCE APPARATUS – sensitive, commercially available laboratory instrument for measuring anisotropy of magnetic susceptibility (AMS) as well as bulk susceptibility in variable fields from 3 to 450 $A.m^{-1}$ in 21 steps and for measuring the temperature variation of susceptibility (from -190 to 700 °C).
Two LDA-3 AF DEMAGNETIZER – the process is microprocessor-controlled and automated. The magnetizing coil serves for the induction of the isothermal remanent magnetization.
The AMU-1A ANHYSTERETIC MAGNETIZER 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 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 to 300 $A.m^{-1}$.
The MMPM 10 PULSE MAGNETISER is designed to give a short duration high field pulse to a sample. The amplitude of the pulse is adjustable from about 20 mT to 9 Tesla with 7 ms pulse duration.

X-ray and DTA/TG laboratory (Head: RNDr. Roman Skála, PhD.)
PHILIPS X´Pert APD (1997)
DERIVATOGRAPH Q 1500 Monimex (1982, computerized in 1998)

Electron scanning and microprobe laboratory (Head: Ing. Anna Langrová)
Microprobe CAMECA 100 (2002)
Microprobe JEOL JXA-50A (1972)
EDAX System PHILIPS (1996)
Accesory devices for preparation of samples

Laboratory of rock processing and mineral separation (Head: Václav Sedláček)
Electromagnetic separator SIM-I (1968)
Electromagnetic separator (1969)
Laboratory table WILFLEY 13 B (1990)
Vibration processor VT 750 (1992)
Jaw crusher FRITSCH pulverisette 1, model 2 (2006)
Crusher CD 160*90 (1991)
Laboratory mill RETSCH (1970)

Crusher ŽELBA D 160/3 (1999)
Mill SIEBTECHNIK (1995)

Laboratory for thin and polished sections (Head: Ing. Anna Langrová)
MINOSECAR (1962, 1970)
DISCOPLAN (1990)
PEDEMOX PLANOPOL (1989)
Montasupal (1977)
DP.U.4 PDM-Force (1993)

Microscopic laboratory (Head: Mgr. Michal Filippi)
Polarization microscope OLYMPUS BX51 with digital camera OLYMPUS DP70 equipped by X-ray fluorescence with wave-length filters; QuickPHOTO MICRO 2.2 software (2006)
Microscope NIKON ALPHAHOT 2/HP (1995)
Polarization microscope AMPLIVAL ZEISS (1974)
Polarization microscope POLMI (1967)
Binocular microscope OLYMPUS SZX 16 with digital camera OPLYMPUS SP-350; Deep Focus 2.0 software (2006)
Binocular microscope OLYMPUS SZ 51 (2006)
Binocular microscope (1959)

Fisson track laboratory (Head: Mgr. Jiří Filip, CSc.)
Analytical system for fisson track – Microscope AXIOPLAN ZEISS and Trackscan system 452110 AUTOSCAN (1999)
Polishing and griding machine MTH APX 010 (2003)

Laboratory of liquid and solid samples (Heads: RNDr. Jan Rohovec, PhD. & **RNDr. Miloš Burian)**
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 BALANCE 2000G (1999)
Decomposition unit PLAZMATRONIKA SERVICE S.C. (1995)
Set of vacuum lysimeters PRENART (1999)
ICP-EOS spectrometer Iris Intrepid XSP (2004)
Ultrasonic Nebulizer CETAC (2004)

Laboratory of rock behaviour under high pressure (Head: RNDr. Vladimír Rudajev, DrSc.)
MTS 815 – PC controlled servo hydraulic rock testing system with high stiffness for compressive loading up to 4500 kN.
High pressure chamber for elastic anisotropy measurement under hydrostatic pressure up to 700 MPa.
Hydraulic press for uniaxial compressive loading up to 3,000 kN with conventional triaxial cell for confinig pressure up to 150 MPa.
Hydraulic press for uniaxial compressive loading up to 300 kN.
Hydraulic press for uniaxial compressive loading up to 100 kN.
Rheological weight press for uniaxial compressive loading up to 500 kN.
Rheological mechanical presses for uniaxial compressive loading up to 80 kN.
Rheological weight presses for tensile loading up to 3 kN.
Vallen AMSY-5 – multichannel acoustic emission system.
Digital strain meters Hottinger (Centipede-100, UPM-40, UPM-60).
Permeability apparatus for measurement permeable and low permeable materials under constant hydraulic incline.
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).

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14. Financial Report

(in thousands Czech Crowns)

A. INCOMES	
1. From the annual budget of the Academy of Sciences CR	36,575
2. From the Grant Agency of the AS CR (accepted research projects)	4,444
3. From the Czech Science Foundation (accepted research projects)	2,681
4. From the internal research projects of the Acad. Sci. CR	319
5. From other state sources (Ministry of Environment, etc.)	646
6. Applied research	1,654
7. Investments (for laboratory facilities)	9,070
8. Investments (for buildings)	2,526
TOTAL INCOMES	**57,915**

B. EXPENSES	
1. Scientific staff – wages, medical insurance	26,418
2. Research and scientific activites	8,326
3. Administration and technical staff – admin. expenses, wages, medical insurance	4,432
4. General expenses (postage shipping, maintenance of buildings, energies, transport, office supplies, miscellaneous, etc)	6,082
5. Library (subscriptions etc.)	791
6 Editorial activites (Geolines, Annual Report, Geologica Carpathica)	270
7 Investments (for laboratory facilities)	9,070
8 Investments (for buildings)	2,526
TOTAL EXPENSES	**57,915**