



Symposia Program 12th Swiss Geoscience Meeting

Fribourg, 21st – 22nd November 2014

Drilling the Earth

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Swiss Academy of Sciences
Akademie der Naturwissenschaften
Accademia di scienze naturali
Académie des sciences naturelles

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UNIVERSITÉ DE FRIBOURG
UNIVERSITÄT FREIBURG

**Symposia Program SGM2014
21st - 22nd November 2014, Fribourg**

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1) **Structural Geology, Tectonics and Geodynamics**

Conveners: Guido Schreurs, Neil Mancktelow, Paul Tackley

Supporting

Organizations: *Swiss Tectonics Studies Group of the Swiss Geological Society*

Description: Presentations are invited considering structural geology, tectonics, and geodynamics, including field, experimental and model studies of structures at all scales. The session should also provide a forum for interdisciplinary contributions studying the interplay between surface processes, topography and tectonics. Young researchers are particularly encouraged to participate and present their results.

2) **Mineralogy, Petrology, Geochemistry**

Conveners: Eric Reusser, Sébastien Pilet

Supporting

Organizations: *Swiss Society of Mineralogy and Petrology (SSMP)*

Description: This session aims to provide a platform for research reports in all fields related to mineralogy, petrology, and geochemistry that are not covered by other sessions (e.g. experimental petrology, volcanology, analytical approaches etc.). Furthermore, it provides a platform to young scientists that want to report about the results of their PhD/master projects. It is planned to have an accompanying poster session.

3) **Magma fluxes and their effect on crustal growth, magma chemistry and dynamics of volcanic eruptions**

Conveners: Olivier Bachmann, Luca Caricchi

Support:

Description: The amount of magma transfer from the mantle through the crust is a major control on the rate of crustal growth and the type of volcanic eruptions that occur on our planet; it determines the longevity of magma reservoirs, and the amount of magmatic differentiation that can occur in a given province. Multiple lines of evidence suggest that the production, transfer and eruption of magma all occur with a characteristic periodicity that depend on a wide variety of processes.

This session aims at bringing together scientists focusing on topics such as (1) the quantification of magma fluxes, (2) the effect that variable fluxes have on the location, size, and longevity of magma reservoirs, and (3) the determination of the factors controlling the periodicity of magma transfer from the mantle to the atmosphere. We welcome contributions from authors using a range of techniques, including fieldwork, petrology, geochemistry, geochronology, experiments and numerical modelling to unravel the complexity behind the tempo of magmatic and volcanic systems.

4) Palaeontology

Conveners: Lionel Cavin, Damien Becker, Christian Klug

Supporting

Organizations: *Swisstopo, Landesgeologie, Schweizerisches Komitee für Stratigraphie, Naturhistorisches Museum Bern, Schweizerische Paläontologische Gesellschaft, Kommission des Schweizerischen Paläontologischen Abhandlungen (KSPA)*

Description: This session is dedicated to all subdisciplines of palaeontology in Switzerland and all other countries. Presentations and posters may deal with macro- and microfossils, all major caldes including prokaryotes, eucaryotes, Metazoans, plants etc. Preferred topics are evolution, biostratigraphy, palaeobiogeography, palaeoecology including palaeoclimate, bio-events, evo-devo, but results from other fields may be presented as well. Fossils provide essential data to document the history of life and evolution; index fossils provide important data for stratigraphic correlations; recently, fossils (especially of plants) have been widely used in research on palaeoclimate. Session language is English.

5) Stratigraphy in Switzerland – new data and developments

Conveners: Alain Morard, Reto Burkhalter, Oliver Kempf, Ursula Menkveld-Gfeller

Supporting

Organizations: *Swiss Committee for Stratigraphy (SKS/CSS), Swiss Palaeontological Society (SPG/SPS), Swiss Geological Survey – swisstopo*

Description: Nouveautés concernant tous les domaines de la stratigraphie de la Suisse, en lien notamment avec le projet Harmos. Cette session inclura une séance plénière du Comité Suisse de Stratigraphie (CSS).
Neues aus sämtlichen Sparten der Stratigraphie in der Schweiz, unter besonderer Berücksichtigung der Resultate des Projektes Harmos. Im Anschluss an die Session folgt die Plenumsitzung des Schweizerischen Komitee für Stratigraphie (SKS).
New data from all domains of stratigraphy in Switzerland, in particular regarding the results of the Harmos project. This session will include a plenary meeting of the Swiss Committee for Stratigraphy.

6) Geophysics and Rockphysics

Conveners: Marcel Frehner, Klaus Holliger

Organizations: *Swiss Geophysical Commission*

Description: Both Geophysics and Rock Physics are valuable tools for various applications and at the same time active fields of research. This session is open for contributions from both applied and fundamental research in all fields of Geophysics and Rock Physics (e.g., seismology, georadar, geomagnetism, geoelectrics, petrophysics, or poro-elasticity).

We particularly encourage the submission of synoptic studies aiming at establishing and exploiting links between Geophysics and Rock Physics based on theoretical considerations, numerical calculations, field, or experimental evidence.

Contributions from young scientists presenting their PhD or Master studies are particularly welcome.

7) **Geothermal Energy, CO₂ Sequestration and Shale Gas.**

Conveners: Lyesse Laloui, Larryn Diamond, Paul Bossart,

Support: *Swiss Geothermal Society,*
Swiss Association of Energy Geoscientists (SASEG)

Description: This symposium deals with research and exploration of the sub-surface geology for the energy sector, and focusses on 3 topics: geothermal energy, CO₂ sequestration and shale gas. The goal is to share experience and knowledge gained from those geo-energy fields. Furthermore, it explores the potential scientific directions in order to tackle particular challenges, methods and tools that can secure future energy demands and provide environmental friendly development solutions.

Geothermal heat extracted from depth in excess of 400 meters is defined as deep geothermal energy. The heat is extracted by hot-dry-rock processes or by drilling into aquifers or tectonic faults.

Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon in geological formations. It is a method to slow down greenhouse gases, which are mainly released by burning fossil fuels. The symposium will address the state of the art activities with emphasis on the integrity of geological storage system, through subsurface formation characterization, CO₂ storage capacity, reservoir stability, monitoring technology, implementation and risk management methodology and environmental impact of CO₂ storage.

Shale gas is natural gas that is formed and trapped within shale formations that are characterized by a consistent amount of organic content. The very low porosity, permeability and pore size of the material and thus the high capillary forces developed, enhance the fluid and gas trapping. As a consequence the hydraulic fracturing (fracking) technique is applied to create extensive artificial fractures in the shale formation which enhance the rate of the gas extraction. The control of the propagation of the hydraulic fractures is of major concern to guarantee the safety of the overlaying aquifers: the developed micro-seismicity is often used to monitor the fractures' extent. Horizontal drilling is often performed where the hydraulic fracturing technique is applied. The drilling of deep vertical and horizontal wells in shales comes along with issues concerning wellbore stability and sand production, together with problems related to wastewaters and gas leakages control. The chemical composition of the drilling and fracturing fluids and their interaction with the shale environment is also of major concern.

Presentations related to these 3 topics are kindly invited. This includes field exploration work, lab experiments and modelling studies at all scales, but also work dealing with legal aspects is welcomed.

8) **IODP and ICDP drilling for scientific research: major achievements from past and current drilling initiatives**

Conveners: Anneleen Foubert, Hendrik Vogel, Michael Strasser, Samuel Jaccard

Support: *SwissDrilling*, *International Ocean Discovery Program IODP*, *International Continental Scientific Drilling Program ICDP*

Description: Within the framework of the International Ocean Discovery Program (IODP) and the International Continental Scientific Drilling Program (ICDP), scientific drilling continues to provide unique insights for exploring and unravelling multidisciplinary processes and cycles that are part of our dynamic Earth.

Past and current ocean drilling initiatives have brought major advances in a wide variety of research areas, including palaeoclimatology, palaeoceanography, the deep biosphere, deep crustal and tectonic processes, geodynamics and geohazards. Since more than 15 years, the International Continental Scientific Drilling Program has coordinated and provided support for global efforts in continental drilling, tackling especially multidisciplinary themes of socio-economic relevance such as climate and ecosystem evolution, earthquakes and volcanism, nature of the deep biosphere, unconventional energy resources and the role of environmental forcing in shaping human evolution.

This session aims to summarize and review major scientific results from past and current ocean and continental drilling projects as well as other scientific and applied drilling initiatives with a special emphasis on the Swiss contributions to IODP and ICDP.

9) **Geomorphology**

Conveners: C. Graf, I. Gärtner-Roer, R. Delaloye, M. Keiler, N. Kuhn, C. Scapozza, J. Müller, C. Levy, F. Herman, B. Staub, S. Castelltort

Support: *Swiss Geomorphological Society SGS*

Description: Geomorphologists study processes, forms, materials and evolution of landscapes at Earth's surface, often in close cooperation with practitioners and decision makers as well as with scientists from related disciplines. Especially in the context of global change, geomorphologists develop and promote the understanding of natural processes in geosystems, as well as the relationships between societies and geomorphological processes.

This open session on Geomorphology at the 12th Swiss Geoscience Meeting encourages contributions from all areas of basic and applied geomorphology, including studies of the past and present processes and, for example, the implications for natural hazards, the influence on shaping the present landscape or landforms, or the influence of global change and how that may influence the processes, natural hazards, and resources in the future.

The Swiss Geomorphological Society (SGS) invites people from science and practice to present their geomorphologic interests and results in oral or poster presentations. Especially young scientists are encouraged to take the opportunity of presenting their theses and fostering relationships with colleagues.

10) **Quaternary environments: landscapes, climate, ecosystems, human activity during the past 2.6 million years**

Conveners: Irka Hajdas, Susan Ivy Ochs

Supporting

Organizations: *Swiss Society for Quaternary Research (CH-QUAT)*

Description: During the Quaternary Period, the last 2.6 million years of Earth's history, changes in environments and climate shaped human evolution. In particular, large-scale features of atmospheric circulation patterns varied significantly due to the dramatic changes in global boundary conditions which accompanied abrupt changes in climate.

Past variations in the geosphere, hydrosphere, biosphere and in climate were archived in Quaternary deposits and provide critical information for the interpretation of present and future environmental changes. Quaternary research focuses on understanding these changes in environmental conditions, and on assessing their impact on landscapes, ecosystems, and human societies.

Within this context, this session brings together scientists from diverse disciplines in Earth Science, Archaeology and Environmental Science. In addition to studies focusing on the reconstruction and impact of past environmental change, we also invite presentations focusing on human expansions and cultural development, and contributions to methodological improvements in climate proxy studies or in methods of age determination. Topics may include all aspects of Quaternary science and we strongly encourage students and young scientists to present the results of their ongoing research.

11) **Cryospheric Sciences**

Conveners: J. Alean, A. Bauder, B. Krummenacher, J. Nötzli, C. Lambiel, M. Lüthi, J. Schweizer, M. Schwikowski.

Supporting

Organizations: *Swiss Snow, Ice and Permafrost Society*

Description: This session addresses all topics, which are related to the Alpine and Polar Cryosphere. We expect contributions covering the whole range of Alpine and Polar snow, ice and permafrost research. We encourage theoretical, experimental as well as practical contributions, especially from young researchers. Presentations that address the aspects of dynamics and thermodynamics of snow, ice and permafrost and impacts related to natural hazards are particularly welcomed.

12) **Polar Research**

Conveners: Martin Schneebeli, Martin Lüthi, Jochen Schmitt

Supp. Orgs: *Swiss Committee on Polar and High Altitude Research*

Description: This interdisciplinary session brings together researchers working in Polar Environments (Arctic and Antarctic). We attempt to bring together the various disciplines, which tackle processes specific to polar regions, one of the fastest changing environment on Earth, with the Arctic warming rates far exceeding the global average. Processes in the circumpolar oceans, the cryosphere, the pedosphere and the atmosphere are tightly coupled and lead to specific dynamics. We plan to include a half hour discussion on possibilities how young researchers can participate in polar research. The session language is English.

13) **Freshwater monitoring: from past to present and to future - Measurement and interpretation**

Conveners: B. Schädler, M. Doering, T. Jonas, A. Salvetti, M. Sinreich, P. Schmocker-Fackel.

Supp. Orgs: *Swiss Society for Hydrology and Limnology SGHL, Swiss Hydrological Commission CHy, Swiss Hydrogeological Society SGH*

Description: Long term measured hydrological and limnological data and their temporal and spatial interpretation are essential for the assessment of water resources, water uses and the ecological status of water bodies. This is especially insightful in the context of assessing the impact of global changes. Moreover, all kind of models used for water management depend on water monitoring of high quality.

Freshwater monitoring in this context covers:

- wetlands, groundwater, glaciers, rivers, lakes, ponds and other waterbodies
- precipitation and snowpack
- data on water use and consumption
- monitoring data in the context of river restoration assessment
- data on water quantity, quality (physical, chemical, isotopic and biological characteristics)
- long term data series as well as on line monitoring.

This symposium will give an opportunity

(i) to address recent developments in concepts, methodologies and (new) instruments for freshwater monitoring, from environmental sampling (including drilling) to data measurements and analyses;

(ii) to present modern methods for temporal and spatial analysis of monitored data;

(iii) to present analysis of long term freshwater data, assessing their quality, their evolution and their potential impairment;

(iv) and to present case-studies, from fundamental/applied research or from applications through the end-users.

Oral and poster presentations will be scheduled. To ensure attractive oral sessions, the organizers will select a number of applications for oral presentations.

14) National Research Programme NRP 68: Research for improving soil knowledge and for sustainable use of soils

Conveners: A. Papritz, F. Hagedorn, J. Leifeld

Supp. Orgs: *National Research Programme "Sustainable Use of Soil as a Resource" (NRP 68)*
Swiss Soil Science Society

Description: Soil is a scarce resource in Switzerland which has a variety of functions: food production, regulation of nutrient and hydrological cycles, habitat for organism, support for residential and infrastructural building projects, etc. Each of these functions has a societal value, which must be considered when evaluating different land usage options in planning. To benefit in the long-term from soil functions, management of soils in agriculture and forestry must accord with their capacities for particular functions. The goal of sustainable soil use poses thus considerable challenges to society. The National Research Programme NRP 68 "Sustainable Use of Soil as a Resource" aims at establishing principles for integrative, sustainable and resource-efficient soil management in Switzerland.

The researchers of NRP 68 are concerned with improving our knowledge of soil systems, developing instruments for assessing soil as a resource and devising strategies for the sustainable use of land. The NRP 68 research projects mostly focus on four aspects: soil organic matter, soil organisms and soil quality, agricultural management and soil quality and spatial soil information for sustainable land management. This session offers a platform to present first research results generated in the various NRP 68 projects.

15) Biogeochemical cycles in a changing environment

Conveners: Patrick Schleppe, Peter Waldner, Werner Eugster.

Supporting Organizations: *Commission for Atmospheric Chemistry and Physics*

Description: Biogeochemical cycles are essential links between atmosphere, biosphere and geosphere of the Earth. The carbon, water and nitrogen cycle, for example, have direct impacts on the climate system and are critical for ecosystem properties such as productivity, soil fertility or water availability. Facing global environmental change, biogeochemical pools and fluxes are subject to significant alteration. A mechanistic understanding of the processes that regulate biogeochemical pools and fluxes under ambient and future conditions is therefore essential to predict the magnitude and impact of a changing environment on biogeochemical cycles. The session will provide insight in plant and ecosystem physiological mechanisms (photosynthesis, transpiration, plant and soil respiration) as well as biogeochemical processes that determine water, carbon and nitrogen cycles and the availability of other nutrients at various scales. We seek for contributions that present experimental and observational studies as well as synthesis across ecosystems and model simulations. Studies that apply ecophysiological methods including stable isotopes or eddy covariance are welcome.

16) **Atmospheric Processes and Interactions with the Biosphere**

Conveners: Christof Ammann, Urs Neu, Werner Eugster

Supporting

Organizations: *ACP – Commission on Atmospheric Chemistry and Physics, ProClim – Forum for Climate and Global Change, IGBP- Swiss Committee*

Description: The aim of this session is to provide a platform for research reports from all fields related to climate science, atmospheric processes, and biosphere–atmosphere fluxes and interactions.

This session welcomes contributions that focus on relevant aspects of atmospheric, surface, or ecosystem processes, which influence atmospheric composition and climate or are influenced by them. Feedback processes are of key interest, but also case studies are welcome that investigate specific chemical or physical processes or the behavior of a specific ecosystem.

The session is suited to researchers working in the field of Climate Sciences, Atmospheric Physics and Chemistry, Physical Geography, Meteorology, Ecology and Agricultural Sciences. We encourage young scientists to present their Master theses or PhD projects, either orally or in the accompanying poster session.

17) **Extreme events in phenology and seasonality**

Conveners: This Rutishauser, Martine Rebetez, Christian Rixen

Supporting

Organizations: *Swiss Commission for Phenology and Seasonality*

Description: Extreme events are important in phenology and seasonality studies. Their effects leave visible traces in natural and human environments. Impacts of longterm changes are increasingly understood. However, there is a large gap in the understanding of the interplay of extreme meteorological and climate events with parts of the biosphere and cryosphere.

In this session, we welcome all studies related to atmospheric and phenological extreme events, in particular contributions directly related to Switzerland and the Alpine region. However, the session is also open for general contribution. We invite contributions from students and senior scientist likewise to foster a lively discussion. A few invited speakers will give a short overview on their research topic. These presentations will then lead to the main part of presentations, where we invite in particular young scientist to present their thesis and discuss it with colleagues. The session also includes the award ceremony of the 4th «Schweizer Wettbewerb für Phänologie und Saisonalität» .

18) **Earth System Science related Earth Observation**

Conveners: Stefan Wunderle, Brigitte Buchmann, Alain Geiger

Supporting

Organizations: *Swiss Commission for Remote Sensing,
Swiss Geodetic Commission*

Description: We aim at organizing a symposium on state-of-the-art Earth Observation methods used for measuring the spheres of the Earth. Recent advances in characterizing spheres and their interaction within the system Earth using remote sensing will be discussed and presented.

Emphasis will be on coupled systems, chemical, biological and physical constituents mapping on land, atmosphere (incl. GHG), ocean, as well as the solid Earth.

Monitoring aspects such as Essential Climate Variables (ECVs), supporting missions and programmes such as GEO/GEOSS, GCOS, GMES/Copernicus, EC Env and Space, etc. are invited to be presented too.

19) **Geoscience and Geoinformation - From data acquisition to modelling and visualisation**

Conveners: Nils Oesterling, Adrian Wiget, Massimiliano Cannata

Supporting

Organizations: *Swiss Geological Survey; Swiss Geodetic Commission; Swiss Geotechnical Commission; Swiss Geophysical Commission; Swiss Hydrogeological Society*

Description: Digital data acquisition and 3D visualisation of geospatial objects and processes are already standard and are still gaining increasingly importance in geosciences. For instance geodetic data capture in combination with digital geological mapping constitutes an important basis for various tasks in engineering geology, natural hazard prevention and other geoscientific fields. Moreover, 3D modelling and visualisation of such data gives a better understanding of the respective problem setting.

In this symposium papers related to the value adding chain from data acquisition, geo-processing, GIS handling to 3D modelling and visualisation will be presented. The focus will be on the following topics:

- Development and application of digital tools for geodetic, geological, geotechnical and geophysical data capture
- Transformation from field data to digital datasets and time series
- Digital geological mapping and geoscientific information systems
- 3D modelling, analysis of temporal variations and visualisation of geospatial objects and processes

Methodological papers as well as thematic case studies will be discussed. Contributions related to the topic of the SGM of this year «Drilling the Earth», e.g. data models, surveying methods, exchange of data, legal aspects, etc. are especially welcome this year.

20) **Symposium in Human Geography**

Conveners: Olivier Graefe, Heike Mayer, Martin Müller

Supporting
Organizations: *Swiss Geography Association (ASG)*

Description: This session provides a forum for human geographers of all sub-disciplines and those in related fields to discuss new ideas, present ongoing research or disseminate research results. We encourage theoretical, methodological and empirical contributions that address a wide range of topics. These might cover themes such as political ecology, socio-materiality, knowledge and power, cities and regions, globalization, affect and the body, discourse and practices, but are not limited to them. The session equally welcomes early-career researchers as it does established ones.

21) **Drilling the Earth - challenges for a research integrating Natural and Engineering Sciences with Social Sciences and Humanities**

Conveners: Olivier Ejderyan, Patrick Wäger.

Supporting
Organizations: *Swiss Academic Society for Environmental Research and Ecology SAGUF*

Description: Observations that human actions have taken a significant role in shaping natural processes (as illustrated by the qualification of our era as the anthropocene) but also the acknowledgement that many outputs of Natural and Engineering Sciences research have socio-political consequences has led to a multiplication of calls asking for more interdisciplinary research or for taking into account “social” or “human” dimensions of topics that were until recently only enquired by natural sciences (such as biodiversity or climate change).

The goal of this session is to discuss the implications of these calls for more integration of Natural and Engineering Sciences with Social Sciences and Humanities within research on natural resources. In what respect does research integrating Natural and Engineering Sciences and Social Sciences and Humanities allow for a more sustainable use of natural resources? What are the issues raised and challenges presented by such research for researchers, but also for users? How can they be dealt with?

For this session, we seek papers that:

- Engage with the rationales of integrative research on natural resources;
- Describe and evaluate integrative research projects – successful or not; and
- Critically reflect on experiences of researchers engaged in integrative research projects on natural resources.

Expected participants: Researchers from the natural and engineering sciences as well as from the social sciences and humanities addressing questions on a more sustainable use of natural resources and interested in interdisciplinary collaboration and exchange.