

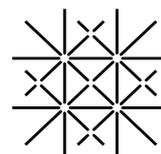
# First announcement 13<sup>th</sup> Swiss Geoscience Meeting

Basel, 20<sup>th</sup> – 21<sup>st</sup> November 2015

## Modelling the Earth

sc | nat 

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



University  
of Basel

# 13<sup>th</sup> SWISS GEOSCIENCE MEETING 2015 BASEL

The Department of Environmental Sciences of the University of Basel and the Platform Geosciences of the Swiss Academy of Sciences, SCNAT cordially invite you to participate in the 13<sup>th</sup> Swiss Geoscience Meeting to be held on 20<sup>th</sup> and 21<sup>st</sup> November 2015 in Basel.

## Friday 20<sup>th</sup>,

The theme of the 13<sup>th</sup> Swiss Geoscience Meeting is “Modelling the Earth”. Four keynote speakers will present their research covering a wide range of geoscientific topics.

**Paul Tackley** (ETH Zurich) will bring us close to the Earth’s core-mantle boundary and show us how modelling can link experimental petrology and geophysical observations leading to an impressive understanding of the Earth’s structure and long-term evolution.

The presentation of **Gian-Kasper Plattner** (IPCC WGI TSU, University of Bern) will review how climate models and climate change projections have evolved over time since the early Intergovernmental Panel on Climate Change (IPCC) assessment reports and what the latest, the 5th IPCC assessment report, has to say about future climate change.

**Klaus Wallmann** (GEOMAR Helmholtz Centre for Ocean Research Kiel) will highlight the effects of eustatic sea-level change on atmospheric pCO<sub>2</sub> and seawater composition over the late Quaternary. His mass balances and modeling results reveal that the observed 100-kyr climate cycle may be driven by pCO<sub>2</sub> and the biogeochemical removal processes at continental margins.

The last speaker, **Sanjeev Gupta** (Imperial College London), takes us to the planet Mars and acquaints us with the adventures of NASA’s car sized rover, Curiosity, which has been exploring the surface of Gale crater. This mobile laboratory is studying the geology and chemistry of rocks on Mars to determine if the Red Planet could ever have been habitable for life.

## Saturday 21<sup>th</sup>,

Eighteen scientific symposia will cover the diverse spectrum of current research in geoscience, encompassing the lithosphere, the hydrosphere, the cryosphere, the biosphere, the atmosphere and the anthroposphere.

The SGM also provides the ideal environment to foster informal contacts and discussion among scientists, in particular during the Swiss Geoscience Party on Friday evening but also at the poster sessions in the hallways of the conference building (Kollegengebäude) on Saturday. Time is reserved for two poster sessions, at which the authors will be present for active discussion and feedback.

## CONTRIBUTIONS:

**Deadline for abstract submission is August 28<sup>th</sup>, 2015.**

Depending on the number and subject of abstracts submitted, proposed sessions may be merged or new ones created. Abstracts will be initially assigned to the session indicated by the authors at the time of abstract submission. Abstracts should be submitted electronically following the instructions on the SGM2015 website: <http://geoscience-meeting.ch/sgm2015>.

## REGISTRATION:

**Deadline for registration is Friday October 30<sup>th</sup>, 2015.**

Registration should be done electronically following the instructions on the SGM2015 website.

Registration fee is SFr. 55.- (SFr. 35.- for students /PhD students).

An extra SFr 20.- will be charged for the Geoscience Party (SFr 15.- for students).

Onsite registrations will be charged an extra CHF 20.-

**SYMPOSIA at SGM 2015:**

We kindly invite you to submit abstracts for oral presentations or posters addressing the following subjects:

1. Structural Geology, Tectonics and Geodynamics
2. Mineralogy, Petrology, Geochemistry
3. Gemmology
4. Palaeontology
5. Stratigraphy
6. Geophysics and Rockphysics
7. Geothermal Energy, CO<sub>2</sub> Sequestration and Shale Gas
8. Modeling in Geomorphology
9. Quaternary environments: landscapes, climate, ecosystems, human activity during the past 2.6 mio. years
10. Cryospheric Sciences
11. Hydrology, Limnology and Hydrogeology
12. Temperature and density influenced flow and transport of groundwater and coupled hydraulic processes
13. The International Year of Soils: open session on soil security
14. Biogeochemistry of aquatic and terrestrial realms
15. Atmospheric Processes and Interactions with the Biosphere
16. Phenology and seasonality
17. Earth Observation addressing key Earth System processes
18. Geoscience and Geoinformation - From data acquisition to modelling and visualisation

Detailed information on this venue can be found on:  
<http://geoscience-meeting.ch/sgm2015>

Looking forward to seeing you in Basel !  
The SGM 2015 Organizing Committee

# SGM 2015: Symposia list

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## **1. Structural Geology, Tectonics and Geodynamics**

Guido Schreurs, Neil Mancktelow, Paul Tackley

*Swiss Tectonics Studies Group of the Swiss Geological Society*

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**

Sebastien Pilet, Bernard Grobéty, Eric Reusser

*Swiss Society of Mineralogy and Petrology (SSMP)*

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. Gemmology**

Michael S. Krzemnicki (Uni Basel), Laurent E. Cartier

*Swiss Gemmological Society (SGG), Swiss Society of Mineralogy and Petrography (SSMP)*

This session will cover all aspects related to coloured gemstones, diamonds and pearls. We will cover the geological formation of different gemstone deposits and mining processes required to extract precious gemstones. Origin determination of gemstones and treatments of gemstones will be an important focus, along with the geochemical and spectroscopic techniques used to analyse these questions. Biomineralisation of organic gem materials such as corals and pearls will also be addressed.

## 4. Palaeontology

Christian Klug, Torsten Scheyer, Lionel Cavin

*Schweizerische Paläontologische Gesellschaft,  
Kommission des Schweizerischen Paläontologischen Abhandlungen (KSPA)*

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

Alain Morard, Reto Burkhalter, Olivier Kempf, Ursula Menkveld-Gfeller

*Swiss Committee for Stratigraphy (SKS/CSS)  
Swiss Palaeontological Society (SPG/SPS)*

This session is dedicated to the presentation and discussion of new results from all stratigraphic subdisciplines: lithostratigraphy, chronostratigraphy, chemostratigraphy, sequence stratigraphy, ... As concerns biostratigraphic contributions, a coordinated program will be established with the paleontology session (please submit your abstract there in this case). Talks and posters on specific regional questions, broader scale correlations and reconstitutions, as well as on new methodological developments, are most welcome.

## 6. Geophysics and Rockphysics

Marcel Frehner, Klaus Holliger

*Swiss Geophysical Commission*

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, CO<sub>2</sub> Sequestration and Shale Gas

Lyesse Laloui, Larryn Diamond, Paul Bossart

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

This symposium deals with research and exploration of the sub-surface geology for the energy sector, and focusses on 3 topics: geothermal energy, CO<sub>2</sub> 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, CO<sub>2</sub> storage capacity, reservoir stability, monitoring technology, implementation and risk management methodology and environmental impact of CO<sub>2</sub> 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 overlying 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. Modeling in Geomorphology

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

*Swiss Geomorphological Society (SGS)*

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 modeling in geomorphology at the 13<sup>th</sup> 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. Based on this year's meeting theme "Modeling the Earth", contributions focusing on modeling geomorphological issues will be preferred.

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.

## 9. Quaternary environments: landscapes, climate, ecosystems, human activity during the past 2.6 million years

Philippe Rentzel, Christine Pümpin

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

During the Quaternary Period, the last 2.6 million years of Earth's history, changes in environments and climate shaped human evolution. 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, the 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.

## 10. Cryospheric Sciences

M. Schwikowski, A. Bauder, M.Lüthi, J. Alean, Martin Heggli, Jeannette Nötzli

*Swiss Snow, Ice and Permafrost Society)*

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.

This year a special sub-session will be included to celebrate the 40 year anniversary of ice core drilling on Colle Gnifetti (co-chairs Margit Schwikowski and Martin Hoelzle).

## 11. Hydrology, Limnology and Hydrogeology

Bruno Schädler, Tobias Jonas, Ole Rössler, Michael Sinreich, Massimiliano Zappa

*SGHL, SGH, CHy*

The session is open to contributions dealing with hydrology, limnology and hydrogeology in a broad sense.

Additionally, this year particularly welcome are recent developments in the modelling of hydrology, limnology and hydrogeology at all scales and especially contributions demonstrating interdisciplinary approaches. Topics may include applications on climate change, drought, floods, biodiversity, energy, forecasting.

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

Key speakers will be invited..

## **12. Temperature and density influenced flow and transport of groundwater and coupled hydraulic processes**

Peter Bayer, Peter Huggenberger, Gunter Siddiqi, Eric Zechner

*Schweiz. Gesellschaft für Hydrogeologie*

Efficient utilization of the shallow and deep underground as resource and storage medium relies on modern techniques of exploration, investigation, monitoring, simulation and assessment in various types of geological media. In all relevant application areas such as low- and high enthalpy geothermics, deep underground and tunnel constructions, as well as CO<sub>2</sub> storage, the dynamic behaviour of geofluids and groundwater plays a prominent role. Separate analysis of flow or transport conditions gives a first insight into the hydraulic regime, but full system analysis is often only possible by considering coupled processes such as hydro-thermal and hydro-mechanical effects. Additionally, often variable thermal conditions and/or solute concentrations induce density-driven processes. The session aims to provide an overview of the current and future research in the field, covering any temporal or spatial scale.

We invite contributions from the broad field of temperature and density influenced flow and transport of groundwater and coupled hydraulic processes. Both in research and in practice, the realistic characterization of subsurface flow and heat transport, observations related to induced or natural variations of the thermal regime and solute concentration, the seasonal and long-term development of thermal, hydrochemical and mechanical conditions in aquifers, and energy and mass transfer across aquifer boundaries are focal points. This covers the geological, hydraulic and thermal characterization of shallow and deep aquifers including sealing aquitards. Of similar interest are contributions on hydraulic/thermal/mechanical processes relevant for underground constructions of e.g. deep wells, tunnels, caverns, CO<sub>2</sub> storage systems, and hydrothermal and engineered geothermal systems. We seek new insights into advances in experimental design, reports from new laboratory tests and field observations, as well as demonstration of sequential or coupled modelling concepts.

## **13. The International Year of Soils: open session on soil security**

Nikolaus J. Kuhn, Stéphane Burgos, Emmanuel Frossard, Frank Hagedorn, Elena Havlicek, Jens Leifeld, Walther Pascal, Andreas Papritz, Urs Steiger

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

2015 has been designated as the International Year of Soils by the Food and Agriculture Organization of the United Nations. Soil is undoubtedly one of the most valuable resources for humans, providing food and energy, but also many further ecosystem services. Soil is also under threat, e.g. by erosion, loss of nutrients or pollution. Unlike atmosphere and water, soil is threatened not "just" by pollution that could be cleaned up rather quickly, but by destruction that cannot be reversed in a feasible time span. Such soil losses therefore resembles the extinction of plants and animals. Surprisingly, there are no international conventions or directions to protect soil specifically.

The aim of this session is to discuss new ways and measures on how the maintenance and improvement soils in all its functions can be secured.

## 14. Biogeochemistry of aquatic and terrestrial realms

Helge Niemann, Jakob Zopfi, Moritz Lehmann, Franz Conen, Katrin Meusburger, Christine Alewell

Biogeochemical processes are the basis for biotic controls on the chemistry of the environment or geochemical controls on the structure and function of ecosystems. Biosphere-geosphere interactions are critical in mediating element cycles, and act on a spatial continuum from the molecular to the global scale and link Earth's distant past with its present and future.

This symposium aims at providing a platform for all scientists working on aspects related to the wider field of biogeochemistry on any spatial or temporal scale. Important topics will include, but are not restricted to:

- Element cycling
  - geosphere-hydrosphere-terrasphere-atmosphere interactions
  - geo(micro)biology
  - synthesis, transformation, accumulation & mobilisation, degradation, sequestration
- Global change
  - greenhouse gas production & consumption
  - proxy indicators
  - alterations of biogeochemical processes
- Isotopes
  - tracers of biogeochemical processes
- Modelling & budgeting
  - transport
  - reactions
  - scenarios

## 15. Atmospheric Processes and Interactions with the Biosphere

Christof Ammann, Stefan Brönnimann, Lutz Merbold, Peter Waldner

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

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. Exchange and feedback processes are of key interest, but also case studies of specific chemical, physical or ecosystem processes are welcome, as well as insights from long-term monitoring and larger research infrastructures like e.g. ICOS-CH.

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.

## 16. Phenology and seasonality

Martine Rebetez, Christian Rixen, This Rutishauser

*Swiss Commission for Phenology and Seasonality (CPS)*

The timing of the seasons is important to many bio-geoscientific systems. Across disciplines, data sources and methodological approaches, phenology often is a dominant factor for understanding underlying processes.

In this session, we welcome all studies related to the timing of biotic and abiotic events, in particular contributions directly related to Switzerland and the Alpine region. We are looking for contributions that present seasonality changes based on recent plant and animal phenological observations, historical documentary sources, or seasonality measurements using climate data, remote sensing, flux measurements or modelling studies. 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 5th «Schweizer Wettbewerb für Phänologie und Saisonalität».

## 17. Earth Observation addressing key Earth System processes

Stefan Wunderle, Mathias Kneubühler, Brigitte Buchmann, Alain Geiger

*Swiss Commission for Remote Sensing, Swiss Geodetic Commission*

During the symposium we expect overviews and in-depth presentations 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, ocean, as well as the solid Earth. Monitoring aspects such as Essential Climate Variables (ECVs), supporting missions and programs from national and international organizations and agencies are invited to be presented, too.

## 18. Geoscience and Geoinformation - From data acquisition to modelling and visualisation

Nils Oesterling, Adrian Wiget, Massimiliano Cannata, Michael Sinreich

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

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, GIS handling and visualisation of such data gives a better understanding of the respective problem setting.

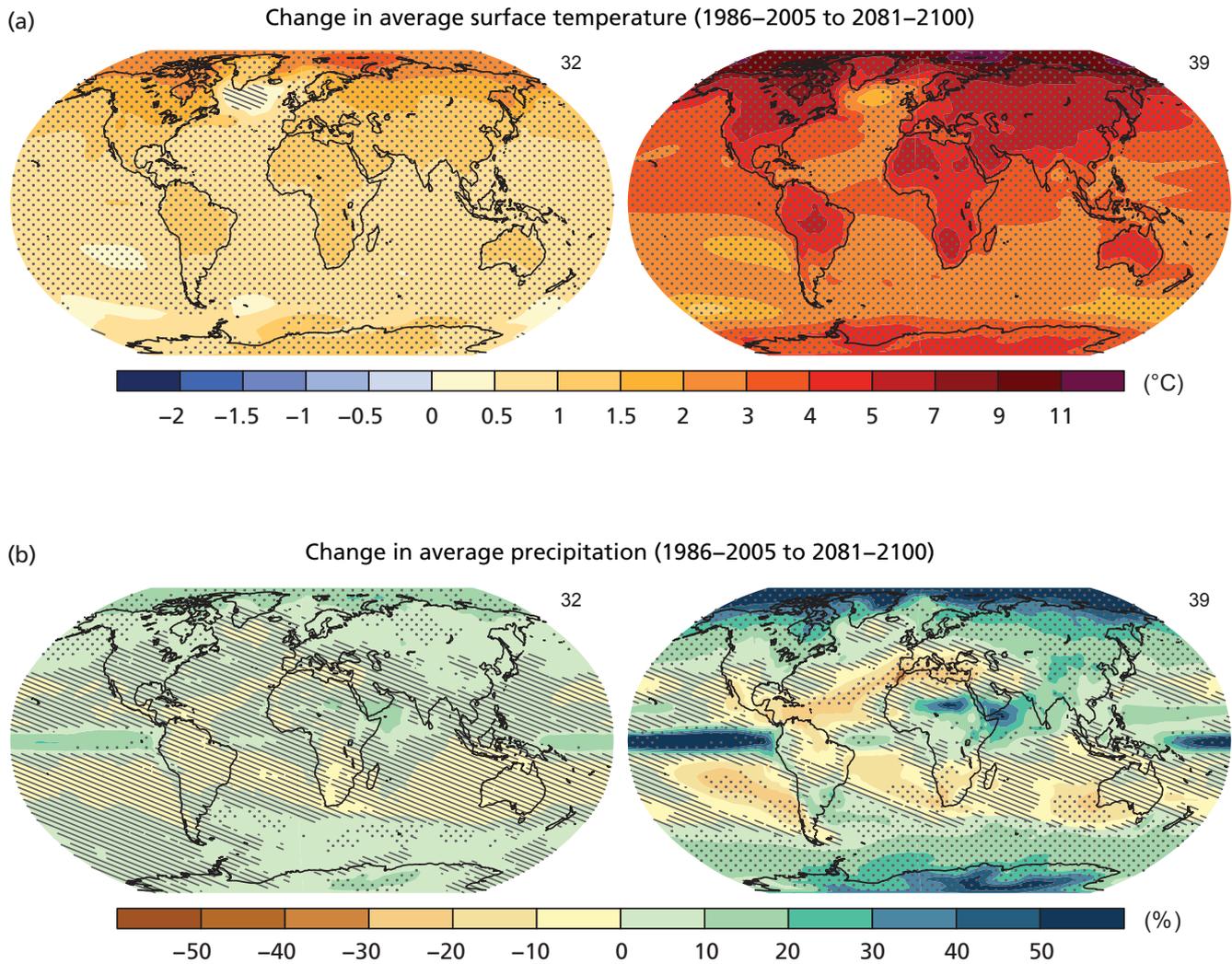
In this symposium papers related to geospatial applications in all geosciences (geodesy, geophysics, geology, hydrogeology, engineering geology, geomorphology, etc.) will be presented. The focus will be on the following topics:

- Development and application of digital tools for 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 «Modelling the Earth», e.g. data models, modelling techniques, exchange of data and models, visualisation and analysis of models, etc. are especially welcome this year.

RCP 2.6

RCP 8.5



#### Legend for cover pictures:

The cover pictures are details of the figure above showing projected temperature and precipitation changes by the end of the 21st century under a strong climate mitigation scenario (left) and a business-as-usual scenario (right): Coupled Model Intercomparison Project Phase 5 (CMIP5) multi-model mean projections (i.e., the average of the model projections available) for the 2081–2100 period under the RCP2.6 (left) and RCP8.5 (right) scenarios for (a) change in annual mean surface temperature and (b) change in annual mean precipitation, in percentages. Changes are shown relative to the 1986–2005 period. The number of CMIP5 models used to calculate the multi-model mean is indicated in the upper right corner of each panel. Stippling (dots) indicates regions where the projected change is large compared to natural internal variability (i.e., greater than two standard deviations of internal variability in 20-year means) and where at least 90% of the models agree on the sign of change. Hatching (diagonal lines) indicates regions where the projected change is small compared to natural internal variability (i.e., less than one standard deviation of natural internal variability in 20-year means). (Source: Adapted from Figure SPM.8 of IPCC, 2013: Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1–30, doi:10.1017/CBO9781107415324.004.)