

Summer School on Geomorphology: Complex Response of Earth Surface Processes to Environmental Change

General information

Date and duration: 2010, 6 days

September 26 to October 2, 2010

Venue: Kernsmühle, historical mill (1560 AD) with conference facilities

City: Heimbuchenthal (70 km from Frankfurt International Airport)

Application details: coming soon on <http://www.ak-geomorphologie.de/organisation/junge-geomorphologen>

Applicants

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Enclosures

- **Proposal (this document):** including summary, detailed explanation, organization and costs.
- **Appendix:** Program and time table, participants and CV of applicants.
- **Letters of support:**
 - Prof. R. Dikau, head of German Working Group on Geomorphology (AK Geomorph).
 - Prof. H.-R. Bork, president of the German Association of Geography (DGFG).
 - Dr. M. Keiler und Dr. A. Kellerer-Pirklbauer, head of Austrian Research Group on Geomorphology and Environmental Change (Austria Geomorphologie).
 - Prof. R. Delaloye, head of Swiss Geomorphological Society (SGMG).
 - Prof. M. Fort, president of the Association of French Geomorphologists and ex vice president of the International Association of Geomorphologists (IAG).

English summary

Geomorphological research plays a key role in a rapidly evolving field of research that focuses on Earth surface dynamics. In times of global change, geomorphology can act to improve the understanding of physical, biological, chemical and anthropogenic processes and their interactions which form and transform the earth surface. Reductionist concepts that help to model particular phenomena and processes have evolved fast over the last decade. We outline that complexity research shows a way to coalesce reductionist concepts into a more general understanding of earth surface dynamics.

The 1st Mid-European Summer School on Geomorphology (SSOG) brings together a team of young aspiring scientists and renowned complexity researchers from different scientific disciplines and backgrounds. The SSOG will address theory building, the derivation of hypotheses, data gathering and analysis as well as upscaling and modeling strategies in the context of complexity research. In a “hands on” approach at the research supersite “Kirschgraben”, the participants are introduced to novel methodological approaches such as OSL-dating, anthracology, laserscanning, 3D near surface geophysics, data processing and landscape evolution modeling (using CAESAR).

Next to the excellent learning environment, members of the SSOG will be given the opportunity to establish contacts with key players in international complexity research. We expect that the SSOG will be a stepping stone for young scientists into this rapidly evolving field of research and will help to boost the scientific career of the participants. The SSOG will initialize a series of SSOGs that will particularly focus on specific interactions of complex geomorphological systems with particular poles of interaction, such as the human-environment interaction.

German summary

Die Geomorphologische Forschung nimmt eine integrative Schlüsselfunktion in einem sich rasch entwickelnden Forschungsumfeld zur Dynamik der Erdoberfläche ein. In Zeiten des globalen Wandels besteht ihr Anspruch darin, ein besseres Verständnis der physikalischen, biologischen, chemischen und anthropogenen Prozesse und deren Interaktionen, welche die Erdoberfläche formen und verändern, zu entwickeln. Im Kontext einer raschen Entwicklung reduktionistischer Ansätze, die Einzelphänomene und -prozesse modellierbar machen, zeigt die Komplexitätsforschung Wege auf, um diese zu einem dynamischen Gesamtverständnis der Erdoberfläche zusammenzuführen.

In der 1st Mid-European Summer School on Geomorphology (SSOG) werden junge aufstrebende Wissenschaftlern/-innen mit weltweit renommierten Komplexitätsforschern verschiedener Fachdisziplinen zusammengebracht. Im Kontext der Komplexitätsforschung werden gemeinsam Theorie- und Hypothesenfindung diskutiert, Datenaufnahme und –analyse hinterleuchtet sowie Regionalisierungs- und Modellierungsstrategien entworfen. In einem „hands on“ Ansatz am „research supersite“ Kirschgraben führt die SSOG die Teilnehmer auch in zielführende methodische Ansätze der OSL-Datierung, Anthrakologie, Laserscanning, 3D-Untergrunderkundung, Datenprozessierung und der Modellierung der Landschaftsentwicklung (mit CAESAR) ein.

Die Teilnehmer an der SSOG haben neben einer exzellenten Fortbildung die Möglichkeit zur Kontaktknüpfung zum internationalen Forschungsumfeld. Es wird erwartet, dass die SSOG den Teilnehmern den Eintritt in dieses rasch wachsende Forschungsfeld öffnet und ihre weitere Forschungskarriere positiv beeinflusst. 1st Mid-European Summer School on Geomorphology (SSOG) versteht sich als Auftaktveranstaltung für weitere SSOGs, welche die Vernetzung einer komplex gedachten Geomorphologie mit einzelnen Interaktionsfeldern, wie z.B. der Mensch-Umwelt-Interaktion, näher in den Fokus nehmen.

Appendix I: Program and time table

Background literature, a multidisciplinary data base on the Kirschgraben study site, tutorials (e.g. on SAGA GIS, regression analysis with R etc.), working materials and documents for the “hands on” approaches will be sent to all participants at the 1st of September.

Day 0 (26.9.2010): Arrival

- Arrival (bus shuttle from Frankfurt International airport and train station)
- 19:00 Ice breaker in the historical “Kernsmühle” mill

Day 1 (27.9.2010): Keynote talks on complexity science and geomorphology

Theory:

- Complexity theory, a paradigm to think about systems and scales (K. Fraedrich)
- The role of complexity in process geomorphology and geoarchive geomorphology (R. Dikau)
- Soil layering – a key to analyzing complex behavior of past environments (C. Lorz)

Data gathering:

- Sediment budgets and process characterization in a nonlinear world (P. Houben)

Data analysis/interpretation:

- Temporarily changing Holocene sediment budgets (G. Verstraeten, enquired)
- Interannual, decadal and multidecadal scale climatic variability and geomorphology (H. Viles)

Day 2 (28.9.2010): Data gathering in a complex system

8.30-12.30: Guided field tour to key locations and sediment exposures in the Kirschgraben catchment (A. Kranz, H.-R. Bork)

14.00-18.00: Field work on present process activity and geomorphologic reconstruction, sediment budget and dating methods (*activities are located at several bases in a walking distance in the catchment; small groups of participants rotate from one activity to the next*):

- Introduction the environmental history of the Kirschgraben Catchment (A. Kranz and H.-R. Bork)
- Event-based interpretation of complex fluvial and hillslope archives (H.-R. Bork)
- Enhanced dating and geochemical approaches for complex, multiphase and multiprocess hillslope sediments (M. Fuchs)
- 3D-quantification of sediment bodies with different geophysical approaches to reveal complex internal structures (M. Krautblatter)
- High-resolution terrestrial laserscanning of recent gully erosion (T. Heckmann)

Day 3 (29.9.2010): Data analysis, processing and interpretation

8.30-12.30 Data analysis of terrestrial laser scanning and near surface geophysics (*both topics perform a two hour “hands on” tutorial for 15 participants each*)

- High-resolution laserscanning (T. Heckmann)
- 3D near surface geophysics (M. Krautblatter)

14.00-18.00: Spatial prediction of soil properties (A. Papritz)

- Key lecture: Nonlinear spatial prediction of soil properties from point samples (A. Papritz)
- Discussion: Spatial predictive modeling and interpolation techniques
- Tutorial: Spatial analyses and prediction using SAGA GIS and R

Day 4 (30.9.2010): From observations to modeling

8.30-12.30 Spatial prediction of soil properties (*"hands on" tutorials continued in small groups, supervision by A. Papritz, W. Schwanghart, T. Heckmann*)

14.00-18.00: Deriving a conceptual model

- Key lecture: On the knife's edge between overwhelming complexity and undue simplicity (T. Coulthard)
- Discussion: Conceptual models - finding simplicity in complex systems
- Tutorial: Formulating the basic equations required for a numerical model based on the conceptual models

Day 5 (1.10.2010): Modeling and validation strategies

8.30-12.30: Assessment of model sensitivity to uncertainties of input data and error propagation

- Key lecture: Introduction to CAESAR*, a geomorphologic, numerical model of landscape evolution. Scopes and limitations (T. Coulthard)
- Tutorial: Simulations of the sensitivity of the CAESAR model to uncertainties in the input parameters

14.00-18.00: CAESAR model runs and assessment

- Tutorial: Event-based and spatially distributed hydrological and geomorphological model of coarse sediment transport
- Discussion: Nonlinear model results vs. findings gained in the field, available data and prior interpretations.

(*The Cellular Automaton Evolutionary Slope and River model is an event-based and spatially distributed hydrological and geomorphological model of coarse sediment transport. The numerical engine of the model uses time steps of different lengths and is thus capable of simulating sequences of extreme events on time scales of tens to thousands of years. Catchments tend to respond in a spatially heterogeneous manner and non-linearly to environmental changes owing to the passage of sediment waves, variable local sediment storage and availability, and large- and small-scale thresholds for sediment transfer within each catchment.)

Day 6 (2.10.2010): Plenary session: Process and archive geomorphology in a complex world

Moderation: R. Dikau

8.30-12.30: Plenary session I

- Discussion: The explanatory power of the complex system theory with respect to theory building, the derivation of hypotheses, data gathering/analysis and modelling strategies (R. Dikau).

13.30-14.30: Plenary session II: Joint output

- Discussion: Joint article (geomorphology or so) on the topic of the summer school based on the theoretical advances achieved and supported by best practice examples collated during the course of the summer school.

Departure from the venue will be after the coffee break.