GEOMOD 2016 SESSIONS

S1- Geodynamics:

Geodynamics involves processes that may be either very fast or extremely slow (earthquakes vs. oceanic plate cooling), multi-scale and depth-dependent, which limits their study from an observational-only prospect. This is why both analogue and numerical modelings play an essential role to test hypothesis on the physics and evolution of geodynamic processes. The ongoing development of computational andanalysis capabilities in both numerical and analogue simulations allows for an improvement of the spatial and temporal resolutions and helps reducing the gap between small-scale and large-scale deformations, which results in a fast-improvement of the understanding of geodynamic problems. In this session, we invite contributions highlighting the state-of-the-art in analogue and numerical modelings of geodynamic processes, which include, but are not limited to, deformation of the lithosphere, subduction, rifting, mantle convection, and plumes. Contributions that use the joint numerical-analogue modeling approaches are particularly welcome.

Conveners:

Thibault Duretz (University of Lausanne, Switzerland) and Laetitia Le Pourhiet (University Pierre et Marie Curie, Paris).

Keynote speaker:

The impact of Wilson Cycle inheritance on continental rifted margins.

Susanne Buiter (Norway Geological Survey, Norway) - susanne.buiter@ngu.no

S2- Coupling Tectonic and Surface processes:

Tectonic deformation and climate-driven erosion control the shape and evolution of continental topography. In turn, landscapes and sedimentary records offer valuable archives of the dynamics of these processes and of their potential couplings. However, unravelling the respective influence of mantle or lithosphere dynamics,erosion, sedimentation, climatic changes and structural inheritance remains a major challenge in the Geosciences. This partly results from a lack of understanding of how integrating short- and fine-scale processes into the big picture of topography building, basin development and structural evolution. To address this issue, numerical and experimental modelling is required both to refine our understanding of the dynamics of the Earth's surface and sub-surface and to guide future geophysical, geochemical and field-based observations. To this session, we welcome studies that develop one or both approaches, as well as innovative contributions addressing technical and theoretical challenges. We particular warmly welcome studies 1) that model processes occurring on short time scales (earthquakes, typhoons or floods) or on fine spatial scales (fracturing, landsliding or river avulsion) or 2) that integrate these short- or fine-scale processes into longer- or larger-scale models to investigate how the wide spectrum of couplings between deformation, climate and surface processes shape the Earth's topography.

Conveners:

Philippe Steer (University of Rennes, France) and Oriol Ferrer (University of Barcelona, Spain).

Keynote speaker:

Scale-independent self-organization in channelized transport systems.

Chris Paola (University of Minnesota, USA) - cpaola@umn.edu

S3 - Volcanoes: from the plumbing system to the eruptive plume:

Eruptions dynamics is controlled by magma discharge rates and by magma physical properties when reaching the Earth's surface. Magmas are complex 3 phases mixtures of liquid, gas and crystals. Their physical properties and their ability to reach the surface depend not only on their composition but also on how they interact with the crust during their journey from depth. Experimental, analytical and numerical approaches are required to capture the physics of magma transfer and stalling in the crust, the building and destruction of volcanic edifices, and the transport of the erupted products at the Earth's surface or in the atmosphere. Models should aim to explain and reconcile a diversity of geological, geophysical and geochemical observations characterized by various uncertainties. This session welcomes contributions describing progresses in volcano and volcanic hazard modeling, and that relies on improved model complexities, on the integration of physical observations, or on the characterization of uncertainties.

Conveners:

Francesco Maccaferri (GFZ, Potsdam, Germany) and Catherine Annen (University of Bristol, U.K.).

Keynote speaker:

Shallow magmatic intrusions in planetary crusts.

Chloe Michaut (IPGP, Paris, France) - michaut@ipgp.fr

S4- Seismic cycle & Earthquake dynamics:

Destructive earthquakes, like the Haiti earthquake (2010, Mw=7, >230000 deaths), Tohoku earthquake (2011, Mw=9.1, >15000 deaths) or the recent Nepal earthquake (2015, Mw7.8, > 9000 deaths), generate heavy human, economic and environmental losses. A better understanding of these natural disasters represents, then, a major societal and scientific challenge. Nowadays, new technological advances in satellite imagery measurements as well as the development of dense geodetic and seismologic networks allow now for detailed analyses of surface kinematics associated with these deformation phases. Earthquake study faces, however, major limiting factors related to the difficulty to access the deep source of earthquake and to integrate the characteristic time scales of deformation processes that extend from seconds to thousands of years. Numerical and analog modeling are often the only and best approaches to interpret the observations and improve our understanding of such geological processes. All contributions dealing with the seismic cycle, earthquake dynamics, seismic source processes, active fault kinematics, co-seismic surface deformations, ... are more than welcome.

Conveners:

Rodolphe Cattin (University of Montpellier, France) and Matthias Rosenau (GFZ German Research Centre for Geosciences, Potsdam, Germany).

Keynote speaker:

Dynamics of crustal deformation and seismicity, a Himalayan perspective.

Jean-Philippe Avouac (Caltech, USA) - avouac@gps.caltech.edu

S5- Rheology, strain localization, folding and faulting:

The deformation of the lithosphere beyond elastic limits is strongly nonlinear and involves material damage leading to ductile and/or viscous flow. The damage typically results in

strain localization, fracturing, folding, and faulting. These are complex processes that are sensitive to rock-mechanic properties that in turn depend on the rock type, loading conditions, temperature, presence of fluids. Laboratory rock tests, field studies as well as analogue and numerical modeling conducted at different time and length scales help to understand these processes. A topical issue here is the question of strain localization at the origin of faulting. Another key problem is a definition of constitutive laws from both experimental and theoretical studies considering the scale issues. These laws are implemented into numerical codes and taken into account when scaling analogue models. In this session, we welcome papers on all the aforementioned approaches and particularly those (1) contributing to better understand/describe the rheology of lithosphere and its layers, (2) focusing on the quantification of the mechanical parameters governing strain localization, (3) addressing the scaling problems in both analogue and numerical modeling.

Conveners :

Frantz Maerten (Schlumberger-MpTC, France) and Marcel Frehner (ETH, Switzerland).

Keynote speaker:

Experimental analysis of strain transients in a heterogeneous semi-brittle system: Implications for tectonics.

Jacqueline Reber (Dept. of Geological and Atmospheric Sciences Iowa State University, USA) - jreber@iastate.edu

S6- Dynamics of sedimentary Basins, Fluids & Georeservoirs:

Surface sedimentary rocks are the locus of many human underground activities. Industrial issues concern the exploration, extraction, and storage of hydrocarbons, heat, nuclear waste, or CO2, while societal issues point to the evaluation of the environmental risk (pollution, seismicity, soil stability). The sedimentary records also give first order informations about plate tectonics, relief dynamics and paleoenvironement evolution. In all cases, modeling techniques are challenged to improve their efficiency and/or precision in order to simulate more completely the various data (surface, wells, seismics). Numerical modeling techniques face the challenges of integrating pore pressure, fluid flow, temperature and chemical reactions in highly strained media with large displacement jumps (faults), in particular in 3D. Complementary physical modeling techniques are now developing towards more quantitative protocols and measurements, and better controlled rheologies. This session welcomes contributions involving numerical or physical basin modeling to study basin formation and deformation (including fold-and-thrust belts and accretionary prisms), the structural and thermal evolution of georeservoirs, or the fluid production and migration, from both fundamental and industrial perspectives.

Conveners:

Jean-Claude Ringenbach (Total, France) and Giacomo Corti (NRC, Roma, Italy).

Keynote speaker:

On the use (and potential abuse) of models in Earth Science with application to inferring sedimentary basin dynamics.

Guy Simpson (University of Geneva, Switzerland) - Guy.Simpson@unige.ch