

COURSE FEES

Registration deposit	50 €
Students*	20 €
External	40 €

*Including PhD students. Employees and students of the University of Potsdam are exempted from the fee

REGISTRATION (max. 16 participants)

For registration please write an email to the course organizer Dr. Henry Wichura.

wichura@geo.uni-potsdam.de

Once you have the registration you will be informed about the payment modalities.

ORGANIZER

“StRATEGy” Coordination Office

Dr. Henry Wichura

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Webpage. <http://www.irtg-strategy.de>

LECTURER

Dr. Sascha Brune (GFZ Potsdam)

Sascha has been applying numerical models to solve geodynamic problems on topics like continental rifting, mantle convection, ductile shear zone formation, and tsunami propagation. He gained his PhD in the field of geophysics at 2009 (GFZ Potsdam / University of Potsdam). He worked as a post-doc on rifted margin formation at GFZ Potsdam and developed techniques to analyse tectonic reconstructions at the University of Sydney during a Marie Curie fellowship. Since 2016 he is leading the Helmholtz young investigators group CRYSTALS at GFZ Potsdam, which focuses on continental rift dynamics across the scales.

MSc. Anne Glerum (GFZ Potsdam)

Anne uses finite element codes to explore geodynamic processes in both global and regional context. During her PhD she extended ASPECT for application to complex models of lithospheric subduction, including nonlinear, viscoplastic rheologies and realistic, data-driven set-ups. With these models she investigated the control mantle dynamics exert on the present-day crustal deformation of the Eastern Mediterranean. As part of the CRYSTALS group, she works on regional- and local-scale models of the East African Rift System.

INTRODUCTION TO GEODYNAMIC MODELLING

MAY 15-18, 2018

8-5 pm

S. Brune
A. Glerum

COURSE OBJECTIVES

Earth is constantly being shaped by geodynamic processes that deform the crust and mantle of our planet. Since the majority of these processes takes place at unreachable depths or over long time scales, our understanding of them is largely based on indirect geological and geophysical observations. Geodynamic modelling has the potential to link these observations using additional knowledge from rheology, continuum mechanics, and computer sciences in order to elucidate the geodynamic processes at play. This course will provide an introduction to geodynamic modelling by combining the following topics: rheology on geological time scales, lithospheric strength profiles, plate tectonic reconstructions as a link between regional and global scale geodynamics, analogue and numerical modelling concepts, an introduction to continuum mechanics, numerical solution strategies and their application in solid Earth deformation, and the role of initial and boundary conditions in modelling. The course involves both lectures and hands-on modelling exercises. The latter will employ the open-source geodynamic modelling software ASPECT and will cover key geodynamic processes: mantle convection, continental rifting, and subduction. The course is suitable for master and PhD students of geosciences and previous experience in computational geophysics or numerical modelling methods is not required.

COURSE PROGRAM

TUESDAY/WEDNESDAY MAY 15th/16th

Introduction to Solid Earth Deformation

- Introduction to the course
- Rheology on geological time scales
- Lithospheric strength profiles
- Modelling concepts (analogue, numerical, mathematical, data-driven)
- ASPECT setup and environment

THURSDAY MAY 17th

Basics of numerical forward modelling

- Introduction to continuum mechanics
- Numerical solution strategies and their application in solid Earth deformation
- Using ASPECT for geodynamic modelling
- Applying ASPECT to subduction modelling

FRIDAY MAY 18th

From regional to global scale and back

- The role of initial and boundary conditions in modelling
- Plate tectonic reconstructions as a link between regional and global scale
- Basics of mantle convection modelling
- Applying ASPECT to rift modelling
- Wrap up and summary

LOCATION

University of Potsdam Campus Golm
8-12am lecture House 29 Room 0.25
1-5pm exercise House 24 Room 0.06/0.07

SOFTWARE REQUIREMENTS

ASPECT (<https://aspect.geodynamics.org>)
GPlates (<https://www.gplates.org>)
MATLAB

LITERATURE

Taras Gerya: Introduction to numerical geodynamic modelling

Bangerth et al: ASPECT – the Manual

The main ASPECT papers:
Kronbichler, M., Heister, T., and Bangerth, W., 2012, High accuracy mantle convection simulation through modern numerical methods: Geophysical Journal International, v. 191, p. 12–29, doi: 10.1111/j.1365-246X.2012.05609.x.

Heister, T., Dannberg, J., Gassmüller, R., and Bangerth, W., 2017, High accuracy mantle convection simulation through modern numerical methods – II: realistic models and problems: Geophysical Journal International, v. 210, p. 833–851, doi: 10.1093/gji/g-gx195.