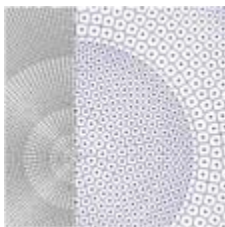


Our main research focus is the development of numerical methods for computing seismic wave propagation and rupture processes, while tomographic methods (e.g. finite difference method, pseudospectrals, finite elements, finite volumes) allow us to account for the three-dimensional character of Earth models and wave fields. Adopting these methods leads to computationally complex programs which require high performance computers to calculate realistic models. This requires standard program development to be accompanied by algorithm parallelization in using the message passing standard (MPI). The developed algorithms are, in particular, applicable in

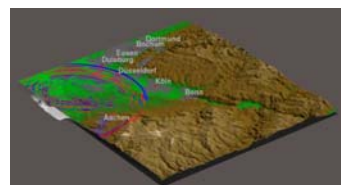
- ♦ Computation of earthquake scenarios in seismically active regions.
- ♦ Simulation of global wave fields for spherical geometries.
- ♦ Apprehension of rupture processes, which have not yet been fully understood.
- ♦ Volcanic seismology, where simulation technology will allow modeling of the complex nature of seismic sources, their topography and structure.

We also observe and model rotational motions induced by earthquakes via novel ringlaser technology. We also benefit from the **Seismological Observatory** in Fürstenfeldbruck which is part of the worldwide seismological network (GSN).

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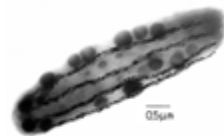


Earthquake simulation (left), computational grids (above).

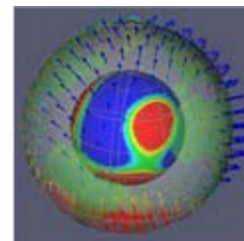


Our research goals include:

- ♦ **Plate tectonic reconstructions** of the Earth in the geological past and quantification of deformation kinematics within orogenic belts - crucial for better understanding plate tectonic and mountain building processes.
- ♦ **Geomagnetic field behavior** reflects the magneto-hydrodynamic state of the Earth's liquid outer core and thus helps to elucidate the origin of the magnetic field.
- ♦ **Magnetostratigraphy** is a powerful tool to date fossil-poor sediments and quantify sedimentation rates, in turn providing information on basin development and the balance between erosion and uplift of mountains.
- ♦ **Biomagnetism:** How do organisms, such as magnetotactic bacteria, interact with the geomagnetic field? Our studies include the biophysical mechanisms of magnetic field reception in higher organisms, which requires interdisciplinary collaboration with microbiology, biophysics and neurophysiology.
- ♦ **High-pressure mineral physics:** How do extreme pressures influence the electromagnetic properties of geomaterials? Our diamond anvil cells are designed to answer such questions.
- ♦ Detailed **rock magnetic** characterization is essential for understanding magnetic signals recorded within rocks and ensure their recording fidelity. Our labs are well equipped with state-of-the-art instruments to help elucidate compositions and grain sizes of the magnetic particles in earthen materials.

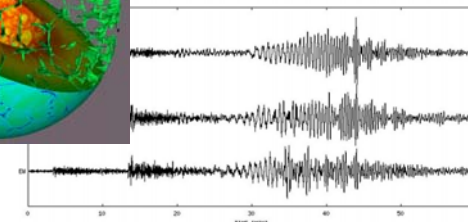
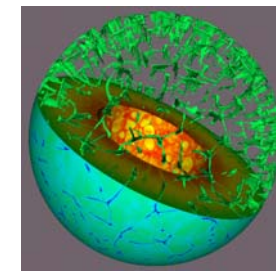


Magnetobacterium bavaricum (left), image of magnetic vectors during a magnetic field reversal (right).



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International Master-of-Science Program in Geophysics



LMU Munich
Dept. of Earth & Env. Sciences

Geodynamics

Goals

- The course is designed to provide a research-oriented study program in geophysics.
- The course allows a specialization in either Geodynamics, Seismology or Paleo- and Geomagnetism.

Basic Information

- The course is offered by the Ludwig-Maximilians-University, one of Germany's elite universities.
- The organization of the course is modular, according to the European Bologna approach.
- ECTS Credits: the course consists of 120 credits, 30 belong to the Master's Thesis and its defense.
- The language of the course is English.
- Degree: Master of Science.
- Duration: 2 years (i.e. 4 semesters), including Master's Thesis.
- Start: winter semester 2010/2011
- Application period: 01. January – 31. May 2010
- Entry qualifications: Bachelor of Science or equivalent degree (i.e. program of at least 6 semesters) in geosciences, geophysics, mineralogy, geology, physics, biology, mathematics, engineering sciences or related subjects.
- Language proficiency: candidates for the program must provide proof (TOELF, IELTS, CAE, CPE) of very good mastery of the English language.



Dr.-Ing. Marcus Mohr

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Geophysics Section

Theresienstr. 41/IV

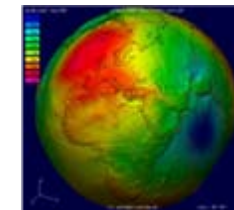
80333 Munich, Germany

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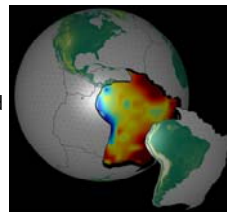
- Detailed information about the course (study program, application procedure, etc.) is available on the geophysics homepage at the following website:

<http://www.geophysik.uni-muenchen.de/>

Geodynamics is concerned with the physical processes that drive mountain building or plate tectonics on the Earth and planets. By nature highly interdisciplinary, Geodynamics provides the link between such diverse areas in the Earth Sciences as tectonics, paleomagnetism, seismology, mineral physics, geochemistry or geodesy. Connections between these fields arise because convection in the Earth's mantle and core is the source of all geologic activity on our planet. Ultimately convection in the Earth and planets reflects their gradual heat loss, as these bodies slowly cool over time. The methods of Geodynamics are firmly rooted in physics, specifically in continuum mechanics. Increasingly computer modeling and modern high-performance parallel computing are gaining ground in order to solve the equations of motion that govern geodynamic processes, although analog models to study physical processes at the laboratory scale are holding their own. Geodynamicists share the growing importance of computer simulations with researchers in other fields. For the coming decade this development, which is driven by rapid advances in computer hardware, promises dramatic progress in our ability to understand many complex Earth processes.



Earth's gravitational field (left), mantle convection and tectonic plate boundaries (right)



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