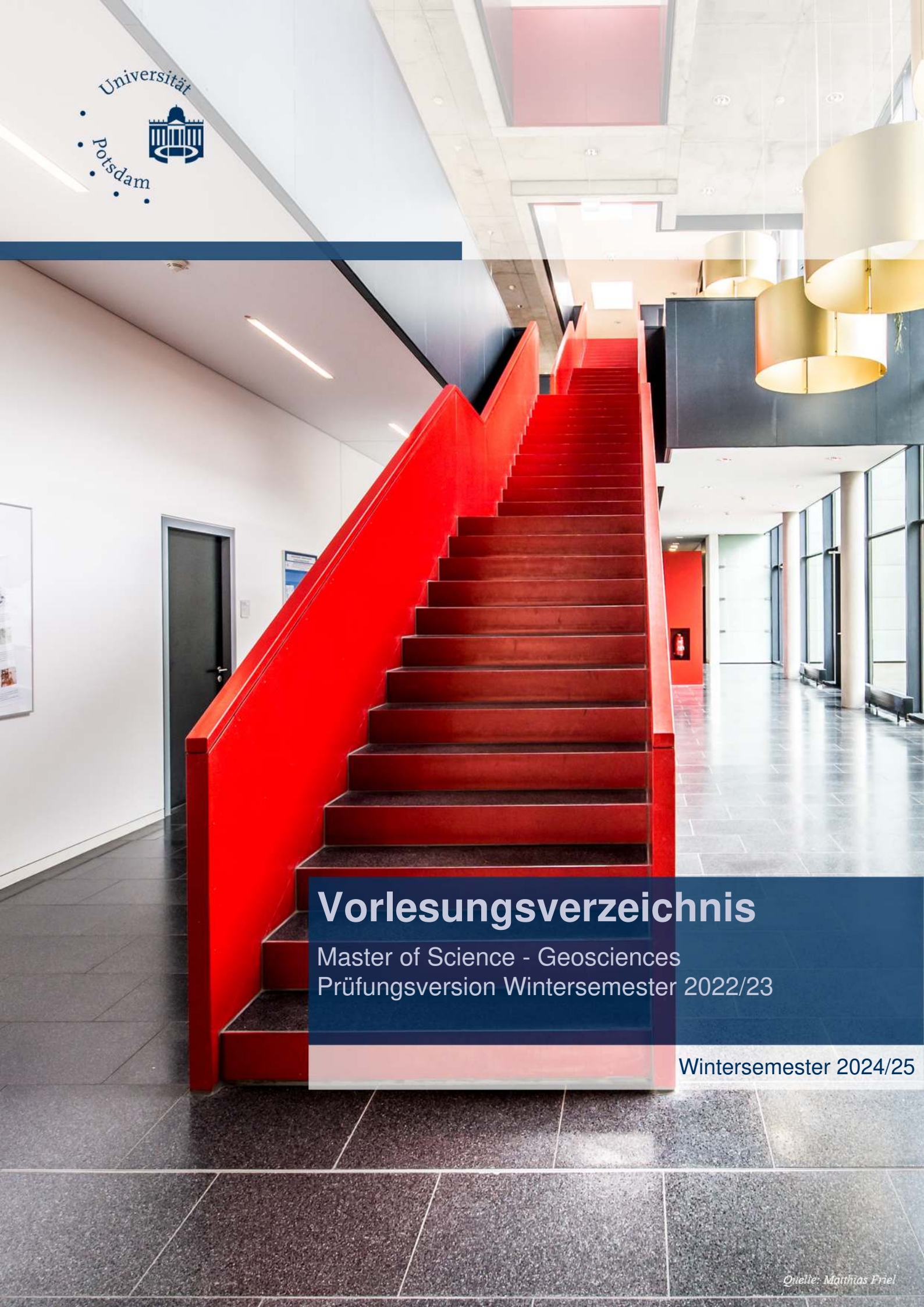

# Vorlesungsverzeichnis

## Master of Science - Geosciences
## Prüfungsversion Wintersemester 2022/23

Wintersemester 2024/25

Quelle: Matthias Friel

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# Abkürzungsverzeichnis

**Veranstaltungsarten**

| | |
|---|---|
| AG | Arbeitsgruppe |
| B | Blockveranstaltung |
| BL | Blockseminar |
| DF | diverse Formen |
| EX | Exkursion |
| FP | Forschungspraktikum |
| FS | Forschungsseminar |
| FU | Fortgeschrittenenübung |
| GK | Grundkurs |
| HS | Hauptseminar |
| KL | Kolloquium |
| KU | Kurs |
| LK | Lektürekurs |
| LP | Lehrforschungsprojekt |
| OS | Oberseminar |
| P | Projektseminar |
| PJ | Projekt |
| PR | Praktikum |
| PS | Proseminar |
| PU | Praktische Übung |
| RE | Repetitorium |
| RV | Ringvorlesung |
| S | Seminar |
| S1 | Seminar/Praktikum |
| S2 | Seminar/Projekt |
| S3 | Schulpraktische Studien |
| S4 | Schulpraktische Übungen |
| SK | Seminar/Kolloquium |
| SU | Seminar/Übung |
| TU | Tutorium |
| U | Übung |
| UN | Unterricht |
| UP | Praktikum/Übung |
| UT | Übung / Tutorium |
| V | Vorlesung |
| V5 | Vorlesung/Projekt |
| VE | Vorlesung/Exkursion |
| VK | Vorlesung/Kolloquium |
| VP | Vorlesung/Praktikum |
| VS | Vorlesung/Seminar |
| VU | Vorlesung/Übung |
| W | Werkstatt |
| WS | Workshop |

**Veranstaltungsrhytmen**

| | |
|---|---|
| wöch. | wöchentlich |
| 14t. | 14-täglich |
| Einzel | Einzeltermin |
| Block | Block |
| BlockSa | Block (inkl. Sa) |
| BlockSaSo | Block (inkl. Sa,So) |

**Andere**

| | |
|---|---|
| N.N. | Noch keine Angaben |
| n.V. | Nach Vereinbarung |
| LP | Leistungspunkte |
| SWS | Semesterwochenstunden |
|  | Belegung über PULS |
| PL | Prüfungsleistung |
| PNL | Prüfungsnebenleistung |
| SL | Studienleistung |
| L | sonstige Leistungserfassung |

# Vorlesungsverzeichnis

## Compulsory Modules

### GEW-MM01 - Topics in Earth System Science

#### 108497 S - Seminar / Topics in Earth System Science

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | S | Mo | 10:15 - 11:45 | wöch. | 2.27.2.24 | 14.10.2024 | Prof. Dr. Maria Mutti, N.N., Dr. Benjamin Rendall |
| 1 | S | Di | 08:30 - 11:45 | wöch. | 2.27.2.36 | 15.10.2024 | Prof. Dr. Bodo Bookhagen |
| 1 | S | Di | 12:30 - 14:00 | wöch. | 2.27.2.24 | 15.10.2024 | Prof. Dr. Martin Trauth, Dr. Manfred Mudelsee, Dr. Markus Lothar Fischer |
| 1 | S | Di | 14:15 - 15:45 | wöch. | 2.27.2.24 | 15.10.2024 | Dr. Matthias Ohrnberger, Alea Joachim, Emilio José Marcelo Criado Sutti |
| 1 | S | Do | 12:30 - 14:00 | wöch. | 2.27.2.24 | 17.10.2024 | Prof. Dr. Jens Tronicke, Sophie Stephan, Dr. Julien Guillemoteau, Dr. rer. nat. Philipp Koyan |
| 1 | S | Do | 14:15 - 15:45 | wöch. | 2.27.2.24 | 17.10.2024 | Prof. Dr. Pieter van der Beek |
| 1 | S | Fr | 12:30 - 14:00 | wöch. | 2.27.2.07 | 18.10.2024 | Prof. Dr. Max Wilke, Prof. Dr. Patrick O'Brien, Dr. Melanie Jutta Sieber, Dr. Martin Jan Timmerman, Christoph Moeller |

**Kurzkommentar**

Students are expected to attend the weekly seminars in the working group of their choice.

**Leistungen in Bezug auf das Modul**

PNL 576222 - Arbeitsgruppenseminar (unbenotet)

#### 108498 SK - Kolloquium / Topics in Earth System Science

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | SK | Mo | 16:15 - 17:45 | wöch. | 2.27.0.01 | 14.10.2024 | Prof. Dr. Martin Trauth, Prof. Dr. Jens Tronicke, Professor Edward Sobel, Prof. Dr. Maria Mutti, Prof. Dr. Frank Krüger, Prof. Dr. Max Wilke, Prof. Dr. Patrick O'Brien, Prof. Dr. Bodo Bookhagen, Prof. Dr. Pieter van der Beek |

**Leistungen in Bezug auf das Modul**

PNL 576221 - Kolloquium und Diskussion (unbenotet)

### GEW-MM02 - Project Practical or Research Internship



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**108499 FP - Project Practical or Research Internship**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | PR | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Jens Tronicke, Prof. Dr. Martin Trauth, Prof. Dr. Max Wilke |

**Kommentar**

Project practicals or internships have to be organized individually. Once, you found a place you need to register it with the examination board to have it approved.

see: https://www.uni-potsdam.de/en/geo/study/examinationcommittee-1-1

**Leistungen in Bezug auf das Modul**

SL 576231 - Praktikum (35 Tage oder 280 h) (unbenotet)

**108500 S - Project Practical or Research Internship (Seminar)**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | S | Do | 16:15 - 17:45 | 14t. | 2.27.2.36 | 24.10.2024 | Prof. Dr. Max Wilke, Prof. Dr. Martin Trauth, Prof. Dr. Jens Tronicke |

**Kommentar**

In dem Seminar zu diesem Modul muss der Vortrag über das geleistete Praktikum gehalten werden. Dieser ist neben dem erfolgreichen Bericht nötig, um das Modul abzuschliessen. Er kann nicht durch einen Vortrag in der Praktikumsinstitution ersetzt werden.

**Das Seminar startet am 24.10.24 und findet 14-tägig statt.**

**Bitte melden Sie sich per e-mail bei Frau Heidemann, um einen Vortragstermin zu reservieren (sekretariat@geo.uni-potsdam.de).**

Der Vortrag ist nach dem Praktikum zu halten. Der Bericht sollte am Tag des Vortrags abgegeben und durch den Betreuer akzepiert sein (Bestätigung des Betreuers durch e-mail), kann aber auch vor Abgabe des Berichtes geahlten werden. Der Vortrag sollte eine Länge von ca. 10 min haben, danach können Fragen gestellt werden.

Bitte melden Sie sich nur zum Modul an, wenn Sie den Vortrag in diesem Semester halten wollen.

Weitere Infos zum Projektpraktikum auf der Webseite des Prüfungsausschuss.

In this Seminar of the module a talk has to be given about the internship. This talk and a successful report is needed to finalize the module. The talk cannot be replaced by one given at the institution of internship.

**Seminar will start on 24.10.24 and takes place every other week.**

**Please, register by e-mail with Mrs. Heidemann to reserve a slot for your talk (sekretariat@geo.uni-potsdam.de).**

The talk needs to be given after the internship. The report should be submitted by the date of the talk and it should be accepted by the internship's supervisor (confirmation e-mail by supervisor). The talk can be also given before submission of the report. The talk should be 10 min long, afterwards questions can be posed. Please, only register for the module and seminar if you are determined to give the talk in the current term. Further info on the "project practical research internship" can be found on the webpage of the examination board.

**Leistungen in Bezug auf das Modul**

SL 576232 - Seminar (unbenotet)

# Core Modules

**GEW-MC01 - Sedimentary Earth System Record**

**108502 VU - Sedimentary Earth System Record**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 10:15 - 11:45 | wöch. | 2.27.1.10 | 16.10.2024 | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |
| 1 | VU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |

**Leistungen in Bezug auf das Modul**

PNL 575941 - Vorlesung und Übung (unbenotet)

**108503 PU - Sedimentary Earth System Record (field practicals)**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | PU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |

**Leistungen in Bezug auf das Modul**

PNL 575942 - Exkursion (unbenotet)

## GEW-MC02 - Tectonics and Geodynamics

**108504 VU - Tectonics and Geodynamics**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 08:30 - 10:00 | wöch. | 2.27.2.07 | 14.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Sascha Brune |
| 1 | U | Mo | 10:15 - 11:45 | wöch. | 2.27.2.07 | 14.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Sascha Brune |

**Kommentar**

**Contents**

This module aims to familiarize students with current concepts concerning the structure and mechanical behavior of the lithosphere, in relation to its thermal structure and rheology. Covered subjects include: the forces driving plate tectonics, the rheology of the lithosphere, the dynamics of orogenic processes, numerical modeling of lithospheric deformation, and the couplings of mantle dynamics and surface processes.

**Qualification goals**

Students:

- gain an understanding of the structure and dynamics of the lithosphere and the forces that drive its deformation

- gain familiarity with modern quantitative methods for observing and modeling the deformation of the lithosphere and its driving forces.

- learn to analyze modern research questions in tectonics and geodynamics by studying the literature on a chosen topic.

**Literatur**

Textbooks:C.M.R. Fowler, The Solid Earth: An Introduction to Global Geophysics (2nd Ed.). . D. Turcotte & G. Schubert, Geodynamics (3rd Ed.). . Additional background papers (available on Moodle)

**Leistungen in Bezug auf das Modul**

PNL 575951 - Vorlesung und Übung (unbenotet)

## GEW-MC03 - Data Analysis and Statistics



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### 108506 VU - Data Analysis and Statistics (MS GSC)

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mi | N.N. | wöch. | N.N. | N.N. | Prof. Dr. Martin Trauth |
| | Zeit nach Absprache / Time slot tbd | | | | | | |
| 1 | U | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Martin Trauth |
| | Zeit nach Absprache / Time slot tbd | | | | | | |

**Kommentar**

This is course includes an introduction to a higher-level programming languages such as MATLAB, Python and Julia; overview of data types and methods; one-, two-, and multi-variable statistics; time series analysis; statistics for spatial and directional data; numerical procedures; image processing and analysis. The course is based on the instructor's textbooks available for free.

**Literatur**

Trauth, M.H. (2024) MATLAB Recipes for Earth Sciences – 6th Edition. Springer International Publishing.

Trauth, M.H. (2024) Python Recipes for Earth Sciences – 2nd Edition. Springer International Publishing.

**Bemerkung**

The course has two parts:

- weekly Zoom lectures and demonstrations, date to be determined.
- a one-week practical in person after after the term, date to be determined.

You can also study the course at any time using my books and the recorded lectures. Please write me an email if you prefer asynchronous learning and we will find a way.

**Leistungen in Bezug auf das Modul**

PNL 575961 - Seminar und Übung (unbenotet)

## GEW-MC04 - Advanced Field Practical

Für dieses Modul werden aktuell keine Lehrveranstaltungen angeboten

## GEW-MC05 - Theoretical Geophysics

### 108508 VU - Theory of elastic seismic waves

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 08:30 - 10:00 | wöch. | 2.27.2.36 | 17.10.2024 | Prof. Dr. Torsten Dahm |
| 1 | U | Do | 10:15 - 11:45 | wöch. | 2.27.2.36 | 17.10.2024 | Prof. Dr. Torsten Dahm |



Abkürzungen entnehmen Sie bitte Seite 6

**Kommentar**

The course *Theory of Elastic Waves* provides a basic introduction to the theory of wave propagation, needed to understand observations and to interprete seismological data. One focus is on the mode description of body and surface waves. Fundamentals of elasticity theory and elementary solutions of the wave equation are presented in detail. I start with a one-dimensional description of waves on a string, to explain key features of free oscillation and wave modes on ”membranes” (layers). Thereby, fundamental mathematical approaches and representation theorems are introduced. Later, we come to the reflection and refraction of seismic plane waves at plane boundary layers, to guided waves and seismic surface waves. The theory of seismic sources is not covered here, as the material is extensively taught in my course *Rupture Processes in Seismology and Volcanology* .

Seismological analysis techniques applied to body and surface waves are described and learned with computer practicals. Examples are: Interpreting and classifying body and surface waves, recognising near and far field signals, converting pressure to ground displacement on the seabed, calculate synthetic seismograms for the Earth, amplitude ratios and polarisation of waves on the surface, true and apparent polarisation, estimation of velocity structure from spectral ratios, ambient vibration and seafloor compliance methods, dispersion analysis of surface waves, detection of anelastic damping and attenuation tomography.

Potsdam, 3 September 2023, Torsten Dahm

**Voraussetzung**

- Bachelor in Geophysics / Physics / Geosciences

- Basics in physics, math and programming

**Literatur**

Dahm, T. Seismology II: body and surface waves. Lecture notes, ca. pp. 230. (will be provided as pdf)
Müller, G. (2007): Theory of elastic waves, (Scientific Technical Report STR ; 07/03), 228 S. https://doi.org/10.2312/GFZ.b103-07037
Aki, K.; Richards, P. (2002). Quantitative Seismology. University Science Books
Lay, Th.; Wallace, T.C. (1995). Modern Global Seismology. Academic Press

**Leistungen in Bezug auf das Modul**

SL 575981 - Vorlesung und Übung (unbenotet)

## GEW-MC06 - Geophysical Inversion and Data Analysis

### 108510 VU - Geophysical Inversion

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 12:30 - 14:00 | wöch. | 2.27.2.37/38 | 15.10.2024 | Dr. Matthias Ohrnberger |
| 1 | VU | Mi | 12:30 - 14:00 | wöch. | 2.27.2.37/38 | 16.10.2024 | Dr. Matthias Ohrnberger |

**Kommentar**

Inverse theory can be seen as the mathematical formalisation of the process of data interpretation. It is about the inference of properties (parameters) of a (hypothesized) physical system (model) from observed data.

We know what we (believe to) know about the Earth (and other physical systems) applying inverse problem techniques to those system observables we are capable to measure and quantify. Unfortunately, observations in earth sciences are often noisy, spatially or temporally sparse and sometimes even contradictory or inconsistent. Further, the physical systems we want to describe are often not well understood and thus simplified models are often used to allow quantification at all. It is therefore clear that within inverse problem theory model parameter uncertainty estimates are also of key interest as well as techniques allowing for selecting reasonable/appropriate models from a number of hypothesis regarding the physical system.

In the course, students will be introduced to the principal ideas of the formal treatment of inverse problems and will learn the application of inversion techniques to problems in geophysics and geosciences with hands-on examples.

**Literatur**

1) William Menke, Geophysical data analysis, discrete inverse theory

2) Andreas Fichter, Lecture notes on inverse theory (doi: 10.33774/coe-2021-qpq2j)

**Leistungen in Bezug auf das Modul**

| | |
|---|---|
| SL | 575991 - Vorlesung und Übung (unbenotet) |

## GEW-MC07 - Geophysical Laboratory

### 108511 U - Geophysical Laboratory

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | U | Mo | 12:30 - 15:30 | wöch. | 2.27.2.36 | 14.10.2024 | Dr. Jürgen Matzka, Prof. Dr. Jens Tronicke, Dr. rer. nat. Philipp Koyan, Dr. Julien Guillemoteau |

**Kommentar**

This course is a **core module** of the programe **MSc Geosciences** and is obligatory for students with a specialization in Geophysics. It includes a series of six lab experiments covering selected fundamental topics of applied and general geophysics (e.g., gravity, magnetics, seismology). In addition to the actual experiments and experimental methods, the course conveys basic aspects of analyzing, interpreting, and presenting experimental data and also recaps and deepens some fundamentals of geophysics (additional lectures and exercises offered in a weekly fashion at the beginning of the semester).

The first meeting with an introduction, a detailed overview and time schedule will be on **Monday, Oct 23 at 12:30 (room 2.27.2.36)** .

**Leistungen in Bezug auf das Modul**

| | |
|---|---|
| PNL | 576001 - Laborübung (unbenotet) |

## GEW-MC08 - Advanced Mineralogy-Petrology

### 108512 VU - Advanced Geochemistry

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Fr | 08:30 - 10:00 | wöch. | 2.27.2.49 | 18.10.2024 | Dr. Martin Jan Timmerman |



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**Kommentar**

**Content**

Whereas the geological evolutions of most other stony planets in our solar system have come to a halt billions of years ago, planet Earth, after 4,5 billion years, is still a dynamic system due to a vigorous mantle convection. Moreover, Earth is first and foremost a *chemical* system and using the tools of geochemistry to solve geological problems, we can understand Earth and how it works.

This course will focus on fundamental processes that gave rise to the characteristic geochemical features of the continental crust and the mantle. It will provide essential insights into magmatic processes (differentiation, assimilation and contamination, partial melting), role and use of major and trace elements, geochemical classification of magmatic rocks, variation diagrams, element behaviour during melting and fractionation, simple fractionation and melting models, selected phase diagrams, the structure and mineralogy of the shallow and deep mantle, generation of basaltic magmas at oceanic spreading ridges, oceanic intraplate magmatism, plume magmatism, continental flood basalts, layered mafic intrusions, magmatism in subduction settings (island arcs and continental arcs), granitoids, continental alkaline magmatism, anorthosites. Furthermore, alkaline vs. sub-alkaline rocks: classification, AFM diagram, alumina saturation index. Introduction to dating methods (Rb-Sr, Sm-Nd), isochrons, introduction to the U-Th-Pb system (decay equations, Concordia diagram), the Lu-Hf system in zircon, the geochemical and Sr-Nd-Pb(-Hf) isotope composition of the continental crust and the different mantle reservoirs. The geochemical evolution of the Earth since Precambrian times will be addressed, and standard analytical techniques will be explained.

Similar to studying mathematics or a foreign language, it is no use studying geochemistry without practicing. For this reason, several carefully prepared home works will be offered, which you can solve alone or in a group. Pitfalls and solutions will be jointly discussed in the lecture of the ensuing week. This home work is not compulsory, but it is nevertheless highly recommended to participate.

**The students:**

- gain an understanding of the chemical composition of the Earth and other planets, and the chemical processes that affect them
- gain familiarity with analytical methods used for geochemical analyses
- learn to analyse modern research questions in geochemistry by studying the literature on a chosen topic
- are able to critically analyze scientific literature containing geochemical data
- acquire the ability to critically analyse, interpret and present data.

**Leistungen in Bezug auf das Modul**

SL 576012 - Vorlesung und Übung II (unbenotet)

**110025 VU - Basics of Thermodynamics**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Fr | 10:15 - 11:45 | wöch. | 2.27.2.36 | 18.10.2024 | Prof. Dr. Max Wilke |

**Kommentar**

This course will introduce to the principles of thermodynamics and how they can be used for understanding geological processes. You will learn about the thermodynamical state functions and how they can be determined. We will discuss what controls mineral stability, how mineral reactions can be used to deduce formation conditions of mineral assemblages. All topics will be associated by exercises to enhance understanding.

The course will start on Fr, Oct 18.

Moodlepage: https://moodle2.uni-potsdam.de/course/view.php?id=35856

**Leistungen in Bezug auf das Modul**

SL 576011 - Vorlesung und Übung I (unbenotet)

## GEW-MC09 - Methods in Mineralogy and Petrology

## 108514 VU - Micro-analytical Methods and X-ray Powder Diffraction

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mo | 10:15 - 11:45 | wöch. | 2.27.2.49 | 14.10.2024 | Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth, Christoph Moeller, Georgii Kovalskii |
| 1 | VU | Do | 16:15 - 17:45 | wöch. | 2.27.2.37/38 | 17.10.2024 | Dr. rer. nat. Wolfgang Morgenroth |
| 1 | U | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Martin Jan Timmerman, Dr. rer. nat. Christina Günter |

### Kommentar

This course ‘Micro-analytical Methods and X-ray Powder Diffraction’ consists of two parts in the winter semester: ‘Micro-analytical Methods’ and ‘X-ray Powder Diffraction’. In the following summer semester, there will be additional advanced courses in the module ‘Methods in Mineralogy and Petrology’.

‘X-ray Powder Diffraction’ will start on **XX** in room **XX, XX:XX** h.

‘Micro-analytical Methods’ consists of a lecture and practical hands-on training on the Electron Microscope, Scanning Electron Microscope and Raman. The lecture will be held Mondays at 10:15 in room 2.49 (building 27).

**On Monday, October 17 , we meet at 10:15 in room 2.49 for an overview of the module including a lab tour.** All students interested in this module are asked to attend this meeting as we will also arrange times for the practical hands-on training!!!

Learning goals ‘X-ray Powder Diffraction’:

- refresher in crystallography
- data collection methods in powder diffraction
- information content of a diffraction pattern (profile parameters, structure factors, background)
- least squares method and software for Le Bail- and Rietveld-refinement
- data treatment (data from software tutorials, data collected in practical part)
- practical part: X-ray Powder Diffraction (together with Christina Günter, guenter@geo.uni-potsdam.de )

At the end of the course, you will be able to refine a diffractogram and discuss your results.

Learning goals ‘Micro-analytical Methods’:

- introduction to the following micro - analytical methods: Scanning Electron Microscopy (SEM), Electron Probe Micro Analysis (EPMA, Cathodoluminescence (CL) and Raman
- phase identification, qualitative and quantitative chemical analyses
- understanding limitations, uncertainties, detection limits and errors
- independent interpretation of (mineral) analyses

### Voraussetzung

There are no prerequisites for this course.
Nevertheless, you should have refreshed your knowledge in crystallography on a BSc level before the course starts.

Recommended reading: F. Donald Bloss 'Crystallography and Crystal Chemistry'.
Additionally, at the beginning of the course, we will refresh our knowledge of crystallography.

### Literatur

For the PXRD part, be familiar with the basics of crystallography on a BSc level.
Recommended reading: F. Donald Bloss 'Crystallography and Crystal Chemistry'.

Additionally, at the beginning of the course, we will refresh our knowledge of crystallography.

### Bemerkung

**Students who would like to participate in 'Micro-analytical Methods' are asked to join us on XX, October XX, at XX:XX a.m. in room XX for an introduction and lab tour.**

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576021 - Vorlesung und Übung I (unbenotet) |

# Consolidation Modules

## GEW-MF01 - Earth Surface Dynamics

### 108515 VU - Earth Surface Processes

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 12:30 - 14:00 | wöch. | 2.27.2.07 | 15.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Taylor Schildgen |
| 1 | VU | Di | 14:15 - 15:45 | wöch. | 2.27.2.07 | 15.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Taylor Schildgen |

**Kommentar**

**Contents**

This course deals with the dynamics of Earth-surface processes: erosion, transport and deposition on slopes, by rivers and glaciers. Physical and mathematical models describing these processes are presented and analyzed using available field observations. In addition, the course examines the couplings between tectonics and climate-driven surface processes in landscape evolution. Topics are explored in depth through the reading of scientific papers, followed by group discussion and presentation of research topics to groups of students.

**Qualification goals**

Students:

acquire an understanding of the processes that drive erosion and sediment transport at the Earth's surface, as well as tectonically controlled landscape genesis at plate boundaries and tectonically active regions within continents.

become familiar with modern quantitative methods for observing and modeling Earth-surface processes and their controlling factors.

Learn to analyze and synthesize modern research questions in surface processes and their couplings through literature review, presentations, and group discussions.

**Literatur**

**Textbooks** :

R.S. Anderson & S.P. Anderson, Geomorphology: The Mechanics and Chemistry of Landscapes. .

D. Burbank & R.S. Anderson, Tectonic Geomorphology (2nd Ed.), .

P.R. Bierman & D.R. Montgomery, Key Concepts in Geomorphology (2nd Ed.), .

Additional background papers available on Moodle.

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576111 - Seminar und Übung (unbenotet) |

## GEW-MF02 - Sedimentary Processes

### 108516 VU - Modern Carbonates

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 10:15 - 11:45 | wöch. | 2.27.2.07 | 17.10.2024 | Prof. Dr. Maria Mutti, Dr. Jens Kallmeyer, Dr. Benjamin Rendall, N.N. (Mitarbeiter) |
| 1 | U | Do | 12:15 - 13:45 | wöch. | 2.27.2.07 | 17.10.2024 | Prof. Dr. Maria Mutti, Dr. Jens Kallmeyer, Dr. Benjamin Rendall, N.N. (Mitarbeiter) |

**Leistungen in Bezug auf das Modul**

PNL 576121 - Vorlesung und Übung (unbenotet)

## GEW-MF03 - Numerical Analysis and Modelling

### 108517 VU - Remote Sensing of the Environment

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 10:15 - 11:45 | wöch. | 2.27.1.10 | 14.10.2024 | Prof. Dr. Bodo Bookhagen, Sofia Alejandra Viotto |
| 1 | U | Mo | 12:15 - 13:45 | wöch. | 2.27.1.10 | 14.10.2024 | Prof. Dr. Bodo Bookhagen, Sofia Alejandra Viotto |

**Leistungen in Bezug auf das Modul**

PNL 576131 - Vorlesung und Übung (unbenotet)

## GEW-MF04 - Specialization Module-Theory and Applications

### 108518 VU - Mapping and Geoinformation Systems

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Fr | 10:15 - 11:00 | wöch. | 2.25.D0.01 | 18.10.2024 | Dr. Gerold Zeilinger |
| 1 | U | Fr | 11:00 - 11:45 | wöch. | 2.25.D0.01 | 18.10.2024 | Dr. Gerold Zeilinger |
| 1 | SU | Fr | 12:15 - 13:45 | wöch. | 2.25.D0.01 | 18.10.2024 | Dr. Gerold Zeilinger |

**Kommentar**

Main topics are: design of GIS-database, GIS content management, data distribution with GIS-servers, integration of modeling results in GIS, analyses of river networks and geomorphic parameters, analysis of structural data, remote sensed imagery interpretation and digital elevation model extraction, integration of LIDAR data and utilization of geological 3D models in immersive visualization environments.

**Leistungen in Bezug auf das Modul**

PNL 576141 - Vorlesung und Übung (unbenotet)

### 108519 VU - Sedimentary Systems Modelling

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 14:15 - 17:15 | wöch. | 2.27.2.36 | 15.10.2024 | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |

**Leistungen in Bezug auf das Modul**

PNL 576141 - Vorlesung und Übung (unbenotet)

### 108520 VU - Rates and Dates of Geological Processes

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 10:15 - 11:45 | wöch. | 2.27.2.07 | 15.10.2024 | Professor Edward Sobel |
| 1 | VU | Do | 12:30 - 14:00 | wöch. | 2.27.2.36 | 17.10.2024 | Professor Edward Sobel |



Abkürzungen entnehmen Sie bitte Seite 6

| Leistungen in Bezug auf das Modul | |
|---|---|
| PNL | 576141 - Vorlesung und Übung (unbenotet) |

**110946 PU - Thematic Field School**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VS | N.N. | N.N. | Einzel | N.N. | N.N. | Prof. Dr. Pieter van der Beek |
| 1 | PU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Pieter van der Beek |
| | Field practical will take place last week of September / first week of October 2024 | | | | | | |

| Leistungen in Bezug auf das Modul | |
|---|---|
| PNL | 576142 - Blockkurs oder Geländeübung (unbenotet) |

## GEW-MF11 - Fundamentals of Digital Seismology

**108523 VU - Digital Seismology**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | N.N. | N.N. | Block | N.N. | N.N. | Dr. Matthias Ohrnberger |

**Kommentar**

The course is part of the module 'Fundamentals of Digital Seismology' (12 ECTS) which is composed of the 'Digital Seismology' class (6ECTS) offered in winter semester and the 'Array Seismology' class (6ECTS) taught in summer semester. The module exam will be held at the end of the summer semester and will be aboue the content of both classes. The natural order of visiting the classes in the module is first 'Digital Seismology' as a block course in February and then 'Array seismology'. However, this is not formally required. Note that there will be no exam offered at the end of the winter semester.

Qualification goals of the module are:

**- deepen your understanding of digital signal processing and systems theory using the example of seismic time series**

**- understand the mode of action of different types of filters**

**- design and apply different types of filters for seismogram analysis and interpretation, deconvolution of seismograms and instrument correction**

**- learn the analysis of seismic wave fields by means of array methods**

**- understand multichannel filter process**

- understand the relationship between array geometry, inherent array resolution limits, or spatial aliasing artifacts, and strategies to avoid them

- develop, design and install an array in practice

- understand the advantages of array techniques and their fields of application, e.g. to investigate interdisciplinary geoscientific relationships in the Earth system

- being able to perform scientific analysis of interactions in the Earth system

- understand the basics for independent scientific work

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576151 - Vorlesung und Übung I (unbenotet) |

## GEW-MF12 - Seismological Data Science

**108524 VU - Seismic Hazard Analysis**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 12:30 - 14:00 | wöch. | 2.27.2.37/38 | 17.10.2024 | Prof. Dr. Fabrice Cotton |
| 1 | U | Do | 14:15 - 15:45 | wöch. | 2.27.2.37/38 | 17.10.2024 | Prof. Dr. Fabrice Cotton |



Abkürzungen entnehmen Sie bitte Seite 6

**Kommentar**

In this course, the basics of earthquake hazard estimation will be presented and discussed. We will understand why earthquakes generate damages and how seismological (but also geological and geodetic) data can be used to estimate the size, location and frequency of future earthquakes (seismic source models). We will discuss the different factors that control the frequency and amplitude of seismic shaking and learn how to develop and use seismic motion prediction models. We will discuss the interface between science and decision making and how probabilistic seismic hazard estimation models are established and used. Finally, we will discuss the potential (and future) impact of earthquakes on urban areas and identify the main seismic hot spots on our planet. Practical applications of these notions will be taught from Jupyter notebooks. Training in the Python language and the most useful probabilistic notions in the field of risk estimation (e.g uncertainty evaluation) will be taught in this course.

**Lerninhalte**

Course content

- Key ingredients of seismic hazard analysis
- Understanding the probability concepts used in natural hazards evaluation
- Lessons from recent earthquakes
- Seismic hot spots (the seismic future of cities)
- Scientific programming (use of Python notebooks, Python programming)

**Leistungen in Bezug auf das Modul**

SL 576161 - Vorlesung und Übung I (unbenotet)

## GEW-MF13 - Applied Geophysical Methods I

### 108525 VU - Seismic Methods (block course)

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | B | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Jens Tronicke |

**Leistungen in Bezug auf das Modul**

SL 576172 - Blockkurs I (unbenotet)

### 108526 VU - Seismic Methods

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 08:30 - 10:00 | wöch. | 2.27.2.36 | 16.10.2024 | Prof. Dr. Jens Tronicke |
| 1 | U | Mi | 10:15 - 11:45 | wöch. | 2.27.2.36 | 16.10.2024 | Prof. Dr. Jens Tronicke |

**Kommentar**

This course is part of **GEW-MF13 "Applied Geophysical Methods I"** (specialization module Geophysics, MSc Geosciences). It includes weekly lectures and exercises introducing active seismic methods (such as reflection and refraction seismics) and their diverse applications. In addition to the theoretical and physical fundamentals, the course conveys basic aspects of data acquisition, processing, and interpretation.

The first meeting with an introduction and more details will be on **Friday, Oct 20 at 8:30 (room 2.27.2.37/38)** .

**Leistungen in Bezug auf das Modul**

SL 576171 - Vorlesung und Übung I (unbenotet)

## GEW-MF14 - Applied Geophysical Methods II

### 108528 VU - Electrical and Electromagnetic Methods

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Di | 08:30 - 10:00 | wöch. | 2.27.2.37/38 | 15.10.2024 | Dr. Julien Guillemoteau |
| 1 | U | Di | 10:15 - 11:45 | wöch. | 2.27.2.37/38 | 15.10.2024 | Dr. Julien Guillemoteau |
| 1 | B | N.N. | N.N. | Block | N.N. | N.N. | Dr. Julien Guillemoteau |

**Kommentar**

This course is part of the in-depth module "Applied Geophysical methods II". It is recommended for the students following the focus in **Geophysics** with a keen interest in applied geophysics. It covers both theoretical and standard interpretation aspects for the subsurface geophysical imaging methods based on the theory of electromagnetics (i.e., **DC, EMI and GPR** ).

**The first introductory lecture is scheduled on Tuesday 17.10.23 at 8:30.**

**Leistungen in Bezug auf das Modul**

SL 576181 - Vorlesung und Übung (unbenotet)

## GEW-MF21 - Advanced Petrology and Age Determination

### 108530 VU - Advanced Petrology

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 12:30 - 14:00 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Patrick O'Brien, Dr. Martin Jan Timmerman |
| 1 | VU | Di | 14:15 - 15:45 | wöch. | 2.27.2.49 | 15.10.2024 | Dr. Martin Jan Timmerman, Prof. Dr. Patrick O'Brien |

**Leistungen in Bezug auf das Modul**

SL 576191 - Vorlesung und Übung I (unbenotet)

## GEW-MF22 - Physicochemical Mineralogy-Petrology

### 108531 SU - Experimental Mineralogy-Petrology

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | S | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Sergey Lobanov, Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth |
| 1 | U | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Sergey Lobanov, Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth |

**Kommentar**

This course ‘Experimental Mineralogy-Petrology’ is part of the module: GEW-MF22 – ‘Physicochemical Mineralogy-Petrology'

learning goals of the module are:

- conducting high-pressure/high-temperature laboratory experiments on minerals, glasses and rocks to better understand magmatic and metamorphic processes in nature

components of the module are:

- one course in WiSe or SoSe ('Experimental Mineralogy-Petrology') and
- one course in SoSe ('Mineral Physics and Spectroscopy')

in this course 'Experimental Mineralogy-Petrology' you will be:

- conducting experiments
- examine the resulting material with various analytical methods
- prepare a short presentation and report

After a pre-meeting (October XXth), you will carry out your experiments and analysis in approx. 4 - 6 laboratory appointments.

| Bemerkung |
|---|
| Students interested in this course are asked to join our pre-meeting for this course which includes the selection of projects:<br><br>**XX, October XX, at XX:XX at in room XX**<br><br>In case you can not join in person, please contact Melanie Sieber, melanie.sieber@uni-potsdam.de , or Wolfgang Morgenroth, wolfgang.morgenroth@uni-potsdam.de , by email. |

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576202 - Seminar und Übung (unbenotet) |

**GEW-MF23 - Special Topics in Mineralogy-Petrology**

**108532 VS - Geofluids and Clay Mineralogy**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 14:15 - 15:45 | wöch. | 2.27.2.49 | 14.10.2024 | Dr. Anja Schleicher, Prof. Dr. Max Wilke |
| 1 | S | Di | 16:15 - 17:45 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Max Wilke, Dr. Anja Schleicher |

| Kommentar |
|---|
| One part of the course will deal with the role of aqueous fluids in geochemical processes. We will discuss their properties at geological conditions and the chemical thermodynamics of fluids. We will discuss what samples of geological fluids are available and how we can understand them. We will discuss fluid-rock interactions and how they influence large-scale geological processes. Knowledge of thermodynamics is very helpful to follow this course.<br><br>The second part of the course will deal with the role of clay minerals in geological processes. We will discuss their unique properties, analytical techniques to study clays and how they can be used as engineeering materials.<br><br>We will meet for the first time on Oct 15 at 16:15 with a short introductory |

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576211 - Vorlesung und Seminar (unbenotet) |

# Elective Modules

**GEW-MC01 - Sedimentary Earth System Record**

**108502 VU - Sedimentary Earth System Record**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 10:15 - 11:45 | wöch. | 2.27.1.10 | 16.10.2024 | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |
| 1 | VU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |

| Leistungen in Bezug auf das Modul | |
|---|---|
| PNL | 575941 - Vorlesung und Übung (unbenotet) |

**108503 PU - Sedimentary Earth System Record (field practicals)**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | PU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |

| Leistungen in Bezug auf das Modul | |
|---|---|
| PNL | 575942 - Exkursion (unbenotet) |

## GEW-MC02 - Tectonics and Geodynamics

### 108504 VU - Tectonics and Geodynamics

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 08:30 - 10:00 | wöch. | 2.27.2.07 | 14.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Sascha Brune |
| 1 | U | Mo | 10:15 - 11:45 | wöch. | 2.27.2.07 | 14.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Sascha Brune |

**Kommentar**

**Contents**

This module aims to familiarize students with current concepts concerning the structure and mechanical behavior of the lithosphere, in relation to its thermal structure and rheology. Covered subjects include: the forces driving plate tectonics, the rheology of the lithosphere, the dynamics of orogenic processes, numerical modeling of lithospheric deformation, and the couplings of mantle dynamics and surface processes.

**Qualification goals**

Students:

- gain an understanding of the structure and dynamics of the lithosphere and the forces that drive its deformation

- gain familiarity with modern quantitative methods for observing and modeling the deformation of the lithosphere and its driving forces.

- learn to analyze modern research questions in tectonics and geodynamics by studying the literature on a chosen topic.

**Literatur**

Textbooks:C.M.R. Fowler, The Solid Earth: An Introduction to Global Geophysics (2nd Ed.). . D. Turcotte & G. Schubert, Geodynamics (3rd Ed.). . Additional background papers (available on Moodle)

**Leistungen in Bezug auf das Modul**

PNL 575951 - Vorlesung und Übung (unbenotet)

## GEW-MC03 - Data Analysis and Statistics

### 108506 VU - Data Analysis and Statistics (MS GSC)

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mi | N.N. | wöch. | N.N. | N.N. | Prof. Dr. Martin Trauth |
| | Zeit nach Absprache / Time slot tbd | | | | | | |
| 1 | U | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Martin Trauth |
| | Zeit nach Absprache / Time slot tbd | | | | | | |

**Kommentar**

This is course includes an introduction to a higher-level programming languages such as MATLAB, Python and Julia; overview of data types and methods; one-, two-, and multi-variable statistics; time series analysis; statistics for spatial and directional data; numerical procedures; image processing and analysis. The course is based on the instructor's textbooks available for free.

**Literatur**

Trauth, M.H. (2024) MATLAB Recipes for Earth Sciences – 6th Edition. Springer International Publishing.

Trauth, M.H. (2024) Python Recipes for Earth Sciences – 2nd Edition. Springer International Publishing.

**Bemerkung**

The course has two parts:

- weekly Zoom lectures and demonstrations, date to be determined.
- a one-week practical in person after after the term, date to be determined.

You can also study the course at any time using my books and the recorded lectures. Please write me an email if you prefer asynchronous learning and we will find a way.

**Leistungen in Bezug auf das Modul**

PNL 575961 - Seminar und Übung (unbenotet)

## GEW-MC04 - Advanced Field Practical

Für dieses Modul werden aktuell keine Lehrveranstaltungen angeboten

## GEW-MC05 - Theoretical Geophysics

### 108508 VU - Theory of elastic seismic waves

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 08:30 - 10:00 | wöch. | 2.27.2.36 | 17.10.2024 | Prof. Dr. Torsten Dahm |
| 1 | U | Do | 10:15 - 11:45 | wöch. | 2.27.2.36 | 17.10.2024 | Prof. Dr. Torsten Dahm |

**Kommentar**

The course *Theory of Elastic Waves* provides a basic introduction to the theory of wave propagation, needed to understand observations and to interprete seismological data. One focus is on the mode description of body and surface waves. Fundamentals of elasticity theory and elementary solutions of the wave equation are presented in detail. I start with a one-dimensional description of waves on a string, to explain key features of free oscillation and wave modes on ”membranes” (layers). Thereby, fundamental mathematical approaches and representation theorems are introduced. Later, we come to the reflection and refraction of seismic plane waves at plane boundary layers, to guided waves and seismic surface waves. The theory of seismic sources is not covered here, as the material is extensively taught in my course *Rupture Processes in Seismology and Volcanology* .

Seismological analysis techniques applied to body and surface waves are described and learned with computer practicals. Examples are: Interpreting and classifying body and surface waves, recognising near and far field signals, converting pressure to ground displacement on the seabed, calculate synthetic seismograms for the Earth, amplitude ratios and polarisation of waves on the surface, true and apparent polarisation, estimation of velocity structure from spectral ratios, ambient vibration and seafloor compliance methods, dispersion analysis of surface waves, detection of anelastic damping and attenuation tomography.

Potsdam, 3 September 2023, Torsten Dahm

**Voraussetzung**

- Bachelor in Geophysics / Physics / Geosciences

- Basics in physics, math and programming

**Literatur**

Dahm, T. Seismology II: body and surface waves. Lecture notes, ca. pp. 230. (will be provided as pdf)
Müller, G. (2007): Theory of elastic waves, (Scientific Technical Report STR ; 07/03), 228 S. https://doi.org/10.2312/GFZ.b103-07037
Aki, K.; Richards, P. (2002). Quantitative Seismology. University Science Books
Lay, Th.; Wallace, T.C. (1995). Modern Global Seismology. Academic Press

**Leistungen in Bezug auf das Modul**

SL 575981 - Vorlesung und Übung (unbenotet)

## GEW-MC06 - Geophysical Inversion and Data Analysis

### 108510 VU - Geophysical Inversion

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 12:30 - 14:00 | wöch. | 2.27.2.37/38 | 15.10.2024 | Dr. Matthias Ohrnberger |
| 1 | VU | Mi | 12:30 - 14:00 | wöch. | 2.27.2.37/38 | 16.10.2024 | Dr. Matthias Ohrnberger |

**Kommentar**

Inverse theory can be seen as the mathematical formalisation of the process of data interpretation. It is about the inference of properties (parameters) of a (hypothesized) physical system (model) from observed data.

We know what we (believe to) know about the Earth (and other physical systems) applying inverse problem techniques to those system observables we are capable to measure and quantify. Unfortunately, observations in earth sciences are often noisy, spatially or temporally sparse and sometimes even contradictory or inconsistent. Further, the physical systems we want to describe are often not well understood and thus simplified models are often used to allow quantification at all. It is therefore clear that within inverse problem theory model parameter uncertainty estimates are also of key interest as well as techniques allowing for selecting reasonable/appropriate models from a number of hypothesis regarding the physical system.

In the course, students will be introduced to the principal ideas of the formal treatment of inverse problems and will learn the application of inversion techniques to problems in geophysics and geosciences with hands-on examples.

**Literatur**

1) William Menke, Geophysical data analysis, discrete inverse theory

2) Andreas Fichter, Lecture notes on inverse theory (doi: 10.33774/coe-2021-qpq2j)

**Leistungen in Bezug auf das Modul**

SL 575991 - Vorlesung und Übung (unbenotet)

## GEW-MC07 - Geophysical Laboratory

### 108511 U - Geophysical Laboratory

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | U | Mo | 12:30 - 15:30 | wöch. | 2.27.2.36 | 14.10.2024 | Dr. Jürgen Matzka, Prof. Dr. Jens Tronicke, Dr. rer. nat. Philipp Koyan, Dr. Julien Guillemoteau |

**Kommentar**

This course is a **core module** of the programe **MSc Geosciences** and is obligatory for students with a specialization in Geophysics. It includes a series of six lab experiments covering selected fundamental topics of applied and general geophysics (e.g., gravity, magnetics, seismology). In addition to the actual experiments and experimental methods, the course conveys basic aspects of analyzing, interpreting, and presenting experimental data and also recaps and deepens some fundamentals of geophysics (additional lectures and exercises offered in a weekly fashion at the beginning of the semester).

The first meeting with an introduction, a detailed overview and time schedule will be on **Monday, Oct 23 at 12:30 (room 2.27.2.36)** .

**Leistungen in Bezug auf das Modul**

PNL 576001 - Laborübung (unbenotet)

## GEW-MC08 - Advanced Mineralogy-Petrology

## 108512 VU - Advanced Geochemistry

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Fr | 08:30 - 10:00 | wöch. | 2.27.2.49 | 18.10.2024 | Dr. Martin Jan Timmerman |

**Kommentar**

**Content**

Whereas the geological evolutions of most other stony planets in our solar system have come to a halt billions of years ago, planet Earth, after 4,5 billion years, is still a dynamic system due to a vigorous mantle convection. Moreover, Earth is first and foremost a *chemical* system and using the tools of geochemistry to solve geological problems, we can understand Earth and how it works.

This course will focus on fundamental processes that gave rise to the characteristic geochemical features of the continental crust and the mantle. It will provide essential insights into magmatic processes (differentiation, assimilation and contamination, partial melting), role and use of major and trace elements, geochemical classification of magmatic rocks, variation diagrams, element behaviour during melting and fractionation, simple fractionation and melting models, selected phase diagrams, the structure and mineralogy of the shallow and deep mantle, generation of basaltic magmas at oceanic spreading ridges, oceanic intraplate magmatism, plume magmatism, continental flood basalts, layered mafic intrusions, magmatism in subduction settings (island arcs and continental arcs), granitoids, continental alkaline magmatism, anorthosites. Furthermore, alkaline vs. sub-alkaline rocks: classification, AFM diagram, alumina saturation index. Introduction to dating methods (Rb-Sr, Sm-Nd), isochrons, introduction to the U-Th-Pb system (decay equations, Concordia diagram), the Lu-Hf system in zircon, the geochemical and Sr-Nd-Pb(-Hf) isotope composition of the continental crust and the different mantle reservoirs. The geochemical evolution of the Earth since Precambrian times will be addressed, and standard analytical techniques will be explained.

Similar to studying mathematics or a foreign language, it is no use studying geochemistry without practicing. For this reason, several carefully prepared home works will be offered, which you can solve alone or in a group. Pitfalls and solutions will be jointly discussed in the lecture of the ensuing week. This home work is not compulsory, but it is nevertheless highly recommended to participate.

**The students:**

- gain an understanding of the chemical composition of the Earth and other planets, and the chemical processes that affect them
- gain familiarity with analytical methods used for geochemical analyses
- learn to analyse modern research questions in geochemistry by studying the literature on a chosen topic
- are able to critically analyze scientific literature containing geochemical data
- acquire the ability to critically analyse, interpret and present data.

**Leistungen in Bezug auf das Modul**

SL 576012 - Vorlesung und Übung II (unbenotet)

## 110025 VU - Basics of Thermodynamics

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Fr | 10:15 - 11:45 | wöch. | 2.27.2.36 | 18.10.2024 | Prof. Dr. Max Wilke |

**Kommentar**

This course will introduce to the principles of thermodynamics and how they can be used for understanding geological processes. You will learn about the thermodynamical state functions and how they can be determined. We will discuss what controls mineral stability, how mineral reactions can be used to deduce formation conditions of mineral assemblages. All topics will be associated by exercises to enhance understanding.

The course will start on Fr, Oct 18.

Moodlepage: https://moodle2.uni-potsdam.de/course/view.php?id=35856

**Leistungen in Bezug auf das Modul**

SL 576011 - Vorlesung und Übung I (unbenotet)

## GEW-MC09 - Methods in Mineralogy and Petrology

### 108514 VU - Micro-analytical Methods and X-ray Powder Diffraction

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mo | 10:15 - 11:45 | wöch. | 2.27.2.49 | 14.10.2024 | Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth, Christoph Moeller, Georgii Kovalskii |
| 1 | VU | Do | 16:15 - 17:45 | wöch. | 2.27.2.37/38 | 17.10.2024 | Dr. rer. nat. Wolfgang Morgenroth |
| 1 | U | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Martin Jan Timmerman, Dr. rer. nat. Christina Günter |

**Kommentar**

This course ‘Micro-analytical Methods and X-ray Powder Diffraction’ consists of two parts in the winter semester: ‘Micro-analytical Methods’ and ‘X-ray Powder Diffraction’. In the following summer semester, there will be additional advanced courses in the module ‘Methods in Mineralogy and Petrology’.

‘X-ray Powder Diffraction’ will start on **XX** in room **XX, XX:XX** h.

‘Micro-analytical Methods’ consists of a lecture and practical hands-on training on the Electron Microscope, Scanning Electron Microscope and Raman. The lecture will be held Mondays at 10:15 in room 2.49 (building 27).

**On Monday, October 17 , we meet at 10:15 in room 2.49 for an overview of the module including a lab tour.** All students interested in this module are asked to attend this meeting as we will also arrange times for the practical hands-on training!!!

Learning goals ‘X-ray Powder Diffraction’:

- refresher in crystallography
- data collection methods in powder diffraction
- information content of a diffraction pattern (profile parameters, structure factors, background)
- least squares method and software for Le Bail- and Rietveld-refinement
- data treatment (data from software tutorials, data collected in practical part)
- practical part: X-ray Powder Diffraction (together with Christina Günter, guenter@geo.uni-potsdam.de )

At the end of the course, you will be able to refine a diffractogram and discuss your results.

Learning goals ‘Micro-analytical Methods’:

- introduction to the following micro - analytical methods: Scanning Electron Microscopy (SEM), Electron Probe Micro Analysis (EPMA, Cathodoluminescence (CL) and Raman
- phase identification, qualitative and quantitative chemical analyses
- understanding limitations, uncertainties, detection limits and errors
- independent interpretation of (mineral) analyses

**Voraussetzung**

There are no prerequisites for this course.
Nevertheless, you should have refreshed your knowledge in crystallography on a BSc level before the course starts.

Recommended reading: F. Donald Bloss 'Crystallography and Crystal Chemistry'.
Additionally, at the beginning of the course, we will refresh our knowledge of crystallography.

**Literatur**

For the PXRD part, be familiar with the basics of crystallography on a BSc level.
Recommended reading: F. Donald Bloss 'Crystallography and Crystal Chemistry'.

Additionally, at the beginning of the course, we will refresh our knowledge of crystallography.

**Bemerkung**

**Students who would like to participate in 'Micro-analytical Methods' are asked to join us on XX, October XX, at XX:XX a.m. in room XX for an introduction and lab tour.**

**Leistungen in Bezug auf das Modul**

SL 576021 - Vorlesung und Übung I (unbenotet)

## GEW-ME01 - Modelling and Exploring the Earth System

Für dieses Modul werden aktuell keine Lehrveranstaltungen angeboten

## GEW-ME02 - Geosciences Across Scales

### 108535 VU - Stress Field of the Earth's Crust

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mo | 14:15 - 15:45 | wöch. | 2.27.1.10 | 14.10.2024 | Prof. Dr. Arno Zang |
| 1 | B | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Arno Zang |

**Kommentar**

This course aims to give an overview to the state of stress in the Earth's crust and its application to local and regional tectonics. The first part of this course is the very foundation of rock mechanics, and introduces mechanical stress, fracture criteria and simple crustal stress models. The second part deals with stress measuring methods in practice today and is divided logically into borehole and core-based methods. Naturally, the more commonly accepted methods like overcoring, hydraulic fracturing, and borehole breakouts, are given added emphasis. The third part describes stress profiles in the Earth's crust obtained in recent international field projects to investigate earthquake ruptures and fracture processes in energy technology context (geologic repositories and geothermal energy). Local stress data from specific wellbores are related to regional tectonic stresses and the plate tectonics.

**Literatur**

Zang A, Stephansson O (2010) Stress Field of the Earth's Crust. Springer- Verlag. ISBN: 978-1-4020-8443-0

**Leistungen in Bezug auf das Modul**

SL 576041 - Vorlesung und Übung (unbenotet)

### 108537 VU - Radiogenic Isotope Geochemistry and Geochronology

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 16:15 - 17:45 | wöch. | 2.27.2.07 | 15.10.2024 | Dr. Masafumi Sudo, Prof. Dr. Rolf Romer |
| 1 | VU | Mi | 16:15 - 17:45 | wöch. | 2.27.2.07 | 16.10.2024 | Dr. Masafumi Sudo, Prof. Dr. Rolf Romer |

**Kommentar**

Radiogenic isotopes are important geochemical tools. The decay of a radioactive isotope eventually produces a stable (radiogenic) isotope. The process changes the isotopic composition of elements with one or several radiogenic isotopes. This change in isotopic composition can be used in two ways: (i) The concentration ratios of the produced daughter isotope to the present parent isotope can be used to determine the age of minerals and indirectly of geological processes. Systems suitable for the dating of geologically old magmatic and metamorphic rocks include among others the parent-daughter pairs of 40K-40Ar, 87Rb-87Sr, 147Sm-144Nd, and 238U-206Pb. (ii) The isotopic composition of elements with radiogenic isotopes changes through time. Because different geochemical reservoirs have contrasting parent-to-daughter ratios, they will with time develop different isotopic compositions, which in turn can be used to fingerprint the sources of rocks or to quantify contributions from different reservoirs by mass balance.

The class is presenting the most commonly used systems for isotopic dating and provides examples on the use of radiogenic isotopes as geochemical tracers. There will be reading assignments and short presentations by students in each following part:

- Rb-Sr, Sm-Nd, Lu-Hf, Re-Os and U-Pb systems, by apl. Prof. Dr. Rolf Romer

- K-Ar system and Ar/Ar dating, noble gas isotopes, by Dr. Masafumi Sudo

We start the first lecture (90 minutes) from 16:15 on the October 15th at room 2.07 of House 27.

**Leistungen in Bezug auf das Modul**

SL 576041 - Vorlesung und Übung (unbenotet)

## 108538 VU - Fundamentals of geothermics of the Earth's crust

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | N.N. | N.N. | Block | N.N. | N.N. | Dr. rer. nat. Ben Norden, Dr. rer. nat. Sven Fuchs, Dr. Florian Neumann |

**Kommentar**

Video Teaser (youtube)

**Voraussetzung**

- Grundlegende Kenntnisse in den Geowissenschaften (BS)
- Interesse an einem oder mehreren der folgenden Arbeits- und Forschungsfelder: Geothermie, Geodynamik, Geophysik

**Literatur**


- Turcotte, D.L., and Schubert, G. ( **2002** ). Geodynamics: Cambridge University Press.
- Beardsmore, G. R. and J. P. Cull ( **2001** ). Crustal Heat Flow: A Guide to Measurement and Modelling. Cambridge, University Press.
- Haenel, R., L. Rybach and L. Stegena ( **1988** ). Handbook of terrestrial heat-flow density determination. Dordrecht, Kluwer Academic Publishers.
- Allen, Philip A., and John R. Allen ( ). . John Wiley & Sons.


**Leistungsnachweis**

Übung mit schriftlichem Bericht und/oder Vortrag

Exercise with written report and/or presentation

**Bemerkung**

Das Modul vermittelt grundlegende Kenntnisse zu Wärmetransportvorgängen und die daraus resultierende Wärme- und Temperaturverteilung der Erdkruste. Neben theoretischen und physikalischen Grundlagen zu thermischen Gesteinsparametern und thermischen Feldern werden gängige Verfahren zur Bestimmung der thermischen Eigenschaften vorgestellt; dabei wird auf die Gewinnung und Bearbeitung der (Mess-) Daten und die Interpretation der Resultate eingegangen. Die Relevanz thermischer Prozesse wird für geodynamische Vorgänge (plattentektonische sowie bezogen auf Prozesse der Sedimentbeckenbildung) ebenso beleuchtet, wie für eine wirtschaftliche Nutzung des unterirdischen Raums (Geothermie, Endlagerung, Speicherung, etc.). In den begleitenden Übungen werden die erlernten Methoden an realen Beispieldatensätzen vertieft. Labormessungen , ein Messtag im Gelände , sowie ein anschließender 2-tägiger Modellierungskurs (im Rahmen des 1-wöchigen Blockkurses) zur Auswertung der gewonnen Daten führen praxisnah in die Gewinnung und Verwertung thermischer Daten und in die Grundzüge der thermischen Modellierung ein.

The module provides basic knowledge of heat transport processes and the resulting heat and temperature distribution of the Earth's crust. In addition to theoretical and physical fundamentals of thermal rock parameters and thermal fields, common methods for the determination of thermal properties are presented; the acquisition and processing of (measurement) data and the interpretation of the results are addressed. The relevance of thermal processes will be highlighted for geodynamic processes (plate tectonic as well as related to sedimentary basin formation processes) as well as for an economic use of the subsurface space (geothermal energy, disposal, storage, etc.). In the accompanying exercises, the learned methods are deepened on real example data sets. Laboratory measurements, a measurement day in the field, and a subsequent 2-day modeling course (as part of the 1-week block course) to evaluate the data obtained provide a practical introduction to the acquisition and utilization of thermal data and the basic principles of thermal modeling.

**Lerninhalte**

**Lernziele** :

- Verständnis der thermischen Gesteinsparameter, ihrer Variabilität und der thermisch wirksamen Prozesse innerhalb der Erdkruste
- Verständnis der Relevanz für geodynamische Vorgänge oder die Nutzung des unterirdischen Raums (Geothermie, Endlagerung, Speicherung, etc.)

**Learning Objectives:**
Understanding of thermal rock parameters, their variability, and thermally effective processes within the Earth's crust.
Understanding of the relevance to geodynamic processes or the use of subsurface space (geothermal energy, disposal, storage, etc.).

**Leistungen in Bezug auf das Modul**

SL 576041 - Vorlesung und Übung (unbenotet)

**108539 VU - Organic Geochemistry**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | N.N. | N.N. | Block | N.N. | N.N. | Dr. Hans-Martin Schulz, Dr. Kai Mangelsdorf, Prof. Dr. Christian Hallmann, Dr. Stefanie Pötz, Dr. Andrea Vieth-Hillebrand |

**Kommentar**

This course will cover the fundamentals of organic geochemistry, which is the discipline that studies the origin, conversion and fate of organic matter on Earth, and attempts to reconstruct the impact and processes that the biosphere had on the Earth system. In lectures we will cover (amongst other themes) carbon fixation and bioproductivity, aspects of lipid biosynthesis, biomass burial and the global carbon cycle, the formation and composition of fossil fuels, paleoclimate reconstructions, environmental geochemistry and what ancient molecules tell us about the evolution of life on Earth. In the practical part of the course, we will gain hands-on experience by processing rock samples, extracting and simplifying their molecular organic inventory and analyzing the latter using gas chromatography and mass spectrometry, followed by interpretation of fossil biomarker molecules.

The course will be held as a block at the end of the semester, starting on xx xx 2023, allowing us to mix lectures and laboratory work. The location will be external at the German Research Center for Geosciences (GFZ) that is located on the Telegrafenberg in Potsdam, and which can be conveniently reached by public transport.

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576041 - Vorlesung und Übung (unbenotet) |

## GEW-ME03 - Past and Present of the Earth System

### 108516 VU - Modern Carbonates

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 10:15 - 11:45 | wöch. | 2.27.2.07 | 17.10.2024 | Prof. Dr. Maria Mutti, Dr. Jens Kallmeyer, Dr. Benjamin Rendall, N.N. (Mitarbeiter) |
| 1 | U | Do | 12:15 - 13:45 | wöch. | 2.27.2.07 | 17.10.2024 | Prof. Dr. Maria Mutti, Dr. Jens Kallmeyer, Dr. Benjamin Rendall, N.N. (Mitarbeiter) |

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576051 - Vorlesung und Übung (unbenotet) |

### 108532 VS - Geofluids and Clay Mineralogy

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 14:15 - 15:45 | wöch. | 2.27.2.49 | 14.10.2024 | Dr. Anja Schleicher, Prof. Dr. Max Wilke |
| 1 | S | Di | 16:15 - 17:45 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Max Wilke, Dr. Anja Schleicher |

**Kommentar**

One part of the course will deal with the role of aqueous fluids in geochemical processes. We will discuss their properties at geological conditions and the chemical thermodynamics of fluids. We will discuss what samples of geological fluids are available and how we can understand them. We will discuss fluid-rock interactions and how they influence large-scale geological processes. Knowledge of thermodynamics is very helpful to follow this course.

The second part of the course will deal with the role of clay minerals in geological processes. We will discuss their unique properties, analytical techniques to study clays and how they can be used as engineeering materials.

We will meet for the first time on Oct 15 at 16:15 with a short introductory

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576051 - Vorlesung und Übung (unbenotet) |

### 108541 VU - Permafrost Landscapes

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 08:30 - 10:00 | wöch. | 2.27.2.07 | 16.10.2024 | Dr. Jens Strauss |
| 1 | SU | Mi | 10:15 - 11:45 | wöch. | 2.27.2.07 | 16.10.2024 | Dr. Jens Strauss |

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576051 - Vorlesung und Übung (unbenotet) |

## GEW-ME04 - Modern Trends in Geosciences

### 110946 PU - Thematic Field School

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VS | N.N. | N.N. | Einzel | N.N. | N.N. | Prof. Dr. Pieter van der Beek |
| 1 | PU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Pieter van der Beek |
| | Field practical will take place last week of September / first week of October 2024 | | | | | | |

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576061 - Vorlesung und Übung (unbenotet) |

## GEW-ME05 - Geoscientific Data Science

### 108512 VU - Advanced Geochemistry

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Fr | 08:30 - 10:00 | wöch. | 2.27.2.49 | 18.10.2024 | Dr. Martin Jan Timmerman |

**Kommentar**

**Content**

Whereas the geological evolutions of most other stony planets in our solar system have come to a halt billions of years ago, planet Earth, after 4,5 billion years, is still a dynamic system due to a vigorous mantle convection. Moreover, Earth is first and foremost a *chemical* system and using the tools of geochemistry to solve geological problems, we can understand Earth and how it works.

This course will focus on fundamental processes that gave rise to the characteristic geochemical features of the continental crust and the mantle. It will provide essential insights into magmatic processes (differentiation, assimilation and contamination, partial melting), role and use of major and trace elements, geochemical classification of magmatic rocks, variation diagrams, element behaviour during melting and fractionation, simple fractionation and melting models, selected phase diagrams, the structure and mineralogy of the shallow and deep mantle, generation of basaltic magmas at oceanic spreading ridges, oceanic intraplate magmatism, plume magmatism, continental flood basalts, layered mafic intrusions, magmatism in subduction settings (island arcs and continental arcs), granitoids, continental alkaline magmatism, anorthosites. Furthermore, alkaline vs. sub-alkaline rocks: classification, AFM diagram, alumina saturation index. Introduction to dating methods (Rb-Sr, Sm-Nd), isochrons, introduction to the U-Th-Pb system (decay equations, Concordia diagram), the Lu-Hf system in zircon, the geochemical and Sr-Nd-Pb(-Hf) isotope composition of the continental crust and the different mantle reservoirs. The geochemical evolution of the Earth since Precambrian times will be addressed, and standard analytical techniques will be explained.

Similar to studying mathematics or a foreign language, it is no use studying geochemistry without practicing. For this reason, several carefully prepared home works will be offered, which you can solve alone or in a group. Pitfalls and solutions will be jointly discussed in the lecture of the ensuing week. This home work is not compulsory, but it is nevertheless highly recommended to participate.

**The students:**

- gain an understanding of the chemical composition of the Earth and other planets, and the chemical processes that affect them
- gain familiarity with analytical methods used for geochemical analyses
- learn to analyse modern research questions in geochemistry by studying the literature on a chosen topic
- are able to critically analyze scientific literature containing geochemical data
- acquire the ability to critically analyse, interpret and present data.

**Leistungen in Bezug auf das Modul**

SL 576071 - Vorlesung und Übung (unbenotet)

### 108542 VS - Remote Sensing of Permafrost Regions

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Di | 08:30 - 10:00 | wöch. | 2.27.0.29/30 | 15.10.2024 | Dr. Ingmar Nitze, Prof. Dr. Guido Große, Sara Tabea Rettelbach |
| 1 | SU | Di | 10:15 - 11:45 | wöch. | 2.27.0.29/30 | 15.10.2024 | Prof. Dr. Guido Große, Dr. Ingmar Nitze, Sara Tabea Rettelbach |



Abkürzungen entnehmen Sie bitte Seite 6

**Kommentar**

In this module, we will focus on remote sensing of terrestrial regions of the Arctic that are not glaciated but affected by permafrost - about one quarter of the northern hemisphere landmass is part of the permafrost zone and thus a huge diversity of landforms, land cover, processes, and dynamics are encountered that are partially or fully driven by freezing and thawing processes on various spatial and temporal scales. These regions are vast, far away, logistically challenging, and data-sparse. Remote sensing therefore often provides the tools of choice for many analyses needed to better understand how permafrost regions change in a rapdily warming Arctic and what the local to global feedbacks are.

Learn about Arctic Climate Change, Cryosphere, and Permafrost; Permafrost landscapes, disturbances, trends; Northern land cover and vegetation; Permafrost terrain and landforms; Thaw subsidence and frost heave; Permafrost coastal dynamics; and Thermokarst lake dynamics. Learn to use cool data and techniques for characterizing and quantifying landscape dynamics in a rapidly changing Arctic: We will cover high resolution airborne data, high and medium resolution satellite imagery, LiDAR, Big Data approaches with Google Earth Engine, and an overview into several other methods. You also will work on a specific semester project in a 2-student team and work on milestones throughout the semester. You will select the project topic at the beginning of the module and present the project outcome at the semester end. The remote sensing methods from this module will be easily applicable to other regions on Earth.

**Voraussetzung**

Seminars/Exercises will have a strong focus on Google Earth Engine and GIS Desktop systems. You will need to establish a free Google Earth Engine User Account. You will need to install an ArcGIS (student) license on your computer. For one of the seminars on remote sensing of permafrost coastal erosion you will need to install the Digital Shoreline Analysis System (DSAS) for ArcGIS tool.

**Literatur**

The module will rely on latest research papers on remote sensing of permafrost regions. Detailed literature lists will be provided through Moodle. Here are some general literature examples on the topic:

Permafrost: French, H. M. (2007) The Periglacial Environment, 3rd Edition, Wiley, ISBN: 978-0-470-86588-0, 478 pp.

Remote Sensing of Permafrost Regions: Jorgenson MT, Grosse G (2016): Remote Sensing of Landscape Change in Permafrost Regions. Permafrost and Periglacial Processes, 27(4): 324-338. doi: 10.1002/ppp.1914.

Remote Sensing of Permafrost Regions: Westermann S, Duguay C, Grosse G, Kääb A (2015): Remote sensing of permafrost and frozen ground. In: Tedesco M (ed.): Remote sensing of the Cryosphere, pp. 307-344. Hoboken, NJ, Wiley Blackwell, 408 p., doi: 10.1002/9781118368909.ch13.

**Lerninhalte**

Introduction to Climate Change, Arctic Cryosphere, and Permafrost; Introduction to Remote Sensing of Permafrost Regions; Permafrost Landscapes and Dynamics; Permafrost Terrain and Landform Characterization; Permafrost Region Land Cover and Vegetation; Time Series Analysis and Change Detection; Big Data and Machine Learning in Remote Sensing; Big Data and Deep Learning in Remote Sensing; Remote Sensing of High Latitude Lakes and Lake Change; Arctic aquatic remote sensing; Close-range remote sensing; Observing Permafrost Coastal Dynamics; Advanced remote sensing methods for permafrost; Repetitorium / Qzeichenerror  Presentation of remote sensing semester project results; Written Exam

**Zielgruppe**

The module targets remote sensing enthusiasts with an interest in Polar Regions. Ideally, you are already aware of the importance of climate change in the Arctic and understand the importance of global-scale feedbacks in the Earth System, you like to play with different remote sensing approaches, and you enjoy working with images as well as bits and bytes. Overall, the remote sensing methods used in the module are also applicable also in other regions.

**Leistungen in Bezug auf das Modul**

SL 576071 - Vorlesung und Übung (unbenotet)

**108543 VS - Nonlinear Data Analysis Concepts**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VS | Do | 08:30 - 10:00 | wöch. | 2.27.0.29/30 | 17.10.2024 | PD Dr. Norbert Marwan |
| 1 | VS | Do | 10:15 - 11:45 | wöch. | 2.27.0.29/30 | 17.10.2024 | PD Dr. Norbert Marwan |



Abkürzungen entnehmen Sie bitte Seite 6

**Voraussetzung**

- Basic understanding of mathematical concepts and statistics
- Capable to independently and creatively utilize numerical software like Python, Julia, or MATLAB
- Successful participation of the course "Data Analysis and Statistics" or similar course

**Leistungsnachweis**

The examination takes the form of a small project work. The project report is expected to be written in the form of a scientific article. To be eligible for the examination, 60% of the practice exercises during the semester must be successfully completed.

**Lerninhalte**

The lecture introduces the basic concepts of nonlinear dynamics and chaos and how they can be applied for the study of complex systems, spatiotemporal data, and nonlinear interrelationships in geosciences. The specific topics contain

- Basic terminology, dynamical systems, and simple prototypical models
- Dimensions, fractals
- Concept of symbolic dynamics
- Concept of phase space, phase space reconstruction, Lyapunov exponent and correlation sum
- Concept of recurrence in phase space, recurrence plots, recurrence quantification analysis
- Detection of regime transitions, statistical tests
- Concept of synchronization, coupling analysis
- Spatial and spatio-temporal data analysis using recurrence features
- Complex networks, network models, measures, network representations
- Functional networks, reconstruction of networks, climate networks
- Complex networks based time series analysis

**Leistungen in Bezug auf das Modul**

SL 576071 - Vorlesung und Übung (unbenotet)

**108544 VU - Quantification of flow and transport processes for utilisation of the geological subsurface**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 08:30 - 10:00 | wöch. | 2.27.2.37/38 | 14.10.2024 | Prof. Dr. Michael Kühn, Dr.-Ing. Thomas Kempka |
| 1 | U | Mo | 10:15 - 11:45 | wöch. | 2.27.2.37/38 | 14.10.2024 | Dr.-Ing. Thomas Kempka |
| 1 | B | N.N. | N.N. | Einzel | N.N. | N.N. | Dr.-Ing. Thomas Kempka |

**Kommentar**

Bei Interesse an der Veranstaltung bitte unbedingt per Mail bei mir ( tkempka@uni-potsdam.de ) melden, um **Informationen zum virtuellen Veranstaltungsort** zu erhalten.

Please contact me via mail ( tkempka@uni-potsdam.de ) if you are interested in participating to receive **information on virtual lecture room** .

Rückfragen zur Veranstaltung beantworte ich gerne via E-Mail.

**Voraussetzung**

Grundlegende Kenntnisse in den Geowissenschaften, Mathematik, Chemie und Physik. Der erfolgreiche Besuch der Kurse MGEW06 und MGEW20 ist hilfreich, aber nicht zwingend für die Veranstaltung notwendig.

**Literatur**

Ingebritsen, Sanford, Neuzil (2006) Groundwater in Geologic Processes, Cambridge University Press (mehrere Exemplare sind in der Bibliothek verfügbar).Weitere Literatur wird digital zur Verfügung gestellt.

**Leistungsnachweis**

Der Leistungsnachweis erfolgt über **Projektarbeiten in Gruppenform** einschließlich eines Abschlussprojekts mit **schriftlicher Ausarbeitung und mündlicher Präsentation** .

**Lerninhalte**

Dieses Modul vermittelt grundlegende Kenntnisse zur quantitativen Betrachtung von Prozessen in tiefen Grundwassersystemen mithilfe von analytischen und numerischen Modellen, welche im Rahmen der Veranstaltung durch die Studierenden unter Anleitung erarbeitet werden ( Programmiersprache Python, keine Vorkenntnisse notwendig ). Die erforderlichen mathematischen Grundlagen werden nachvollziehbar aufgefrischt und die Anwendung der Finite-Differenzen-Methode zur Erstellung numerischer Simulationsmodelle wird anhand zahlreicher praxisrelevanter Programmierbeispiele erarbeitet.

**Zielgruppe**

Studierende **MS GEW** und **MS GEE** mit Interesse an den Grundlagen zur quantitativen Beschreibung der wesentlichen Prozesse in tiefen geologischen Grundwassersystemen mithilfe numerischer Simulationen.

**Leistungen in Bezug auf das Modul**

SL 576071 - Vorlesung und Übung (unbenotet)

**110025 VU - Basics of Thermodynamics**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Fr | 10:15 - 11:45 | wöch. | 2.27.2.36 | 18.10.2024 | Prof. Dr. Max Wilke |

**Kommentar**

This course will introduce to the principles of thermodynamics and how they can be used for understanding geological processes. You will learn about the thermodynamical state functions and how they can be determined. We will discuss what controls mineral stability, how mineral reactions can be used to deduce formation conditions of mineral assemblages. All topics will be associated by exercises to enhance understanding.

The course will start on Fr, Oct 18.

Moodlepage: https://moodle2.uni-potsdam.de/course/view.php?id=35856

**Leistungen in Bezug auf das Modul**

SL 576071 - Vorlesung und Übung (unbenotet)

## GEW-ME06 - Special Remote Methods in Geosciences

**110885 VU - Earth Surface Deformation and Radar Satellite Interferometry (InSAR)**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | N.N. | 09:00 - 17:00 | Block | 2.27.0.29/30 | 07.10.2024 | Dr. Sabrina Metzger |

**Kommentar**

You will learn the basic theory of, and how to get access to, process, interpret and model radar interferometric (InSAR) data to study crustal deformation phenomena like earthquakes, volcanic inflation, and interseismic strain accumulation. We will work with the open source software SNAP , kite and talpa from the pyrocko-software-suite. A basic knowledge of MATLAB and shell scripting is advantageous, but not mandatory.

The main part will be taught in a 1-week-block course before the semester, plus some additional seminars during the semester, in which you will also pursue a personal project study.

**Leistungen in Bezug auf das Modul**

SL 576081 - Vorlesung und Übung (unbenotet)

**110886 VS - Earth Surface Deformation and Radar Satellite Interferometry (InSAR)**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VS | Di | 16:15 - 17:45 | 14t. | 2.27.0.29/30 | 22.10.2024 | Dr. Sabrina Metzger |

**Kommentar**

You will learn how to get access to, process, interpret and model radar interferometric data to study crustal deformation phenomena like earthquakes, volcanic inflation, and interseismic strain accumulation. We will work with the open source software SNAP , kite and talpa from the pyrocko-software-suite. A basic knowledge of MATLAB and shell scripting is advantageous, bu tnot mandatory.

**Leistungen in Bezug auf das Modul**

SL 576081 - Vorlesung und Übung (unbenotet)

## GEW-ME07 - Special Topics in Geosciences

### 108545 VU - Biogeochemistry

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | B | N.N. | N.N. | Block | N.N. | N.N. | Dr. Jens Kallmeyer |
| 1 | EV | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Jens Kallmeyer |

**Kommentar**

Vorbesprechung zur Terminfindung und Klärung weiterer Fragen am 18.10.2023 um 12:00 in Raum 2.07, Institut für Geowissenschaften. Interessierte die an diesem Termin nicht können sollen sich bitte voher per Email beim Kursleiter, Jens Kallmeyer ( kallm@gfz-potsdam.de ) wenden.

**Leistungen in Bezug auf das Modul**

SL 576091 - Vorlesung und Übung (unbenotet)

### 108547 VS - Coastal Dynamics

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 14:15 - 15:45 | wöch. | 2.27.1.10 | 16.10.2024 | Prof. Dr. Hugues Lantuit |
| 1 | S | Mi | 16:15 - 17:45 | wöch. | 2.27.1.10 | 16.10.2024 | Prof. Dr. Hugues Lantuit |

**Kommentar**

This course is meant to provide future practitioners with a holistic understanding of coastal change and its implications. It is geared towards students in several fields taught at the university, including geoscience, remote sensing and geoecology

1) Skills:
The students will learn basic concepts of coastal geomorphology and coastal processes. They will learn about the relevance of these processes in the real world and the methods used to study and/or address them

2) Methods:
The students will learn how to quantitatively analyze wave dynamics, sediment transport and coastline dynamics

3) The students will be able to use the skills taught in the course to devise holistic studies of coastal dynamics, understanding coastal processes and their implications for coastal management

The lecture will cover the following topics:

- Coastal classifications
- Shoreline definitions
- Tectonics and coasts
- Coastal landforms
- Sea level change / Bruun rule
- Wave theory
- Littoral sediment budgets and cells
- Wave energy and energy flux
- Wave refraction and wave breaking
- Wave set-up, set-down and run-up
- Shoreface profiles
- Cross-shore sediment transport
- Nearshore currents
- Longshore currents
- Coastal engineering and coastal protection
- Coastal ecology – aquatic ecosystems
- Coastal ecology – subaerial ecosystems
- Coastal biogeochemistry – natural carbon and nutrient influx
- Coastal biogeochemistry – anthropogenic fluxes and eutrophication
- Coasts and climate change - adaptation and mitigation strategies
- Legal statuses of coastal systems
- Coastal conservation
- Integrated Coastal Zone Management (ICZM)
- Legal statuses of coastal systems
- Coastal conservation

1) Fachkompetenzen:
Die Studierenden kennen die Grundlagetheorie der Küstenmorphologie sowie der Küstenprozesse, kennen wichtige Anwendungsfälle und können die einschlägigen Methoden verstehen.

2) Methodenkompetenzen
Die Studierenden können Sedimenttransport und Küstenliniendynamik quantitativ analysieren.

3) Handlungskompetenzen
Mit den erworbenen Fach- und Methodenkompetenzen können die Studenten eigenverantwortlich eine integrierte Studie zur Küstenbewegung planen, die relevante Aufgabenstellung setzen und diese selbständig bearbeiten.

Die Vorlesung wird sich mit folgenden Aspekte der Küstendynamik befassen:
- Coastal classifications
- Shoreline definitions
- Tectonics and coasts
- Coastal landforms
- Sea level change / Bruun rule
- Wave theory
- Littoral sediment budgets and cells
- Wave energy and energy flux
- Wave refraction and wave breaking
- Wave set-up, set-down and run-up
- Shoreface profiles
- Cross-shore sediment transport
- Nearshore currents
- Longshore currents
- Coastal engineering and coastal protection
- Coastal ecology – aquatic ecosystems
- Coastal ecology – subaerial ecosystems
- Coastal biogeochemistry – natural carbon and nutrient influx
- Coastal biogeochemistry – anthropogenic fluxes and eutrophication
- Coasts and climate change - adaptation and mitigation strategies
- Legal statuses of coastal systems
- Coastal conservation
- Integrated Coastal Zone Management (ICZM)
- Legal statuses of coastal systems
- Coastal conservation

Abkürzungen entnehmen Sie bitte Seite 6

**Leistungen in Bezug auf das Modul**

SL 576091 - Vorlesung und Übung (unbenotet)

### 108550 VU - Applied Mineralogy and Cultural Heritage

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Di | 08:30 - 10:00 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Steffen Laue, Prof. Dr. Max Wilke, Dr. rer. nat. Wolfgang Morgenroth |
| 1 | U | Di | 10:15 - 11:45 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Steffen Laue, Prof. Dr. Max Wilke, Dr. rer. nat. Wolfgang Morgenroth |

**Kommentar**

Many minerals and rocks are used as building materials or as materials in general. Historical buildings and artifacts are subject to weathering or general deterioration due to environmental influence.

This course will introduce into mineralogical work on samples dealing with problems in cultural heritage, restoration and conservation. It will introduce to the field of building stones, cements and plaster, pigments and other materials. Further, there will be practical exercises with various methods on realistic samples.

**Bemerkung**

This course will start on XX **th of October** at **XX:XX h** in room **XX** with an introduction, 30 - 45 min.

Details (place and time) for the other dates will be announced during this event.

**Leistungen in Bezug auf das Modul**

SL 576091 - Vorlesung und Übung (unbenotet)

### 110933 VU - Visualization and Communication (MS GSC)

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 12:30 - 14:00 | wöch. | 2.27.1.10 | 17.10.2024 | Prof. Dr. Martin Trauth |
| 1 | U | Do | 14:15 - 15:45 | wöch. | 2.27.1.10 | 17.10.2024 | Prof. Dr. Martin Trauth |

**Kommentar**

The module syllabus is based on the instructor's textbook and includes literature and data research, identifying scientific and controversial material, drafting a data analysis project, using modern visualization techniques, and presentation techniques for an expert or lay audience as well as decision-makers.

**Literatur**

Trauth, M.H., Sillmann, E. (2018) Collecting, Processing and Presenting Geoscientific Information, MATLAB® and Design Recipes for Earth Sciences – Second Edition. Springer Verlag, 274 p., Supplementary Electronic Material, Hardcover, ISBN: 978-3-662-56202-4.

**Bemerkung**

The course consists of three parts:

(1) Lectures and demos on Thursdays 12:30-15:45 in person in room 2.27.1.10 and live on Zoom

https://uni-potsdam.zoom.us/j/68613508954

41997623

(2) Q/A and student's weekly challenges

(3) Seminar with invited lectures.

| Leistungen in Bezug auf das Modul | |
|---|---|
| SL | 576091 - Vorlesung und Übung (unbenotet) |

## GEW-ME08 - Monitoring Techniques and Data Analysis in Geosciences

### 108514 VU - Micro-analytical Methods and X-ray Powder Diffraction

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mo | 10:15 - 11:45 | wöch. | 2.27.2.49 | 14.10.2024 | Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth, Christoph Moeller, Georgii Kovalskii |
| 1 | VU | Do | 16:15 - 17:45 | wöch. | 2.27.2.37/38 | 17.10.2024 | Dr. rer. nat. Wolfgang Morgenroth |
| 1 | U | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Martin Jan Timmerman, Dr. rer. nat. Christina Günter |

**Kommentar**

This course ‘Micro-analytical Methods and X-ray Powder Diffraction’ consists of two parts in the winter semester: ‘Micro-analytical Methods’ and ‘X-ray Powder Diffraction’. In the following summer semester, there will be additional advanced courses in the module ‘Methods in Mineralogy and Petrology’.

‘X-ray Powder Diffraction’ will start on **XX** in room **XX, XX:XX** h.

‘Micro-analytical Methods’ consists of a lecture and practical hands-on training on the Electron Microscope, Scanning Electron Microscope and Raman. The lecture will be held Mondays at 10:15 in room 2.49 (building 27).

**On Monday, October 17 , we meet at 10:15 in room 2.49 for an overview of the module including a lab tour.** All students interested in this module are asked to attend this meeting as we will also arrange times for the practical hands-on training!!!

Learning goals ‘X-ray Powder Diffraction’:

- refresher in crystallography
- data collection methods in powder diffraction
- information content of a diffraction pattern (profile parameters, structure factors, background)
- least squares method and software for Le Bail- and Rietveld-refinement
- data treatment (data from software tutorials, data collected in practical part)
- practical part: X-ray Powder Diffraction (together with Christina Günter, guenter@geo.uni-potsdam.de )

At the end of the course, you will be able to refine a diffractogram and discuss your results.

Learning goals ‘Micro-analytical Methods’:

- introduction to the following micro - analytical methods: Scanning Electron Microscopy (SEM), Electron Probe Micro Analysis (EPMA, Cathodoluminescence (CL) and Raman
- phase identification, qualitative and quantitative chemical analyses
- understanding limitations, uncertainties, detection limits and errors
- independent interpretation of (mineral) analyses

**Voraussetzung**

There are no prerequisites for this course.
Nevertheless, you should have refreshed your knowledge in crystallography on a BSc level before the course starts.

Recommended reading: F. Donald Bloss 'Crystallography and Crystal Chemistry'.
Additionally, at the beginning of the course, we will refresh our knowledge of crystallography.

**Literatur**

For the PXRD part, be familiar with the basics of crystallography on a BSc level.
Recommended reading: F. Donald Bloss 'Crystallography and Crystal Chemistry'.

Additionally, at the beginning of the course, we will refresh our knowledge of crystallography.

**Bemerkung**

**Students who would like to participate in 'Micro-analytical Methods' are asked to join us on XX, October XX, at XX:XX a.m. in room XX for an introduction and lab tour.**

**Leistungen in Bezug auf das Modul**

SL 576101 - Vorlesung und Übung (unbenotet)

### 108552 V - Planetary Remote Sensing

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 12:15 - 13:45 | wöch. | 2.27.1.10 | 16.10.2024 | Prof. Dr. Gabriele Arnold |
| 1 | EX | N.N. | N.N. | Einzel | N.N. | N.N. | Prof. Dr. Gabriele Arnold |

**Kommentar**

The lecture is intended for Master students of Earth Sciences and the course Remote Sensing, Geoinformation and Visualization.

The lecture covers the basics of remote sensing with a focus on the specifics of planetary remote sensing. The course will also focus on the inner solar system and its exploration using the developed methods.

The course includes a field trip to the Institute of Planetary Research of the German Aerospace Center (DLR) in Berlin-Adlershof.

**Literatur**

Literature will be announced during the lecture.

**Lerninhalte**

Fundamentals of planetary remote sensing and inner solar system.

**Leistungen in Bezug auf das Modul**

SL 576101 - Vorlesung und Übung (unbenotet)

### 108553 VU - Earthquake and Volcano Deformation

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Mi | 14:15 - 15:45 | wöch. | 2.27.2.37/38 | 16.10.2024 | Prof. Dr. Thomas Walter |
| 1 | VU | Mi | 16:15 - 17:45 | wöch. | 2.27.2.37/38 | 16.10.2024 | Prof. Dr. Thomas Walter |

**Kommentar**

**Volcanoes and earthquakes deform on different scales.** Magma chambers inflate and cause a volcano to rise. Faults are displaced and cause surface deformation. Slow changes such as cooling, compaction, or creep lead to major landforms on geologic time scales.
**The goal of this module is to better understand deformation processes and learn basic techniques and data analysis methods for quantifying them.** This module provides an introduction to volcanic and tectonic deformation processes, with a special emphasis on cross-disciplines that include geological field observations, geodetic monitoring technologies, and geophysical interpretation tools.
Geologic and geophysical field techniques as well as active and passive remote sensing methods are explained and applied to study deformation processes related to gravity tectonics, spreading, body forces, magma tectonics, dyke emplacement and cooling, and faulting associated with earthquakes and slip events. In addition, the course examines the couplings between volcanoes and tectonic processes.
The student will learn many different techniques and analysis approaches, from manual pixel and feature tracking, to image cross correlation and particle image velocimetry, to topography change and DEM of difference analysis, to radar interferometry (InSAR), and finally gain insight into basic modeling techniques.
During the course, theory and examples will be explained by the instructor, followed by group work in class and a small weekly homework assignment to practice the analysis.
**The main objectives of the course are (1) to gain a better understanding of the processes and sources associated with volcanoes and earthquakes, (2) to gain an overview of commonly used and innovative methods for quantifying and analyzing deformation, and (3) to train creative thinking and selection strategies for data and methods.**
Detailed materials for the online course, data and tools, weekly homeworks and results are available on the Moodle site ( deform23_24 ).

**Literatur**

Segall, P. 2010, Earthquake and Volcano Deformation, Princeton University Press, 456 pp.; Dzurisin, D. 2006, Volcano Deformation, Springer Verlag, 256pp.; additional materials will be posted on the course website

**Lerninhalte**

More details and exchange of materials will be provided on the moodle pages related to the course (short name on moodle: deform23_24 )

**Zielgruppe**

Students in all fields of Geosciences, from Geophysics, Remote Sensing, Geology and others are warmly welcome!

**Leistungen in Bezug auf das Modul**

SL 576101 - Vorlesung und Übung (unbenotet)

## GEW-MF01 - Earth Surface Dynamics

### 108515 VU - Earth Surface Processes

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 12:30 - 14:00 | wöch. | 2.27.2.07 | 15.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Taylor Schildgen |
| 1 | VU | Di | 14:15 - 15:45 | wöch. | 2.27.2.07 | 15.10.2024 | Prof. Dr. Pieter van der Beek, Prof. Dr. Taylor Schildgen |

**Kommentar**

**Contents**

This course deals with the dynamics of Earth-surface processes: erosion, transport and deposition on slopes, by rivers and glaciers. Physical and mathematical models describing these processes are presented and analyzed using available field observations. In addition, the course examines the couplings between tectonics and climate-driven surface processes in landscape evolution. Topics are explored in depth through the reading of scientific papers, followed by group discussion and presentation of research topics to groups of students.

**Qualification goals**

Students:

acquire an understanding of the processes that drive erosion and sediment transport at the Earth's surface, as well as tectonically controlled landscape genesis at plate boundaries and tectonically active regions within continents.

become familiar with modern quantitative methods for observing and modeling Earth-surface processes and their controlling factors.

Learn to analyze and synthesize modern research questions in surface processes and their couplings through literature review, presentations, and group discussions.

**Literatur**

**Textbooks** :

R.S. Anderson & S.P. Anderson, Geomorphology: The Mechanics and Chemistry of Landscapes. .

D. Burbank & R.S. Anderson, Tectonic Geomorphology (2nd Ed.), .

P.R. Bierman & D.R. Montgomery, Key Concepts in Geomorphology (2nd Ed.), .

Additional background papers available on Moodle.

**Leistungen in Bezug auf das Modul**

SL 576111 - Seminar und Übung (unbenotet)

## GEW-MF02 - Sedimentary Processes

### 108516 VU - Modern Carbonates

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 10:15 - 11:45 | wöch. | 2.27.2.07 | 17.10.2024 | Prof. Dr. Maria Mutti, Dr. Jens Kallmeyer, Dr. Benjamin Rendall, N.N. (Mitarbeiter) |
| 1 | U | Do | 12:15 - 13:45 | wöch. | 2.27.2.07 | 17.10.2024 | Prof. Dr. Maria Mutti, Dr. Jens Kallmeyer, Dr. Benjamin Rendall, N.N. (Mitarbeiter) |

**Leistungen in Bezug auf das Modul**

PNL 576121 - Vorlesung und Übung (unbenotet)

## GEW-MF03 - Numerical Analysis and Modelling

### 108517 VU - Remote Sensing of the Environment

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 10:15 - 11:45 | wöch. | 2.27.1.10 | 14.10.2024 | Prof. Dr. Bodo Bookhagen, Sofia Alejandra Viotto |
| 1 | U | Mo | 12:15 - 13:45 | wöch. | 2.27.1.10 | 14.10.2024 | Prof. Dr. Bodo Bookhagen, Sofia Alejandra Viotto |

**Leistungen in Bezug auf das Modul**

PNL 576131 - Vorlesung und Übung (unbenotet)

## GEW-MF04 - Specialization Module-Theory and Applications

### 108518 VU - Mapping and Geoinformation Systems

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Fr | 10:15 - 11:00 | wöch. | 2.25.D0.01 | 18.10.2024 | Dr. Gerold Zeilinger |
| 1 | U | Fr | 11:00 - 11:45 | wöch. | 2.25.D0.01 | 18.10.2024 | Dr. Gerold Zeilinger |
| 1 | SU | Fr | 12:15 - 13:45 | wöch. | 2.25.D0.01 | 18.10.2024 | Dr. Gerold Zeilinger |

**Kommentar**

Main topics are: design of GIS-database, GIS content management, data distribution with GIS-servers, integration of modeling results in GIS, analyses of river networks and geomorphic parameters, analysis of structural data, remote sensed imagery interpretation and digital elevation model extraction, integration of LIDAR data and utilization of geological 3D models in immersive visualization environments.

**Leistungen in Bezug auf das Modul**

PNL 576141 - Vorlesung und Übung (unbenotet)

### 108519 VU - Sedimentary Systems Modelling

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 14:15 - 17:15 | wöch. | 2.27.2.36 | 15.10.2024 | Prof. Dr. Maria Mutti, Dr. Benjamin Rendall |

**Leistungen in Bezug auf das Modul**

PNL 576141 - Vorlesung und Übung (unbenotet)

**108520 VU - Rates and Dates of Geological Processes**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 10:15 - 11:45 | wöch. | 2.27.2.07 | 15.10.2024 | Professor Edward Sobel |
| 1 | VU | Do | 12:30 - 14:00 | wöch. | 2.27.2.36 | 17.10.2024 | Professor Edward Sobel |

**Leistungen in Bezug auf das Modul**

PNL 576141 - Vorlesung und Übung (unbenotet)

**110946 PU - Thematic Field School**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VS | N.N. | N.N. | Einzel | N.N. | N.N. | Prof. Dr. Pieter van der Beek |
| 1 | PU | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Pieter van der Beek |
| | Field practical will take place last week of September / first week of October 2024 | | | | | | |

**Leistungen in Bezug auf das Modul**

PNL 576142 - Blockkurs oder Geländeübung (unbenotet)

## GEW-MF11 - Fundamentals of Digital Seismology

**108523 VU - Digital Seismology**

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | N.N. | N.N. | Block | N.N. | N.N. | Dr. Matthias Ohrnberger |

**Kommentar**

The course is part of the module 'Fundamentals of Digital Seismology' (12 ECTS) which is composed of the 'Digital Seismology' class (6ECTS) offered in winter semester and the 'Array Seismology' class (6ECTS) taught in summer semester. The module exam will be held at the end of the summer semester and will be aboue the content of both classes. The natural order of visiting the classes in the module is first 'Digital Seismology' as a block course in February and then 'Array seismology'. However, this is not formally required. Note that there will be no exam offered at the end of the winter semester.

Qualification goals of the module are:

**- deepen your understanding of digital signal processing and systems theory using the example of seismic time series**

**- understand the mode of action of different types of filters**

**- design and apply different types of filters for seismogram analysis and interpretation, deconvolution of seismograms and instrument correction**

**- learn the analysis of seismic wave fields by means of array methods**

**- understand multichannel filter process**

- understand the relationship between array geometry, inherent array resolution limits, or spatial aliasing artifacts, and strategies to avoid them

- develop, design and install an array in practice

- understand the advantages of array techniques and their fields of application, e.g. to investigate interdisciplinary geoscientific relationships in the Earth system

- being able to perform scientific analysis of interactions in the Earth system

- understand the basics for independent scientific work

**Leistungen in Bezug auf das Modul**

SL 576151 - Vorlesung und Übung I (unbenotet)

## GEW-MF12 - Seismological Data Science

### 108524 VU - Seismic Hazard Analysis

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Do | 12:30 - 14:00 | wöch. | 2.27.2.37/38 | 17.10.2024 | Prof. Dr. Fabrice Cotton |
| 1 | U | Do | 14:15 - 15:45 | wöch. | 2.27.2.37/38 | 17.10.2024 | Prof. Dr. Fabrice Cotton |

**Kommentar**

In this course, the basics of earthquake hazard estimation will be presented and discussed. We will understand why earthquakes generate damages and how seismological (but also geological and geodetic) data can be used to estimate the size, location and frequency of future earthquakes (seismic source models). We will discuss the different factors that control the frequency and amplitude of seismic shaking and learn how to develop and use seismic motion prediction models. We will discuss the interface between science and decision making and how probabilistic seismic hazard estimation models are established and used. Finally, we will discuss the potential (and future) impact of earthquakes on urban areas and identify the main seismic hot spots on our planet. Practical applications of these notions will be taught from Jupyter notebooks. Training in the Python language and the most useful probabilistic notions in the field of risk estimation (e.g uncertainty evaluation) will be taught in this course.

**Lerninhalte**

Course content

- Key ingredients of seismic hazard analysis
- Understanding the probability concepts used in natural hazards evaluation
- Lessons from recent earthquakes
- Seismic hot spots (the seismic future of cities)
- Scientific programming (use of Python notebooks, Python programming)

**Leistungen in Bezug auf das Modul**

SL 576161 - Vorlesung und Übung I (unbenotet)

## GEW-MF13 - Applied Geophysical Methods I

### 108525 VU - Seismic Methods (block course)

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | B | N.N. | N.N. | Block | N.N. | N.N. | Prof. Dr. Jens Tronicke |

**Leistungen in Bezug auf das Modul**

SL 576172 - Blockkurs I (unbenotet)

### 108526 VU - Seismic Methods

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mi | 08:30 - 10:00 | wöch. | 2.27.2.36 | 16.10.2024 | Prof. Dr. Jens Tronicke |
| 1 | U | Mi | 10:15 - 11:45 | wöch. | 2.27.2.36 | 16.10.2024 | Prof. Dr. Jens Tronicke |

**Kommentar**

This course is part of **GEW-MF13 "Applied Geophysical Methods I"** (specialization module Geophysics, MSc Geosciences). It includes weekly lectures and exercises introducing active seismic methods (such as reflection and refraction seismics) and their diverse applications. In addition to the theoretical and physical fundamentals, the course conveys basic aspects of data acquisition, processing, and interpretation.

The first meeting with an introduction and more details will be on **Friday, Oct 20 at 8:30 (room 2.27.2.37/38)** .

**Leistungen in Bezug auf das Modul**

SL 576171 - Vorlesung und Übung I (unbenotet)

## GEW-MF14 - Applied Geophysical Methods II

### 108528 VU - Electrical and Electromagnetic Methods

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Di | 08:30 - 10:00 | wöch. | 2.27.2.37/38 | 15.10.2024 | Dr. Julien Guillemoteau |
| 1 | U | Di | 10:15 - 11:45 | wöch. | 2.27.2.37/38 | 15.10.2024 | Dr. Julien Guillemoteau |
| 1 | B | N.N. | N.N. | Block | N.N. | N.N. | Dr. Julien Guillemoteau |

**Kommentar**

This course is part of the in-depth module "Applied Geophysical methods II". It is recommended for the students following the focus in **Geophysics** with a keen interest in applied geophysics. It covers both theoretical and standard interpretation aspects for the subsurface geophysical imaging methods based on the theory of electromagnetics (i.e., **DC, EMI and GPR** ).

**The first introductory lecture is scheduled on Tuesday 17.10.23 at 8:30.**

**Leistungen in Bezug auf das Modul**

SL 576181 - Vorlesung und Übung (unbenotet)

## GEW-MF21 - Advanced Petrology and Age Determination

### 108530 VU - Advanced Petrology

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | VU | Di | 12:30 - 14:00 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Patrick O'Brien, Dr. Martin Jan Timmerman |
| 1 | VU | Di | 14:15 - 15:45 | wöch. | 2.27.2.49 | 15.10.2024 | Dr. Martin Jan Timmerman, Prof. Dr. Patrick O'Brien |

**Leistungen in Bezug auf das Modul**

SL 576191 - Vorlesung und Übung I (unbenotet)

## GEW-MF22 - Physicochemical Mineralogy-Petrology

### 108531 SU - Experimental Mineralogy-Petrology

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | S | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Sergey Lobanov, Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth |
| 1 | U | N.N. | N.N. | Einzel | N.N. | N.N. | Dr. Sergey Lobanov, Dr. Melanie Jutta Sieber, Dr. rer. nat. Wolfgang Morgenroth |

**Kommentar**

This course ‘Experimental Mineralogy-Petrology’ is part of the module: GEW-MF22 – ‘Physicochemical Mineralogy-Petrology'

learning goals of the module are:

- conducting high-pressure/high-temperature laboratory experiments on minerals, glasses and rocks to better understand magmatic and metamorphic processes in nature

components of the module are:

- one course in WiSe or SoSe ('Experimental Mineralogy-Petrology') and
- one course in SoSe ('Mineral Physics and Spectroscopy')

in this course 'Experimental Mineralogy-Petrology' you will be:

- conducting experiments
- examine the resulting material with various analytical methods
- prepare a short presentation and report

After a pre-meeting (October XXth), you will carry out your experiments and analysis in approx. 4 - 6 laboratory appointments.

**Bemerkung**

Students interested in this course are asked to join our pre-meeting for this course which includes the selection of projects:

**XX, October XX, at XX:XX at in room XX**

In case you can not join in person, please contact Melanie Sieber, melanie.sieber@uni-potsdam.de , or Wolfgang Morgenroth, wolfgang.morgenroth@uni-potsdam.de , by email.

**Leistungen in Bezug auf das Modul**

| | |
|---|---|
| SL | 576202 - Seminar und Übung (unbenotet) |

## GEW-MF23 - Special Topics in Mineralogy-Petrology

### 108532 VS - Geofluids and Clay Mineralogy

| Gruppe | Art | Tag | Zeit | Rhythmus | Veranstaltungsort | 1.Termin | Lehrkraft |
|---|---|---|---|---|---|---|---|
| 1 | V | Mo | 14:15 - 15:45 | wöch. | 2.27.2.49 | 14.10.2024 | Dr. Anja Schleicher, Prof. Dr. Max Wilke |
| 1 | S | Di | 16:15 - 17:45 | wöch. | 2.27.2.49 | 15.10.2024 | Prof. Dr. Max Wilke, Dr. Anja Schleicher |

**Kommentar**

One part of the course will deal with the role of aqueous fluids in geochemical processes. We will discuss their properties at geological conditions and the chemical thermodynamics of fluids. We will discuss what samples of geological fluids are available and how we can understand them. We will discuss fluid-rock interactions and how they influence large-scale geological processes. Knowledge of thermodynamics is very helpful to follow this course.

The second part of the course will deal with the role of clay minerals in geological processes. We will discuss their unique properties, analytical techniques to study clays and how they can be used as engineeering materials.

We will meet for the first time on Oct 15 at 16:15 with a short introductory

**Leistungen in Bezug auf das Modul**

| | |
|---|---|
| SL | 576211 - Vorlesung und Seminar (unbenotet) |

# Glossar

Die folgenden Begriffserklärungen zu Prüfungsleistung, Prüfungsnebenleistung und Studienleistung gelten im Bezug auf Lehrveranstaltungen für alle Ordnungen, die seit dem WiSe 2013/14 in Kranft getreten sind.

| | |
|---|---|
| **Prüfungsleistung** | Prüfungsleistungen sind benotete Leistungen innerhalb eines Moduls. Aus der Benotung der Prüfungsleistung(en) bildet sich die Modulnote, die in die Gesamtnote des Studiengangs eingeht. Handelt es sich um eine unbenotete Prüfungsleistung, so muss dieses ausdrücklich („unbenotet“) in der Modulbeschreibung der fachspezifischen Ordnung geregelt sein. Weitere Informationen, auch zu den Anmeldemöglichkeiten von Prüfungsleistungen, finden Sie unter anderem in der Kommentierung der BaMa-O |
| **Prüfungsnebenleistung** | Prüfungsnebenleistungen sind für den Abschluss eines Moduls relevante Leistungen, die – soweit sie vorgesehen sind – in der Modulbeschreibung der fachspezifischen Ordnung beschrieben sind. Prüfungsnebenleistungen sind immer unbenotet und werden lediglich mit "bestanden" bzw. "nicht bestanden" bewertet. Die Modulbeschreibung regelt, ob die Prüfungsnebenleistung eine Teilnahmevoraussetzung für eine Modulprüfung oder eine Abschlussvoraussetzung für ein ganzes Modul ist. Als Teilnahmevoraussetzung für eine Modulprüfung muss die Prüfungsnebenleistung erfolgreich vor der Anmeldung bzw. Teilnahme an der Modulprüfung erbracht worden sein. Auch für Erbringung einer Prüfungsnebenleistungen wird eine Anmeldung vorausgesetzt. Diese fällt immer mit der Belegung der Lehrveranstaltung zusammen, da Prüfungsnebenleistung im Rahmen einer Lehrveranstaltungen absolviert werden. Sieht also Ihre fachspezifische Ordnung Prüfungsnebenleistungen bei Lehrveranstaltungen vor, sind diese Lehrveranstaltungen zwingend zu belegen, um die Prüfungsnebenleistung absolvieren zu können. |
| **Studienleistung** | Als Studienleistung werden Leistungen bezeichnet, die weder Prüfungsleistungen noch Prüfungsnebenleistungen sind. |


# Impressum


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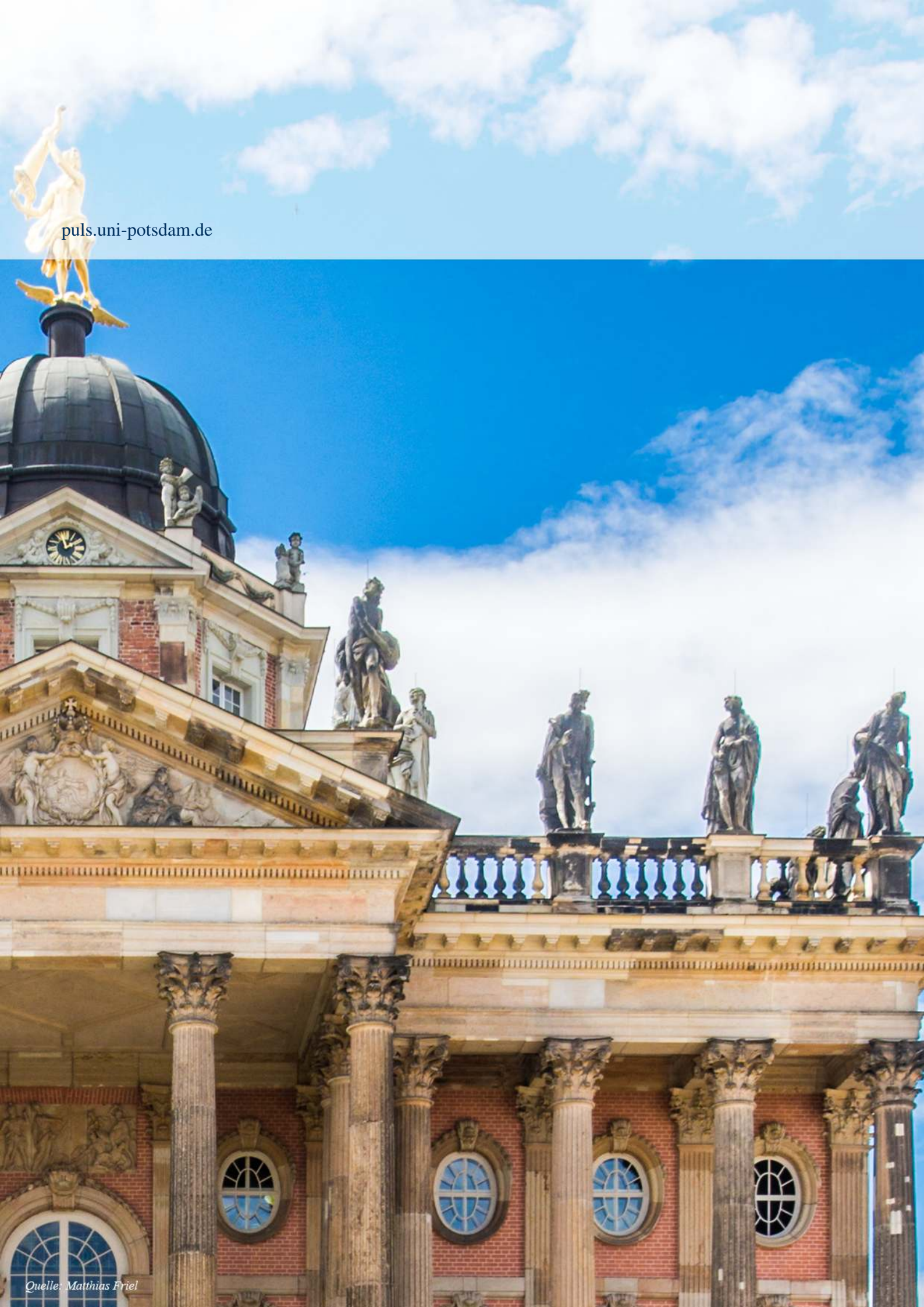

*Quelle: Matthias Friel*