

M.Sc. Polar and Marine Sciences

POMOR

Semester in Germany

Christian Albrechts University of Kiel

Contact

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Term 1 (WS) Russia, St. Petersburg State University	Module 1 Ocean basins, sediments and climate change CP 9	Module 2 High seas and coastal waters oceanography CP 9	Module 3 Polar and marine ecosystem: structure, functioning and vulnerability CP 9	Core Module Part 1 CP 2/6
Term 2 (SS) Russia, St. Petersburg State University	Module 4 Natural resources CP 9	Module 5 Processes in the coastal zone and environmental management CP 9	Module 6 Periglacial environment CP 9	Core Module Part 2 incl. field practice in Russia or Germany CP 4/6
Term 3 (WS) Germany, Partner universities	Semester abroad at one of the partner universities and institutions in Germany, Specialization, Electives, Additional: <ul style="list-style-type: none"> • Hamburg University: Integrated Climate System Sciences (ICSS) • Bremen University: Marine Biology • Christian Albrecht University of Kiel: Marine Geosciences • University of Potsdam: Geosciences/Geology CP 30			
Term 4 (SS) Russia and Germany	M.Sc. Thesis Polar and Marine Sciences with Defence <ul style="list-style-type: none"> • St. Petersburg State University, Russia • University of Hamburg, Germany • Alfred Wegener Institute for Polar and Marine Research, Germany • Arctic and Antarctic Research Institute, Russia • Leibniz Institute for Baltic Sea Research Warnemünde, Germany • GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany • Otto Schmidt Laboratory for Polar and Marine Research (OSL), Russia • University of Bremen, Germany • Christian Albrecht University of Kiel, Germany • University of Potsdam, Germany • University of Rostock, Germany CP 30			

Figure 1: Structure of the M.Sc. Program POMOR

Symbol	DS / Christian Albrecht University of Kiel (CAU) - overview	
Title	Semester abroad at the Christian Albrecht University of Kiel	
Learning outcomes	Students have obtained the latest state of marine geosciences and technology, in particular in marine geology, past climates, biogeochemistry and paleoecology; they know fundamental terms of geological, biological, geochemical and physical processes in the ocean. The students can create and critically assess scientific results and plan, carry out and evaluate ship and laboratory projects on their own responsibility.	
Contents	Based on the modules of the M.Sc. Marine Geosciences students can choose different courses: DS 1 CAU: Specialization: Marine Geosciences DS 2 CAU: Elective Courses DS 3 CAU: Additional in Marine Geosciences	
Educational concept	L, S, P, E	
Language	English	
Formal requirements for participation	None	
Recommended prerequisites	None	
Grading framework (possibly including examinations)	Type:	Written exams
	Language:	English
Credits	30.0	
Coordinator	W.-Ch. Dullo	

Abbreviations: Lecture L. Practical training P. Seminar S. Excursion E.

Symbol	DS 1 CAU	
Title	Specialization: Marine Geosciences	
Learning outcomes	The students have acquired knowledge on marine hydrothermal and volcanic systems and their associated ore deposits and have obtained competence in professional economic geology and deep sea mining techniques. They understand isotope fractionation in stable, radiogenic, radioactive, traditional and non-traditional isotope systems.	
Contents	Recommended courses of the M.Sc. Marine Geosciences are: - Marine Geosystems (MNF-mgeo-MGS); L, S [A. Eisenhauer] CP 4 - Marine Resources (MNF-mgeo-MR); L [C. Devey] CP 3 - Basin Analysis (MNF-geow-MP3); L [W.-Ch. Dullo] CP 5	
Educational concept	L, S	
Language	English	
Formal requirements for participation	None	
Recommended prerequisites	None	
Grading framework (possibly including examinations)	Type:	Written exams
	Language:	English
Credits	9.0-12.0	
Workload	Campus study:	50 hours
	Self-study:	160 hours
	Exam preparation:	90 hours
Module type	Compulsory	
Semester	Semester 3 of M.Sc. POMOR	
Frequency of offer	Every second year in winter semester	
Duration	1 semester	
Usability	Elective for M.Sc. POMOR	
Coordinator	W.-Ch. Dullo	
Course lecturer(s)	See an extract from the module handbook of the M.Sc. Marine Geosciences attached	
Literature	Specific literature will be announced during the courses	

Abbreviations: Lecture L. Practical training P. Seminar S. Excursion E.

Module title	Marine Geosystems
Module number	MNF-mgeo-MGS
Semester / duration	1 / 2 semesters
Coordinator	Prof. Dr. A. Eisenhauer
Courses	Marine Isotope Systems (L) Prof. Dr. Anton Eisenhauer Marine Geosystems (S) Prof. Dr. Anton Eisenhauer Prof. Dr. Martin Frank Prof. Dr. Ing. Klaus Wallmann
Workload	120 h
Credits	4
Requirements	BSc Geosciences
Learning outcomes	Process oriented understanding of isotope fractionation in stable, radiogenic, radioactive, traditional and non-traditional Isotope systems.
Contents	Marine Geosystems introduces physical, chemical and biological processes that lead to the transfer of elements (macro and trace), fluids (porewater, groundwater) and gases (methane, carbon dioxide) between the continents, marine sediments and seawater. These processes contribute to the delivery of chemical signatures to the geological record on all timescales. Modern technologies, e.g. the lander technology, porewater geochemistry and the analysis of stable, radiogenic and radioactive isotopes will be introduced.
Examination	Written exam covering the lectures
Literature	G. Faure, Principles of Isotope Geology A.P. Dickin, Radiogenic Isotope Geology; Geochemistry of Non-traditional Stable Isotopes
Further details	n.a.

Module title	Marine Resources
Module number	MNF-mgeo-MR
Semester / duration	1 / 2 semesters
Coordinator	Prof. Dr. C. Devey
Courses	Hydrothermal Systems and Ore Deposits (L) Prof. Dr. Colin Devey
Workload	90 h
Credits	3
Requirements	BSc Geosciences
Learning outcomes	The students will acquire knowledge on marine hydrothermal and volcanic systems and their associated ore deposits. Competence in professional economic geology and deep sea mining techniques.
Contents	Formation of marine resources in association with volcanic, sedimentary and hydrothermal processes at the sea floor. Characterization of volcanic deposits and their eruption and transport mechanisms. Chemistry and petrology of hydrothermal precipitates, massive sulfides and altered rocks. Technologies for deep-sea exploration and exploitation.
Examination	Written exam
Literature	Hekinian, R., Stoffers, P., Cheminee, J.-L.: Oceanic Hotspots. Springer-Verlag Berlin, 253-280. 2004 P.E. Halbach, V. Tunnicliffe, and J.R. Hein: Energy and mass transfer in marine hydrothermal systems. Dahlem University Press, Berlin. Geochemistry of Hydrothermal Ore Deposits, 3rd Edition. Hubert Lloyd Barnes (Editor). ISBN: 978-0-471-57144-5. Hardcover. 992 pages. June 1997
Further details	n.a.

Module title	Basin Analysis
Module number	MNF-mgeo-MP3
Semester / duration	1 / 2 semesters
Coordinator	Prof. Dr. W.-Ch. Dullo
Courses	Sequence Stratigraphy and Facies Analysis (L) Prof. Dr. Wolf-Christian Dullo Petroleum Geology (L) Prof. Dr. Wolf-Christian Dullo
Workload	150 h
Credits	5
Requirements	BSc Geosciences
Learning outcomes	Students will acquire knowledge in the facies and stratigraphic analysis of basin depositional systems and their interpretation. Competences: professional competence, communicative/presentation competence
Contents	Basics in Sequence- and Seismic Stratigraphy, Facies Analysis of carbonate rocks, Methods in Hydrocarbon exploration. Within the Modul different depositional systems, and their characteristic features in Earth's History will be presented with respect to their potential as source- and host rock potential.
Examination	Oral exam
Literature	Flügel 2004: Microfacies Analyses of Limestones Bally 1996: Atlas of Seismic Stratigraphy Vol 1-3 Mial: 2001 Basin Analysis
Further details	n.a.

Symbol	DS 2 CAU	
Title	Elective Courses	
Learning outcomes	The students have obtained well-grounded knowledge of isotope geochemistry and geochronology. They can analyze sedimentary structures, and reconstruct sediment-dynamic processes applied to the coastal zone of Schleswig-Holstein. The students can carry out independent analytical data acquisition and validation.	
Contents	Recommended courses of the M.Sc. Marine Geosciences are: - Petrology/Geochemistry (MNF-geow-MP5); P, L, S [K. Hoernle] CP 5 - Coastal Geology (MNF-mgeo-MP2); L, S [K. Schwarzer] CP 5 - Project Work Marine Geosciences (MNF-mgeo-WP); S, P [R. Schneider] CP 10 - German Course I; S CP 6	
Educational concept	L, S, P	
Language	English	
Formal requirements for participation	None	
Recommended prerequisites	None	
Grading framework (possibly including examinations)	Type:	Written exams
	Language:	English
Credits	9.0-12.0	
Workload	Campus study:	50 hours
	Self-study:	160 hours
	Exam preparation:	90 hours
Module type	Compulsory	
Semester	Semester 3 of M.Sc. POMOR	
Frequency of offer	Every second year in winter semester	
Duration	1 semester	
Usability	Elective for M.Sc. POMOR	
Coordinator	W.-Ch. Dullo	
Course lecturer(s)	See an extract from the module handbook of the M.Sc. Marine Geosciences attached	
Literature	Specific literature will be announced during the courses	

Abbreviations: Lecture L. Practical training P. Seminar S. Excursion E.

Module title	Petrology/Geochemistry
Module number	MNF-mgeo-MP5
Semester / duration	1 / 2 semesters
Coordinator	Prof. Dr. K. Hoernle
Courses	Isotope Geochemistry and Geochronology (L) Prof. Dr. Kaj Hoernle Prof. Dr. Volker Schenk Dr. Paul van den Bogaard Isotope Geochemistry and Geochronology (P) Prof. Dr. Kaj Hoernle Prof. Dr. Volker Schenk Dr. Paul van den Bogaard Magmatic Processes and Plate Tectonics (L) Prof. Dr. Kaj Hoernle Petrology-Geochemistry Seminar (S) Prof. Dr. Kaj Hoernle
Workload	150 h
Credits	5
Requirements	BSc Geosciences
Learning outcomes	Understanding and well-grounded background knowledge of isotope geochemistry and geochronology applied to magmatic and metamorphic rocks and their geological genesis; understanding of the influence of plate tectonics to melting processes. Lectures and practical exercise: professional competence 100%; seminar: professional competence 90%, communicative/presentation competence 10%
Contents	Basic knowledge of Sr-Nd-Pb-Hf-He isotope geochemistry and isotope geochronology (Rb-Sr, Sm-Nd, U-Th-Pb and Ar/Ar systematics) and of melting processes in relation to plate tectonics.
Examination	Oral exams, presentations
Literature	G. Faure: Principles of Isotope Geology K.G. Cox, J.D. Bell, R.J. Pankhurst: The Interpretation of Igneous Rocks
Further details	n.a.

Module title	MSc Coastal Geology I
Module number	MNF-mgeo-MP2
Semester / duration	1 / 2 semesters
Coordinator	Prof. Dr. Karl Stattegger
Courses	Coastal processes (L) Dr. Klaus Schwarzer Coastal Related Depositional Systems (L) Prof. Dr. Karl Stattegger Field work in Coastal Geology (E) Prof. Dr. Karl Stattegger Dr. Klaus Schwarzer
Workload	150 h
Credits	5
Requirements	BSc Geosciences BSc Physical Earth Sciences
Learning outcomes	Analysis of sedimentary structures, process-oriented classification of depositional environments in their temporal-spatial evolution, description and reconstruction of sediment-dynamic processes applied to the coastal zone of Schleswig-Holstein
Contents	Depositional environments and sedimentary processes in the coastal zone, case studies with examples from the coast of Schleswig-Holstein.
Examination	Written exam covering the lectures
Literature	Carter, R.W.G. (1988): Coastal Environments: 617 p.; London, San Diego, New York, Berkeley, Boston (Academic Press). Galloway, W.E., Hobday, D.K. (1996): Terrigenous Clastic Depositional Systems. 489 pp., Springer. Reineck, H.E., Singh, I.B. (1980): Depositional Sedimentary Environments, 2nd edition: 549 p.; Springer. Schäfer, A., 2005, Klastische Sedimente. 414 S., Elsevier. Woodroffe, C.D., 2002, Coasts. 623 S., Cambridge Univ. Press.
Further details	n.a.

Module title	Work Project Marine Geosciences
Module number	MNF-mgeo-WP
Semester / duration	3 / 1 semesters
Coordinator	Prof. Dr. Ralph R. Schneider
Courses	<p>Work Project Marine Geosciences (P)</p> <p>Prof. Dr. Jan Behrmann Prof. Dr. Colin Devey Prof. Dr. Wolf-Christian Dullo Prof. Dr. Anton Eisenhauer Prof. Dr. Martin Frank Prof. Dr. Wolfgang Kuhnt Prof. Dr. Ralph R. Schneider Prof. Dr. Karl Stattegger Prof. Dr. Ing. Klaus Wallmann PD Dr. Dirk Nürnberg</p> <p>Research Seminar Marine Geosciences (S)</p> <p>Prof. Dr. Colin Devey Prof. Dr. Anton Eisenhauer Prof. Dr. Ralph R. Schneider Prof. Dr. Karl Stattegger Prof. Dr. Ing. Klaus Wallmann</p>
Workload	300 h
Credits	10
Requirements	BSc Geosciences
Learning outcomes	Capability for independent analytical data acquisition and validation. Competence in scientific writing, presentation competence.
Contents	Application of marine geoscientific working methods, report writing and presentation of own project data.
Examination	Project report and presentation
Literature	Actual research articles will be provided in the seminar. Laboratory protocols and manuals are made accessible for project work.
Further details	n.a.

Symbol	DS 3 CAU	
Title	Additional in Marine Geosciences	
Learning outcomes	The students understand complex biogeochemical fluxes in the ocean and marine environmental change in Earth's History. They have obtained knowledge of state of the art chemical laboratory techniques applied to marine sediments. They can critically examine innovative topics of paleontological research.	
Contents	Recommended courses of the M.Sc. Marine Geosciences are: - Biogeochemistry (MNF-geow-MP4); L, P [K. Wallmann] CP 5 - Chemical Paleoceanography (MNF-mgeo-CP); L, S [M. Frank] CP 4 - Evolution of Biosphere and Climate (MNF-mgeo-MP1); L [P. Schäfer] CP 4	
Educational concept	L, S, P	
Language	English	
Formal requirements for participation	None	
Recommended prerequisites	None	
Grading framework (possibly including examinations)	Type:	Written exams
	Language:	English
Credits	9.0-12.0	
Workload	Campus study:	50 hours
	Self-study:	160 hours
	Exam preparation:	90 hours
Module type	Compulsory	
Semester	Semester 3 of M.Sc. POMOR	
Frequency of offer	Every second year in winter semester	
Duration	1 semester	
Usability	Elective for M.Sc. POMOR	
Coordinator	W.-Ch. Dullo	
Course lecturer(s)	See an extract from the module handbook of the M.Sc. Marine Geosciences attached	
Literature	Specific literature will be announced during the courses	

Abbreviations: Lecture L. Practical training P. Seminar S. Excursion E.

Module title	Biogeochemistry
Module number	MNF-mgeo-MP4
Semester / duration	1 / 1 semesters
Coordinator	Prof. Dr. Ing. Klaus Wallmann
Courses	Marine Biogeochemistry (L) Prof. Dr. Ing. Klaus Wallmann Modelling in Marine Biogeochemistry (P) Prof. Dr. Ing. Klaus Wallmann
Workload	150 h
Credits	5
Requirements	BSc Geosciences
Learning outcomes	Understanding of complex biogeochemical fluxes in the ocean. Basic knowledge in biogeochemical modelling in the deep ocean. Professional competence
Contents	Comprehensive introduction to the complex biogeochemical Fluxes and exchange processes in the ocean and at the sediment-water-interface; modelling of early diagenesis; biogeochemical fluxes associated with fluid and gas venting.
Examination	Written exam
Literature	Broecker & Peng: Tracers in the Sea
Further details	n.a.

Module title	Chemical Paleoceanography
Module number	MNF-mgeo-CP
Semester / duration	1 / 2 semesters
Coordinator	Prof. Dr. Martin Frank
Courses	Organic compounds and Trace Metals in Sea Water (S) Prof. Dr. Anton Eisenhauer Prof. Dr. Martin Frank Chemical Paleoceanography (L) Prof. Dr. Martin Frank
Workload	120 h
Credits	4
Requirements	BSc Geosciences
Learning outcomes	Basic understanding of processes and interaction of controlling factors of marine environmental change in Earth's History. Knowledge of state of the art chemical laboratory techniques applied to marine sediments.
Contents	Distribution and Depositional Environment of chemical sediments through Earth's History. Analytical approaches to environmental information stored in marine sediments in the chemistry lab
Examination	Written exam and presentation
Literature	will be announced during lectures: G. Faure, Principles of Isotope Geology A.P. Dickin, Radiogenic Isotope Geology
Further details	n.a.

Module title	Evolution of Biosphere and Climate
Module number	MNF-mgeo-MP1
Semester / duration	1 / 1 semester
Coordinator	Prof. Dr. Priska Schäfer
Courses	Climate Reconstruction through Earth's History (L) Prof. Dr. Ralph R. Schneider Basic Concepts in Paleontology (L) Prof. Dr. Wolfgang Kuhnt Prof. Dr. Priska Schäfer
Workload	120 h
Credits	4
Requirements	BSc Geosciences
Learning outcomes	Critical examination with innovative topics of paleontological research; Acquirement of methodology competence in paleontological and paleoclimatology. Acquisition of presentation skills by self-dependent work on special topics in paleontology and paleoclimatology.
Contents	Overview on innovative topics in Paleontology and their relation to Geosciences; Evolution of Climate during Earth's History and their Impact and Feedback with the Biosphere.
Examination	Written exam covering the lectures
Literature	Stanley: Earth System History Ruddiman: Earth's Climate Past and Future
Further details	n.a.