Kiel: an excellent place for PhD research

future ocean
KIEL MARINE SCIENCES

About Us

The Kiel Cluster of Excellence „Future Ocean" offers an approach to research that is unique: marine researchers, geologists, economists as well as medical scientists, mathematicians, legal and social scientists contribute their expertise to investigate ocean and climate change.

Over 250 scientists from all these disciplines have joined forces to form an excellent environment for Marine Research. The "The Future Ocean" is currently in its second phase (2012-2017) and is supported within the framework of the "excellence initiative" of the German Research Foundation (DFG) on behalf of the German government and the federal states of Germany, funded with 28 Mio € until 2017.

The Helmholtz Centre for Ocean Research Kiel (GEOMAR), a main partner in the Cluster, is a world leader in investigating all relevant aspects of modern marine sciences, from the atmosphere to the sea floor.

www.futureocean.org

About the PhD Programme

As a PhD candidate in the Cluster of Excellence „The Future Ocean" you will be supported by the Integrated School of Ocean Sciences (ISOS) which offers a high level scientific and career-oriented training as well as additional financing and a framework of supervision.

As an international PhD candidate, you will have access to all-round education to get prepared for careers in academia as well as in non-academic areas. The ISOS provides early exposure to topics beyond research, such as social responsibility, public communication, and global sustainability. Input to the programme comes from senior Cluster members, alumni, and persons from industry and public life encouraging you to form networks early and set your own goals for life after your doctorate.

www.futureocean.org/isos

As a student in Kiel you will not pay any tuition fees.
www.uni-kiel.de




You are interested? Then take the next steps:

- Check website of PI
- Contact ISOS or PI
- Submit a draft of your own research proposal to your potential PI
- Contact ISOS or PI for support with your CSC application

Note: The CSC application has to be submitted to the Graduate School of your University at first. Please contact them for details on application procedure/ requirements and deadlines.

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The Cluster of Excellence "THE FUTURE OCEAN" offers PhD Research Topics* in Marine Sciences

Topics in Biological Oceanography

- Chemical and physical properties of marine gel particles – Prof. Dr. Anja Engel
- Towards a mechanistic understanding of phytoplankton responses to multiple environmental drivers – Prof. Dr. Ulf Riebesell
- Uncovering the energetic costs of calcification in coccolithophores – Prof. Dr.Ulf Riebesell

Topics in Chemical Oceanography

- Biogeochemistry of particulate Fe, Ag, Al, Cd, Cu, Mn, Mo, Ni, Pb, U, Zn in the South Atlantic and South Indian Oceans. Contribution to the International GEOTRACES Programme – Prof. Dr. Eric Achterberg
- The impact of pH and temperature on the organic complexation of iron in the ocean – Prof. Dr. Eric Achterberg
- Global oceanic emissions of carbon monoxide (CO) – Prof. Dr. Hermann Bange
- Biogeochemical/biological variability at the Time Series Station Boknis Eck (SW Baltic Sea) – Prof. Dr. Hermann Bange
- Trace gas air-sea exchange using eddy covariance – Prof. Dr. Christa Marandino

Topics in Chemical Paleoceanography

- Reconstructing past precipitation and continental runoff from stable Ba isotopes in corals – Prof. Dr. Martin Frank

Topics in Evolutionary Genomics

- The evolution of multicellularity: investigating the causes and mechanisms utilizing unicellular bacterial populations – Prof. Dr. Tal Dagan
- Evolution of bacteria and their phages in marine ecosystems – Prof. Dr. Tal Dagan

Topics in Ingeneous Geochemistry

- Geochemistry and evolution of the Etendeka flood basalt province, Namibia – Prof. Dr. Kaj Hoernle

Topics in Invasion Ecology

- Understanding the source, spread and impact of the pet traded Nearctic turtles in Schleswig-Holstein – Prof. Dr. Stefanie Ismar

Topics in Marine Biogeochemical Modelling

- Transport of biogeochemical tracers by coherent ocean eddies – Prof. Dr. Andreas Oschlies
- Response of marine elemental cycling to ongoing environmental changes – Prof. Dr. Andreas Oschlies

Topics in Marine Environmental Impact Assessment

- Environmental Life Cycle Assessment (LCA) of aquaculture and fisheries products – Prof. Dr. Carsten Schulz

Topics in Marine Geosystems

- Nutrient cycling in marine sediments – Prof. Dr. Klaus Wallmann

Topics in Marine Meterology

- Remote Influences on Tropical Pacific Climate Variability – Prof. Dr. Mojib Latif

Topics in Marine Microbiology

- Elicitation of secondary metabolism in marine sponge-associated actinomycetes – Prof. Dr. Ute Hentschel Humeida

Topics in Marine Molecular Biology

- Development of CRISPR/Casmediated gene editing in the marine flatworms Macrosotmum lignano - Prof. Dr. Thomas Roeder

Topics in Marine Physiology

- Conoidean Peptides - Novel ion channel targeted peptides from the ocean – Prof. Dr. Heinrich Terlau

Topics in Mathematics and Marine Science

- Simulation, parameter identification and optimization in marine research – Prof. Dr. Thomas Slawig

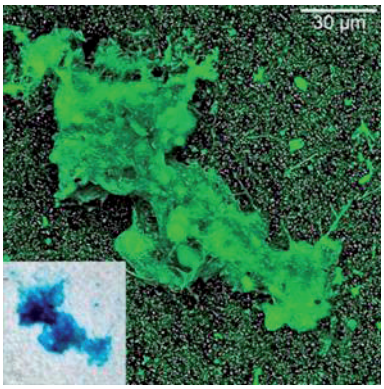
Topics in Paleoceanography

- Water mass dynamics and biogeochemistry in arctic/boreal cold-water coral reef settings off northern Europe – Prof. Dr. Christian Dullo

Topics in Seafloor Modelling

- Effects of sedimentation on strain partitioning and mantle melting during passive margin formation – Prof. Dr. Lars Ruepke

* Important Notice: These topics do not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.



Chemical and physical properties of marine gel particles

Prof. Dr. Anja Engel

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email: aengel@geomar.de

Research Topic

The successful PhD candidate will characterize marine gel particles including molecular and elemental composition as well as chemical-physical properties such as stickiness.
Gel particles such as the polysaccharidic transparent exopolymer particles (TEP) and the proteinaceous Coomassie stainable particles (CSP) play an important role in marine biogeochemical and ecological processes like particle aggregation and export, or microbial nutrition and growth. They form by spontaneous assembly and coagulation of high molecular weight dissolved organic matter components, colloids and particles; however, the actual chemical composition of gel particles remains largely unknown. To better understand the role of gel particles in marine biogeochemical cycling, particle dynamics and food web dynamics it is necessary to obtain comprehensive knowledge of their chemical composition as well as of their physical, chemical and biological reactivity.
The PhD thesis shall reveal the biochemical composition of gel particles using HPLC and IC-HPLC techniques for amino acid and carbohydrate analysis, elemental analysis for carbon, nitrogen and phosphorus as well as confocal laser scanning microscopy to investigate the biochemical structure of gels. Coagulation processes will be studied to determine the dependency of coagulation efficiencies (stickiness) of gel particles such as transparent exopolymer particles (TEP) and Coomassie stainable particles (CSP) on their chemical composition, size and fractal dimension.

This dissertation will be carried out at the GEOMAR Helmholtz Centre for Ocean Research Kiel and the PhD candidate will be enrolled at the University of Kiel. Samples will be collected during experiments with phytoplankton and bacterioplankton cultures as well as during field cruises. This PhD topic will be supervised by Prof. Dr. Anja Engel and co-advised by Dr. Cisternas- Novoa within the Biological Oceanography research unit at GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany.

Picture: Confocal laser scanning microscope (cLSM) image of a marine gel particle stained with the fluorescent lectine Concanavalin A. Insert picture: the same particles stained with the polysaccharide specific dye Alcian Blue. Picture by Jan Michels.

Requirements/Qualifications

- excellent degree in biological or chemical oceanography, or in organic chemistry
- excellent communication skills in English, written and oral
- good background in analytical methods of seawater using HPLC
- good background in microscopic techniques, preferentially cLSM
- preferentially expertise in culturing marine plankton organisms

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

In this application, please also provide at least two scientific contacts with full postal and email addresses for the request of reference letters. An interview will be conducted in English via internet.

Research group

The PhD candidate will work in the Marine Microbial Biogeochemistry group led by Prof. Dr. Anja Engel. This group uses state of the art microbiological and biochemical approaches to understand turn-over and export processes of organic matter in the ocean. One of the key advantages of the GEOMAR Helmholtz Centre for Ocean Research is the strong link between various research groups, enabling cooperation between disciplines.
The co-advisor Dr. Carolina Cisternas-Novoa has received her PhD from Stony Brook University, USA. Dr. Cisternas-Novoa research is concern with understanding the distribution and behavior of particulate organic matter in the ocean, particularly with the distribution and processes related to gel particles, and the role of these compounds in aggregation and carbon export by the biological pump in different marine environments.

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Towards a mechanistic understanding of phytoplankton responses to multiple environmental drivers

Prof. Dr. Ulf Riebesell

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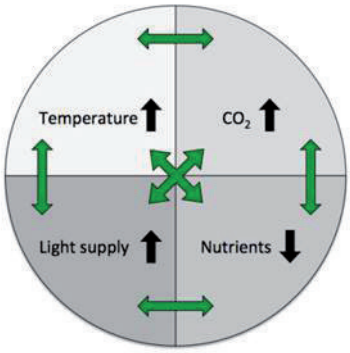
Research Topic

A major challenge in biological oceanography is to estimate how marine ecosystems will respond to climate change. Organisms will encounter a complex matrix of simultaneous environmental changes, including temperature, carbonate chemistry, light supply, nutrient availability and oxygen concentrations. The focus of this project is to achieve a more mechanistic understanding of the effect of multiple changing environmental drivers on marine phytoplankton.
By carrying out a series of culture experiments, we will determine the physiological response to various environmental drivers separately. This will allow us to quantify (i) the functional responses to these drivers and (ii) to identify physiological key parameters, such as optima and thresholds of growth.
Based on this, we will include pairs or trios of drivers in the experiments to determine the interactive effect of drivers on these key parameters. Multivariate data analysis tools and physiological models will allow us to detect synergistic and antagonistic effects of multiple drivers. Ultimately, the results will help us to better quantify phytoplankton responses to the complex matrix of ocean change. Such information is highly valuable to increase realism in marine ecosystem models, and to improve projections of regional and global impacts of global change.



Projected changes in oceanic conditions for some key environmental drivers (black arrows) and potential interactions (synergistic or antagonistic) between the drivers (green arrows). Based on Boyd et al., 2012.

Requirements/Qualifications

- Excellent communication skills in both spoken and written English.
- A high ability to work independently.
- A degree (Msc.) in marine biology or a closely related subject.
- Experience with culturing phytoplankton would be preferable.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The project will be integrated in the Biological Oceanography department at GEOMAR, led by Prof. Dr. Ulf Riebesell. Research in our division focuses on biologically driven processes in the ocean and their impact on marine elemental cycling. In addition to improving our understanding of undisturbed systems, there is a growing need to examine and forecast the effects of natural and human-induced environmental changes on marine biological systems. For example, what is the impact of global warming on biological processes and what consequences are expected from CO_2-induced ocean acidification? How do changes in dust deposition and iron flux into the ocean influence the ocean's productivity and elemental turnover? These and similar questions are addressed by a combination of laboratory experiments under well-controlled conditions, field studies, including manipulative experiments in natural settings, and computer simulations of the coupled physical, chemical and biological processes.
The project will be co-supervised by Dr. Jan Taucher.

Prof. Dr. Ulf Riebesell

Dr. Jan Taucher

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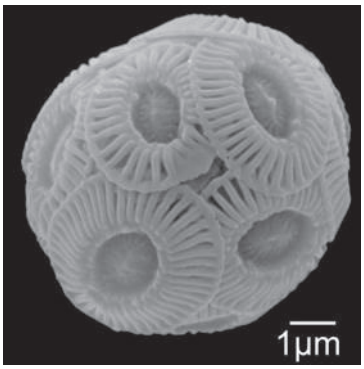

Uncovering the energetic costs of calcification in coccolithophores

Prof. Dr. Ulf Riebesell

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Research Topic

Coccolithophores are a group of globally distributed marine phytoplankton species which cover themselves with a shell (coccosphere) composed of tiny calcium carbonate platelets (coccoliths). Through their ability to calcify they contribute to the vertical gradient in ocean alkalinity, accelerate organic matter export to depth, and increase the Earth's albedo, making this functional group a key player in the climate system. Despite more than a century of intense research on coccolithophore calcification and its biogeochemical relevance, one of the most fundamental questions is still unresolved: What are the energetic costs of calcification? Answering this question is of outstanding importance because if we fail to determine the energetic effort required for calcification we remain unable to predict to what extent calcification costs will increase in a future acidified ocean.

Picture: Scanning electron microscopy picture of Emiliania huxleyi, the most abundant coccolithophore species on the planet.

In the project proposed herein we address this key question with a suite of physiological methods integrated in a novel experimental design. With this new approach we aim to: (1) quantify the energetic costs of calcification in four coccolithophore species with high biogeochemical relevance. (2) investigate if the energetic effort increases under continuously acidifying conditions

Requirements/Qualifications

- Excellent communication skills in both spoken and written English.
-A high ability to work independently.
- A degree (Msc.) in marine biology or a closely related subject.
- Experience with culturing phytoplankton would be preferable.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The project will be integrated in the Biological Oceanography department at GEOMAR, led by Prof. Dr. Ulf Riebesell. Research in our division focuses on biologically driven processes in the ocean and their impact on marine elemental cycling. In addition to improving our understanding of undisturbed systems, there is a growing need to examine and forecast the effects of natural and human-induced environmental changes on marine biological systems. For example, what is the impact of global warming on biological processes and what consequences are expected from CO_2-induced ocean acidification? How do changes in dust deposition and iron flux into the ocean influence the ocean's productivity and elemental turnover? These and similar questions are addressed by a combination of laboratory experiments under well-controlled conditions, field studies, including manipulative experiments in natural settings, and computer simulations of the coupled physical, chemical and biological processes. .
The project will be co-supervised by Dr. Lennart Bach

Prof. Dr. Ulf Riebesell

Dr. Lennart Bach

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Biogeochemistry of particulate Fe, Ag, Al, Cd, Cu, Mn, Mo, Ni, Pb, U, Zn in the South Atlantic and South Indian Oceans. Contribution to the International GEOTRACES Programme

Prof. Dr. Eric Achterberg

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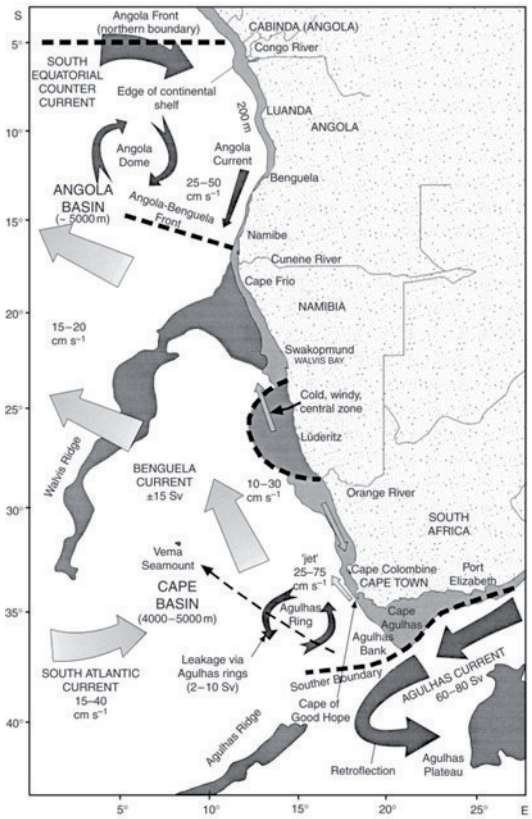
Research Topic

A number of trace metals – micronutrients – are critical to life and play a key role in ocean productivity but have chemical cycles in the oceans that are not well constrained. Particles play a key role in the cycles of many elements. In this project a comprehensive understanding of the distribution, sources, sinks and internal cycling of particulate micronutrient elements in the subtropical South Atlantic and South Indian Oceans shall be developed. These ocean regions have varying levels of productivity and the South Atlantic also features an oxygen minimum zone (OMZ). There is a severe lack of data on particulate trace elements in these regions. Nutrient cycles in these ocean regions have basin-scale significance because upper water transport delivers macro and micronutrients to northern areas, and deep-waters found in the South Atlantic and South Indian Oceans subsequently upwell to supply micronutrients to the Fe limited Southern Ocean. This work also has global significance by providing increased understanding of the role of diverse processes in controlling the chemical environment in which ecosystems operate worldwide.



Schematic compilation of the major oceanographic and bathymetric units and currents in the SE Atlantic.

Additional information

The proposed PhD work will form part of a German contribution to the International GEOTRACES programme and will be conducted on dedicated GEOTRACES research cruises (SE Atlantic, FS Meteor 121, 2015; S Indian Ocean, FS Sonne cruise, 2018). Samples are available from the Meteor cruise, and the PhD student can participate in the Sonne cruise). In addition, additional GEOTRACES cruise work in the Arctic will be available in 2016. The main scientific aim of this project is to quantify the sources (rivers, dust, resuspension of shelf sediments) and to determine the biogeochemical cycling of particulate trace elements in the SE Atlantic and S Indian Oceans.

Requirements/Qualifications

- Excellent degree in chemistry, physical chemistry or oceanography
- Good background in analytical methods of chemical analysis
- Preferably experience of working in a clean room environment
- Interest in undertaking interdisciplinary research Willingness to participate in seagoing expeditions

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The PhD candidate will work within the Marine Biogeochemistry Research Group led by Prof. Dr. Eric P. Achterberg at GEOMAR.
His group currently consists of approximately 20 post-doctoral and doctoral researchers investigating the oceanic carbonate system and ocean acidification, and the marine biogeochemistry of trace metals (including speciation), carbon, nutrients, and their interactions with organisms. They develop novel analytical techniques, and apply them to biogeochemical studies. The research is multi-disciplinary and undertaken in collaboration with national and international partners.
Prof. Dr. Eric Achterberg has a long track record of work on chemical oceanography and marine biogeochemistry, including working on trace elements, carbonate chemistry, sensor development. He is co-chief scientists on the FS Meteor cruise in 2015, and chief scientist on the Sonne cruise in 2018.

Prof. Dr. Eric Achterberg

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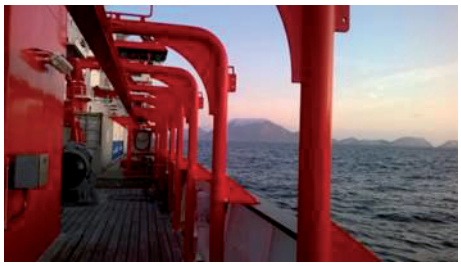

The impact of pH and temperature on the organic complexation of iron in the ocean

Prof. Dr. Eric Achterberg

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Research Topic

Iron is an important micronutrient in the world's oceans, limiting productivity in as much as 30% of the surface ocean. The abundance of iron (in combination with phosphorus) is also thought to determine the distribution of nitrogen fixation. The biogeochemical cycles of both carbon and nitrogen are therefore influenced by the supply of the trace element iron.
The distribution of iron is determined by its sources, sinks and solubility. In oxygenated seawater, iron is present mainly in the oxidised form (Fe(III)). Iron(III) is extremely insoluble, so that it rapidly forms iron oxy-hydroxides, which aggregate and precipitate out of solution. Iron is thought to be stabilised through complexation with natural organic material. The balance between complexation and scavenging determines the maximum possible dissolved iron concentration in seawater, and thus has a critical influence on the overall iron inventory available to support phytoplankton productivity in surface waters In this PhD topic we will apply novel methods and concepts to the determination of iron speciation in seawater that will link the concentrations and composition of organic matter directly to iron speciation and solubility. Opportunities to collect samples on research cruises are available, including GEOMAR led cruises as part of the International GEOTRACES programme in the SE Atlantic and S Indian Ocean. The work will develop both experimental and modelling protocols to predict iron speciation at varying pH and temperatures, and thus allow iron speciation in a future acidified and warmer ocean to be predicted with greater certainty.

Requirements/Qualifications

- Excellent degree in chemistry, physical chemistry or oceanography
- Good background in analytical methods of water analysis
- Preferably experience of working in a clean room environment
- Interest in undertaking interdisciplinary research
- Willingness to participate in seagoing expeditions
Competence in written and spoken English.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The PhD candidate will work within the Marine Biogeochemistry Research Group led by Prof. Dr. Eric P. Achterberg at GEOMAR.
His group currently consists of approximately 20 post-doctoral and doctoral researchers investigating the oceanic carbonate system and ocean acidification, and the marine biogeochemistry of trace metals (including speciation), carbon, nutrients, and their interactions with organisms. They develop novel analytical techniques, and apply them to biogeochemical studies. The research is multi-disciplinary and undertaken in collaboration with national and international partners.

Prof. Dr. Eric Achterberg has a long track record of work on chemical oceanography and marine biogeochemistry, including working on trace elements, carbonate chemistry and sensor development. His group participates in many cruises. He is co-chief scientist on a cruise in the SE Atlantic in 2015 and will be chief scientist on a cruise in the Indian Ocean in 2018.

The co-advisor Dr. Martha Gledhill has a long track record of work on the speciation of metals, particularly iron. She is especially interested in developing new methods in order to understand how chemistry influences metal distributions and bioavailability in the ocean.

Prof. Dr. Eric Achterberg

Dr. Martha Geldhill

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Global oceanic emissions of carbon monoxide (CO)

Prof. Dr. Hermann W. Bange

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Research Topic

Carbon monoxide (CO) is an important atmospheric trace gas. However, estimates of the open ocean source and coastal pathways of CO are associated with a high degree of uncertainty.
In the PhD project CO shall be measured on various cruises in the Atlantic and Pacific Oceans with a recently developed underway CO measurement system which allows measuring CO in the surface layer with an unprecedented spatial and temporal resolution. Based on these new data sets and a comprehensive compilation of literature data a first global CO emission field will be computed in order to significantly reduce the uncertainty of the global CO emission estimate. Moreover, CO should be measured on a monthly basis at the Boknis Eck Time Series Station, SW Baltic Sea (www.bokniseck.de) to decipher the seasonal and interannual variability of the CO pathways in a coastal system and to investigate the effect of the surface microlayer on the CO flux across the air/sea interface.

The overall objective of the PhD is to reassess the global oceanic CO emissions in order improve the prediction of future CO emissions.

Specific objectives are

- to perform CO measurements in the open and coastal oceans with the new underway CO system developed in the working group of HW Bange (see Arévalo-Martínez et al., Ocean Science, 2013),
- to compile existing CO measurements in order to compute a global field of CO surface concentrations and its associated air/sea fluxes across the ocean/atmosphere interface,
- to set up a gas chromatographic system for measurements of CO in discrete seawater samples,
- to perform time series measurements of CO at the Boknis Eck Time Series Station in order to decipher the seasonal/interannual variability of its concentrations and emissions in a coastal system, and
- to perform simple incubation experiments to decipher potential pathways of CO at Boknis Eck.

Requirements/Qualifications

- Degree in chemical oceanography, marine biogeochemistry or related subjects
- Basic knowledge of analytical methods in marine chemistry (incl. absorption spectroscopy and gas chromatography)
- Willingness to participate in ship cruises
- Basic knowledge of statistical methods

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The PhD candidate will work in the Working Group of Prof. Dr. Hermann W. Bange in the Marine Biogeochemistry Research Division of GEOMAR.
Research topics of the WG include (i) marine biogeochemistry of nitrogen, carbon and sulphur in the open and coastal oceans, (ii) biogeochemical time series observations, (iii) oceanic pathways and emissions of trace gases (nitrous oxide, methane, dimethyl sulphide, carbon monoxide), and (iv) measurements of short-lived intermediates of the nitrogen and sulphur cycles (hydroxylamine, hydrazine, nitric oxide, DMSP and DMSO).
H. Bange is coordinator the Boknis Eck Time Series Station (www.bokniseck.de). The WG is operating worldwide with a special focus on coastal upwelling systems.

Prof. Dr. Hermann Bange

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Biogeochemical/biological variability at the Time Series Station Boknis Eck (SW Baltic Sea)

Prof. Dr. Hermann W. Bange

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24105 Germany

email: hbange@geomar.de

Research Topic

The Baltic Sea is one of the largest brackish water systems of the world. Moreover, the Baltic Sea is surrounded by highly-industrialized countries with intensive agricultural activities. Therefore, the Baltic Sea is affected by both natural changes as well as changes triggered by anthropogenic activities. Time series measurements on a regular basis are a valuable tool to understand biogeochemical cycles and ecosystem behavior and can help to decipher ongoing environmental trends.

The Time Series Station Boknis Eck (BE) is located at the entrance of the Eckernförde Bay in the southwestern Baltic Sea and has a water depth of 28m. Riverine inputs are negligible in the Eckernförde Bay and thus the overall hydrographic setting at BE is representative for the southwestern Baltic Sea which is dominated by the regular inflow of North Sea water through the Kattegat and the Great Belt. Monthly sampling at BE started in April 1957 and samples are taken from six standard depths. The location of BE is ideal (i) to study a coastal ecosystem under the influence of pronounced changes of salinity and (ii) to study biogeochemical/biological processes sensitive to changes of dissolved oxygen.

The overall objective of the PhD is to determine the biogeochemical/biological variability at Boknis Eck in order to identify short-term and long-term natural and human-induced trends.

Specific objectives are

- Measurements of biogeochemical/biological core parameters at Boknis Eck (incl. nutrients, oxygen, chlorophyll, pigments, Secchi depth, abundance and composition of bacteria and plankton, etc.) and
- Statistical analysis of time series data.

The PhD will be performed in close collaboration with the Biological Oceanography Research Unit of GEOMAR.

Requirements/Qualifications

- Degree in biological oceanography, marine biogeochemistry, chemical oceanography or related subjects
- Basic knowledge of analytical methods in biological and chemical oceanography (HPLC pigment analysis, flow cytometry)
- Willingness to participate in ship cruises
- Basic knowledge of statistical methods

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The PhD candidate will work in the Working Group of Prof. Dr. Hermann W. Bange in the Marine Biogeochemistry Research Division of GEOMAR. Topics of the WG include (i) marine biogeochemistry of nitrogen, carbon and sulphur in the open and coastal oceans, (ii) biogeochemical time series observations, (iii) oceanic pathways and emissions of trace gases (nitrous oxide, methane, dimethyl sulphide, carbon monoxide), and (iv) measurements of short-lived intermediates of the nitrogen and sulphur cycles.
H. Bange is coordinator the Boknis Eck Time Series Station in the Eckernförde Bay, SW Baltic Sea (www.bokniseck.de). The PhD candidate will have access to the instrumental facilities of the Biological Oceanographic Res. Unit at GEOMAR.

Prof. Dr. Hermann Bange

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Trace gas air-sea exchange using eddy covariance

Prof. Dr. Christa Marandino

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Research Topic

Ocean-atmosphere interaction has important consequences for climate and biogeochemical cycling. However, there is much uncertainty in computing air-sea fluxes for most climate-active trace gases. The basic equation used to determine fluxes (F), $F=k\Delta C$, contains many assumptions that have been shown to be problematic. The gas transfer coefficient, k, is thought to be driven by turbulence in the atmosphere, which is itself driven mainly by horizontal wind speed. The value of k, therefore, is primarily a parameterization of in situ measured wind speed, but with an unclear functional dependency (e.g. linear vs. quadratic). The concentration gradient, ΔC, is usually defined as the difference between the gas concentration in the bulk air (10 m high) and the bulk water (5-10 m deep). However, it is known that the concentration gradient at the interface is the actual driver of the flux. Concentration changes between the bulk and the interface in both media can cause significant error in calculated fluxes.
In order to overcome these problems and provide greater understanding of air-sea gas exchange, direct flux measurement techniques, such as eddy covariance, have been developed as an alternative to computing fluxes. The community is limited, with only a handful of groups performing eddy covariance measurements at sea.
This PhD project will be to further develop the technique at GEOMAR, where the method has been successfully implemented for dimethylsulfide (DMS) and carbon dioxide (CO_2) measurements. The PhD candidate will improve the data acquisition system and the chemical measurements (using a variety of chemical sensors) for deployment on ship-based research campaigns. One main goal is to install the system on a voluntary observing ship line running between Europe and Canada for continuous, autonomous CO_2 flux measurements in collaboration with Dr. Tobias Steinhoff.

Picture caption: The eddy covariance meteorological mast mounted on the bow of the R/V Sonne in Guayaquil, Ecuador.

Requirements/Qualifications

- Good background in physics and analytical chemistry
- Must know Matlab and Labview
- Must have good understanding of electronics
- Experience working with mass spectrometers is highly recommended

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

TRace gas Air-Sea Exchange using Eddy Covariance (TRASE-EC), Prof. Dr. Christa Marandino – Oceanic chemical, biological, and physical processes have the potential to significantly impact atmospheric trace gas chemistry through air-sea exchange, with important consequences for life on earth. Two often cited examples of this include ocean uptake of anthropogenic CO_2, which influences global climate change, and ocean emissions of DMS, which may influence the radiative budget of the atmosphere by forming aerosols. Other examples of atmospherically important trace gases influenced by air-sea exchange include oxygenated volatile organic compounds, acetonitrile, and nitrous oxide.

Many studies have investigated surface ocean processes as well as the physical constraints on air-sea flux. One major goal of these studies is to understand how to predict ocean fluxes of trace gases using models. There has long been interest in having simple parameterizations to compute fluxes, which has been highlighted in recent years due to the availability of global satellite data. However, universally applicable parameterizations continue to elude the community. Additionally, it is important to understand how trace gases are produced/consumed in the surface ocean and whether the ocean is a net source or sink of these compounds to the atmosphere.

Our laboratory performs both direct flux measurements and surface ocean process studies of climate- and chemically-active trace gases in order to understand the ocean-atmosphere interactions. We use several different detectors for our measurements, such as purge and trap gas chromatography coupled to mass spectrometry, spectrophotometric methods, and atmospheric pressure chemical ioniztation mass spectrometry.

Prof. Dr. Christa Marandino

GEOMAR

GEOMAR Helmholtz Centre for Ocean Research Kiel is one of the world's leading institutes in the field of marine sciences. The institute investigates the chemical, physical, biological and geological processes of the seafloor, oceans and ocean margins and their interactions with the atmosphere. With this broad spectrum GEOMAR is unique in Germany. Additionally, the institute has successfully bridged the gap between basic and applied science in a number of research areas.

Reconstructing past precipitation and continental runoff from stable Ba isotopes in corals

Prof. Dr. Martin Frank

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Research Topic

The reconstruction of tropical hydroclimate and continental runoff into the oceans is of vital importance for understanding the factors and mechanisms driving climate variability such as Monsoons or the El Nino Southern Oscillation. Barium to calcium ratios in marine carbonates (Ba/Ca) are an established proxy indicator for freshwater and salinity based on the elevated Ba concentrations in continental riverine runoff compared to oceanic concentrations. However, this proxy can be influenced by a number of other processes and if compared to other paleo salinity tracers does not always result in a conclusive picture. The goal of this project is the development of the mass dependent stable isotope fractionation of Ba as a new and quantitative proxy for riverine input to the oceans. First measurements indicate that rivers have an overall significantly lighter Ba isotope signature than open ocean surface waters, resulting in systematic mixing gradients.

The focus of the proposed PhD position will be to establish the Ba isotope proxy in corals from areas influenced by continental riverine runoff such as the Andaman Sea in the northern Indian Ocean (Ganges/Irrawaddy Rivers), the Indonesian Seas and the South China Sea. For this purpose, recent corals from the vicinity of rivers will be used to examine the seasonal Ba signal that will be calibrated in combination with measurements of water samples where available. Together with established proxies (oxygen isotopes, Sr/Ca) the proxy will then be applied at high resolution on coral cores covering the past several hundred years and older material that can be precisely dated using U/Th methods.

Requirements/Qualifications

- We are looking for a student interested in pursuing and further developing an innovative and analytically challenging approach in isotope geochemistry.
- An excellent degree in geochemistry or chemical paleoceanography
- Analytical experience including clean laboratory work and mass spectrometry are desirable.
- Willingness to work in a multi-disciplinary environment.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The research interests of the working group "Chemical Paleoceanography" at GEOMAR are focusing on the reconstruction of ocean circulation and its relationships to the climate of the past on different time scales. In addition, the relationships between inputs from the continents, nutrient utilization, biological productivity, and the climate are subject of our investigations. For these reconstructions we develop, improve and apply geochemical and isotopic proxy indicators. Our interests are centered around radiogenic (Nd, Pb, Hf, Sr) and stable (i.e. Si, Ba, Mo) isotope systems, as well as element distributions (i.e. rare earth elements, REEs). Besides the extraction of these proxy signatures from marine archives (sediments, corals, manganese crusts and nodules) a particular focus is the understanding of the processes controlling these proxies in the present day water column. Our group runs a state of the art clean laboratory and operates a Nu Instruments MC-ICP mass spectrometer. In addition, we operate a newly acquired Neptune Plus MC-ICPMS together with the research group Marine Geosystems. In close collaboration with other groups at GEOMAR further techniques and methods are applied in order to achieve comprehensive multi proxy data sets.

Prof. Dr. Martin Frank

GEOMAR

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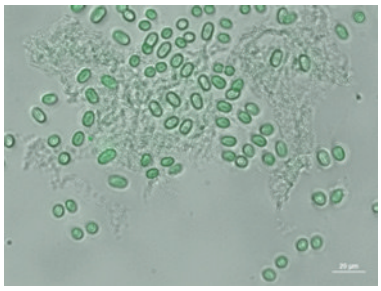

The evolution of multicellularity: investigating the causes and mechanisms utilizing unicellular bacterial populations

Prof. Dr. Tal Dagan

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Research Topic

Utilizing experimental populations of unicellular bacteria, the selective causes (ecological conditions), and underlying mechanisms of the evolution of complex bacterial phenotypes will be investigated.

The transition to multicellularity is one of the most significant events in the history of life. The first of at least 25 independent transitions to multicellularity happened more than 3-3.5 billion years ago as estimated from fossils of prokaryotic filamentous and mat-forming cyanobacteria-like organisms. Free-living single cells must have started to form simple groups, such as colonies, filaments, clumps or mats. After some evolutionary time, functional integration between the members of these early groups must have increased, resulting in a situation where group living became less optional. Such novel evolutionary adaptations are likely to happen during times of rapid environmental/ global change, such as increasing water temperature or changed chemical composition. How (bacterial) populations adapt to rapid environmental change is in the times of global warming a question of major relevance.

This dissertation project utilizes a very recent approach to investigate the transition to multicellularity: experimental evolution studies with unicellular organisms, where the transition to multicellularity is mimicked in the laboratory. In such an experimental set up will the ecological conditions and the selective causes required for the transition to multicellularity be tested and phenotypic and genetic changes (employing latest state of the art genomics and metagenomics) be followed in real time.

This PhD project will be supervised by Prof Dagan and co-advised by Dr Hammerschmidt within the Genomic Microbiology Group at the Institute of Microbiology.

Picture: Unicellular cyanobacteria and their extracellular secretions.

Requirements/Qualifications

- Enthusiastic about science
- Background in evolutionary biology, genetics, genomics and/or microbiology
- Experience in laboratory work
- Willingness to carry out labour-intensive laboratory experiments
- Excellent interpersonal skills

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Please send your application, preferably by e-mail, to:

Dr. Katrin Hammerschmidt

Institute of Microbiology
Christian-Albrechts-University Kiel
ZMB, Am Botanischen Garten 11
24118 Kiel, Germany

email: khammerschmidt@ifam.uni-kiel.de

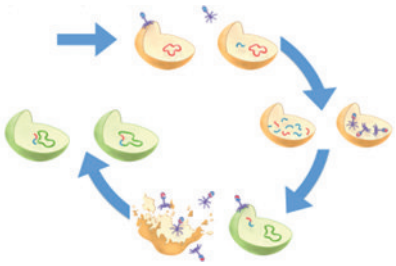
In this application, please also provide at least two scientific contacts with full postal and email addresses for the request of reference letters.

Research group

The PhD candidate will work in the group of Prof. Dr. Tal Dagan at the Institute of Microbiology. Prof Dagan's group is international and multidisciplinary with a research focus on microbial genome evolution. The PhD candidate will be supported through expert knowledge, e.g., culturing bacteria, genetic manipulation, and bioinformatics. The group is equipped with a modern lab and office space including the required conditions for molecular microbiology work at an S1 security level. The PhD candidate will have access to all the relevant technology platforms that are present at the Centre for Molecular Biosciences at Kiel University and will employ the latest state of the art genomics and metagenomics analyses.

The co-advisor Dr Katrin Hammerschmidt joined the group in 2015, having previously worked at Massey University, New Zealand, The University of Sheffield, UK, and the Max Planck Institute for Evolutionary Biology, Germany. She is an evolutionary biologist by training and is interested in understanding the underlying causes and mechanisms of evolution, with a current focus on the evolution of life cycles and individuality. Dr Hammerschmidt has ample experience in designing, performing, and analysing experimental evolution studies in bacterial populations.

Dr. Katrin Hammerschmidt



Evolution of bacteria and their phages in marine ecosystems

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Research Topic

Studying bacterial and viral genome evolution using high-resolution metagenomics data

Metagenomic sequencing has been developed in recent years as a tool to study biological communities that reside in specific environments by sequencing the genetic content of all community members together. It was originally applied in ecological research to describe the diversity and functional capacity of prokaryotic communities that include unculturable bacteria and phages. The advance in sequencing technology now allows a deeper than ever sampling of the genomic space of unknown communities. This enables the extraction of further information on genetic heterogeneity within the community members that can be used for a functional and evolutionary reconstruction.
The student will learn the cutting-edge approaches for the analysis of high-resolution metagenomic data. The analysis will be focused on the study of genome evolution of marine bacteria and their phages. The available longitudinal data from specific habitats will be used for an evolutionary reconstruction of past adaptation events. Thereby the focus will be on (i) inferring single-nucleotide polymorphisms and assessing their selective advantage, (ii) quantifying gene content variation and the functional capacity of phages, and (iii) assessing the linkage between polymorphisms and gene content variation. These investigations are expected to provide new insights into the co-evolution of phage-bacteria and the role of phages in bacterial population dynamics.

Requirements/Qualifications

- Excellent degree in Bioinformatics or Computational Biology. Alternatively, a degree in Microbiology or Molecular Biology with a strong focus on bioinformatics
- Experience in programming and scripting
- Background in genomics; hands-on experience in genomics applications and willingness to install and effectively use complex genomics programs
- Background in statistics and data analysis, preferentially in R
- Ability to work as part of a team as well as independently
- Good communication skills in English and a creative approach to problem-solving
- Hands-on experience in next-generation sequencing analysis is an advantage
- Background in evolutionary theory and population genetics is an advantage

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

In your application, please also provide at least two scientific contacts with full postal and email addresses for the request of reference letters. An interview will be conducted in English via internet.

Research group

The PhD candidate will work in the Genomic Microbiology group led by Prof. Tal Dagan. The research interest of the group is on microbial genome evolution. The current focuses include the study of DNA acquisition dynamics in natural environments, the evolution of protein interaction with the chaperones and the evolution of phenotypic diversity in cyanobacteria. The group encompasses both computational and experimental scientists with a focus on links between computational and experimental research.

The co-advisor Dr. Anne Kupczok has been working in the research group since October 2013 and has a strong background in bioinformatics. She is interested in patterns of genomic variation present in metagenomic data sets and in forces of microbial genome evolution resulting in this variation.

Geochemistry and evolution of the Etendeka flood basalt province, Namibia

Prof. Dr. Kaj Hoernle and
PD Dr. Jörg Geldmacher

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Research Topic

Large igneous provinces (LIP's), such as the Etendeka flood basalts in Namibia, formed by voluminous, laterally extensive eruptions of predominantly mafic magma over apparently short periods of time and are generally attributed to a starting mantle plume (head). In addition, continental LIP's often mark the beginning of continental rifting and breakup and may have contributed to mass extinction events in Earth's history. The Etendeka flood basalts in Namibia and the Paraná flood basalts in Brazil are remnants of an enormous LIP that can be linked to the active Tristan hotspot in the South Atlantic. After opening of the South Atlantic, the hotspot formed the conjugate Walvis Ridge and Rio Grande Rise and eventually the Tristan and Gough seamount chains, suggesting that there may be a link between LIP volcanism, continental breakup, and associated time-progressive hotspot track. However, the debate over whether the Etendeka/ Paraná volcanism originated solely by shallow (continental rifting-related) processes, or was initiated by a deep-seated mantle plume (possibly originating in the lower mantle?) is not yet resolved. Addressing this question is critical to our understanding of solid earth cycles, mantle convection, plate motion and the causes of continental breakup. Testing the different hypotheses requires accurate age information ($^{40}Ar/^{39}Ar$ dating) for the onset and duration of flood basalt formation and detailed geochemical characterization (major and trace element composition and radiogenic Sr, Nd, Pb, Hf isotope ratios) of the erupted lavas. A crucial problem that needs to be resolved is the extent of interaction of magmas generated within the asthenosphere/plume with the mantle and crustal portions of the overlying continental lithosphere.
The Etendeka lavas occur as scattered remnants over an area of 80,000 km^2 in western Namibia. The lavas are predominantly tholeiitic basalts but cover a wide compositional range, including alkali basalts, basanites, nephelinites, carbonatites to dacites, rhyolites, trachytes and phonolites, as well as their intrusive equivalents, such as alkali gabbros, syenites, and granites.

Picture caption: Etendeka, Namibia (credit: S.A. Gibson, www.largeigneousprovinces.org)

Studying the entire range of rock types should allow us to distinguish between sublithospheric and lithospheric origin of lavas and also to what extent and with which compositional end members the melts from below the lithosphere were contaminated in the lithospheric mantle and lower and upper crust. GEOMAR Professor Kaj Hoernle sampled Etendeka lavas, dikes and intrusives during field expeditions in 2012 and 2014 and therefore a significant number of Etendeka rock samples of high-quality are available at GEOMAR. The successful Ph.D. candidate could also participate in possible future field expedition to Etendeka to complement the existing sample pool and to work out detailed field relationships.
Most of the analytical work will be done in the laboratories of GEOMAR and the Universities of Kiel and Hamburg (in cooperation with Prof. S. Jung). The Ph.D. candidate will prepare the different igneous rocks for petrological (thin section examination) and geochemical analyses including x-ray fluorescence and ICP-mass spectrometry and Ar/Ar laser step-heating age determination. K-bearing mineral phases such as feldspar phenocrysts and feldspars separated from the groundmass will be preferentially used for age determination. Currently, a new mineral separation lab is being set up at GEOMAR that can be used. The candidate will learn to process igneous rock samples for isotopic analyses in the GEOMAR state-of-the-art clean-room laboratories and to measure Sr, Nd, Hf, and Pb isotope ratios on Multi-collector -Thermal Ionization and -ICP mass spectrometers. The PhD candidate is expected to publish his/her results in English-speaking, peer reviewed international journals.

Requirements/Qualifications

- degree in geology or mineralogy/petrology (including experience in thin section polarization microscopy)
- sufficient English communication skills
- experience in working with igneous rocks is preferred but not required
- willingness to participate in possible future ship and land expeditions.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.
Application deadline for interested CSC-candidates: 10.01.2016

Research group

Kaj Hoernle is a Professor for petrology and geochemistry and head of the research group „Magmatic and Hydrothermal Systems - Subunit Petrology and Geochemistry“ at the GEOMAR Helmholtz Centre for Ocean Research Kiel. He was the chair of the Collaborative Research Center „Volatiles and fluids in subduction zones“ and is GEOMAR‘s scientific program coordinator. His research interests include subduction zone and intraplate magmatism (including LIP volcanism), plume-ridge interaction and the formation and alteration of oceanic lithosphere. Jörg Geldmacher, one of the senior scientists in the research group, with extensive experience working on intraplate volcanism, will serve as co-advisor. The successful candidate will be integrated in a diverse, international working group and will receive special training in radiogenic isotope geochemistry.

Prof. Dr. Kaj Hoernle

PD Dr. Jörg Geldmacher

GEOMAR

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Understanding the source, spread and impact of the pet traded Nearctic turtles in Schleswig-Holstein

Prof. Dr. Stefanie M. H. Ismar

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Research Topic

Human-mediated invasions by nonindigenous species (NIS) are one of the greatest threats to biodiversity. NIS may act as predators, parasites, pathogens or competitors with native species, and their introduction can result in significant ecosystem changes. Historically, many vertebrate species have been introduced intentionally. However today, more likely introductions of vertebrates to new areas are accidental, through the escape or release of captive and pet species.
The advertised PhD topic will investigate sources, current distributions and population structure of the pet traded Nearctic turtles (e.g., red-eared slider, Trachemys scripta elegans) in Schleswig-Holstein, Germany. In particular, correlations between the turtle availability in pet stores, number of sold turtles per year, genetic diversity of sold pets, and geographic distribution of established populations of turtles in streams, lakes and ponds will be elucidated.
The chosen candidate will determine distribution of turtles in several ponds, lakes and streams in towns in Schleswig-Holstein and their near vicinity, and compare it to distribution of turtles in more rural areas. Furthermore, the candidate will determine the number of potential source pet stores in those areas and examine possible connections between the stores and the establishment of the turtles in nature. Population genetic structure will be determined to elucidate the connections among different populations of turtles and their connection to pet stores. Finally, impact of turtles on local ecosystems will be examined by comparing biodiversity in waterbodies with and without turtles.
The project is designed as a case example to address the factors and drivers that link the pet trade to biological invasions that are currently poorly understood.

Requirements/Qualifications

- excellent degree in Biology
- strong background in ecology
- basic skills in statistics
- background in Genetics, Biochemistry and GIS desirable
- high motivation to conduct research in an interdisciplinary working group.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

Stefanie M. H. Ismar is a Junior Professor for Marine Ecology at the GEOMAR Helmholtz Centre for Ocean Research and at the Christian Albrechts University of Kiel. She is a full member in the Kiel Future Ocean Cluster of Excellence. Her research foci include assessment of pathways in aquatic food-webs, from plankton to aquatic top-predators with a strong interest in adapting novel genetic tools to quantify trophic links.
She is situated with the Research Unit Experimental Ecology – Food Webs led by Prof. Ulrich Sommer, which has a long-standing research record in the experimental analyses of aquatic food webs and in forming ecological theory of food-web dynamics.

Prof. Dr. Stefanie Ismar

Dr. Elizabeta Briski

The co-advisor Elizabeta Briski is a Research Group Leader in GEOMAR Helmholtz Centre for Ocean Research in Kiel, sponsored by the Alexander von Humboldt Sofja Kovalevskaja Award. Her research area is Invasion Ecology. Her current research explores if species from a particular region (e.g., Ponto-Caspian species) have inherent advantages over other species in colonizing new areas, and transitions of those species from marine to freshwater habitats and vice versa. She also explores community dynamics of plankton and benthic invertebrates transported in human mediated vectors (e.g., commercial ships), and works on strategies for prevention of introduction of non-indigenous species to aquatic ecosystems.
(contact: ebriski@geomar.de)

GEOMAR

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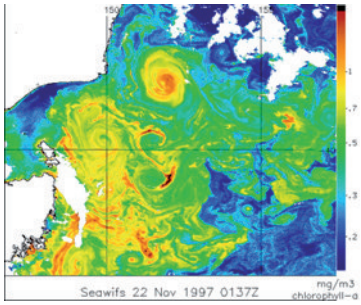

Transport of biogeochemical tracers by coherent ocean eddies

Prof. Dr. Andreas Oschlies

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Research Topic

Ocean vortices of scales of the order of 100 km ("mesoscale eddies") are an inherent part of ocean circulation. They are known to be important for biogeochemical tracer distributions in the ocean because they act to reduce tracer gradients, hence homogenizing spatial tracer variability, through mixing. Another effect of mesoscale eddies on tracers which is less understood, leaving aside quantified, is the ability of coherent eddies to transport water and its tracer properties in their core laterally across tracer gradients. With this impact, eddies have the potential to be effective over much larger distances than their typical spatial scale and to act upgradient, i.e. enhancing tracer gradients. It is of interest to the Earth system modelling community if this effect should be represented in numerical models which do not explicitly resolve ocean mesoscale eddies.

Picture: Provided by CSIRO Marine Research, under the auspices of the SeaWiFS Project, NASA/Goddard Space Flight Center and GeoEye.

The PhD objective is to investigate and quantify the efficiency of mesoscale eddies to coherently transport waters with their biogeochemical properties, with the focus on ocean regions of major tracer fronts, such as the boundaries of the subtropical gyres or the Southern Ocean. The successful candidate will run a regional ocean-biogeochemical model for selected regions featuring large tracer gradients, identify eddies in the simulations and seed particles or add dye tracer in the cores of eddies, with the goal to investigate the efficiency of eddies to transport biogeochemical tracers across tracer fronts.
The candidate will have the opportunity to work in a highly dynamic and interdisciplinary research environment having access to a broad range of training opportunities within the Integrated School of Ocean Sciences (ISOS).

Requirements/Qualifications

PhD candidates must be highly motivated in studying ocean dynamics and marine biogeochemical tracers, programming and using numerical modelling tools. The candidate must hold a Master degree (or equivalent). Experience with a programming language, a plotting software, large datasets and numerical modelling is desired.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The biogeochemical modelling research unit lead by Prof. A. Oschlies, carries out interdisciplinary research on the interactions between physical-chemical and biological processes at different spatial and temporal scales. Main tools are numerical models of different complexity that are continuously being developed.

The co-advisor Dr. Ivy Frenger has been working in the field of oceanography and marine biogeochemistry, using observational and modelling approaches to understand the characteristics and local effects of ocean mesoscale eddies, and the large-scale implications.

Prof. Dr. Andreas Oschlies

Dr. Ivy Frenger

GEOMAR

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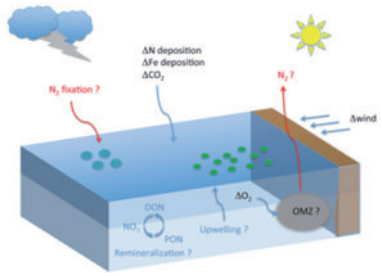

Response of marine elemental cycling to ongoing environmental changes

Prof. Dr. Andreas Oschlies

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24105 Germany

email: aoschlies@geomar.de

Research Topic

Human activities have induced large modifications in the physical and chemical properties of the ocean leading to surface warming, deoxygenation, acidification and increased dust and nitrogen deposition. These changes are expected to alter the cycling of marine nitrogen, an essential nutrient controlling marine biological production, by impacting directly on the magnitude of marine N2 fixation and marine denitrification. The combined effect of these stressors on the N inventory is not known and the response of the marine ecosystem to changes in the N-cycle remain to be explored.
The PhD objective is to investigate the combined effects of multiple stressors on the cycling of marine nitrogen and to asses how these changes may impact marine ecosystems and human activities based on marine resources. The successful candidate will set up, analyse and expand global biogeochemical models currently in use in our research group. The candidate will have the opportunity to work in a highly dynamic and interdisciplinary research environment having access to a broad range of training opportunities within the Integrated School of Ocean Sciences (ISOS).

Requirements/Qualifications

PhD candidates must be highly motivated in studying marine biogeochemical cycles and using numerical modelling tools. The candidate must hold a Master degree (or equivalent). Experience in numerical modelling and programming language is desired.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The biogeochemical modelling research unit lead by Prof. A. Oschlies, carries out interdisciplinary research on the interactions between physical-chemical and biological processes at different spatial and temporal scales. Main tools are numerical models of different complexity that are continuously being developed.

Angela Landolfi works in the biogeochemical modelling group combining both experimental and modelling approaches to investigate the biogeochemical cycling of biologically active elements in the ocean (C, N, P).

Wolfgang Koeve has been working in the field of coupled elemental cycles (C:N, orgC:$CaCO_3$) from local to global scales using a mix of sea going studies, data base analysis and global modelling. In the recent years he focused on ocean acidification impact on the $CaCO_3$ cycle, evaluation of global models and nitrogen cycling in OMZ regions.

Prof. Dr. Andreas Oschlies

Dr. Angela Landolfi

Dr. Wolfgang Koeve

GEOMAR

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Environmental Life Cycle Assessment (LCA) of aquaculture and fisheries products

Prof. Dr. Carsten Schulz

Institute of Animal Breeding and Husbandry,
Kiel University
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email: cschulz@tierzucht.uni-kiel.de

Research Topic

Seafood production, including production from fisheries and aquaculture, are highly interdependent with respect to their growth and impacts on the environment. The rapid growth of aquaculture and the limited supply from the production of fisheries need to be considered when assessing impacts from both systems and compare the relative environmental impacts for use in sustainable management. However, there are still major methodological challenges to measure the environmental impacts of fisheries and aquaculture. Recently adopted impact assessment studies of seafood production have utilized life cycle assessment (LCA) method. The LCA is used to address the environmental impact of products and/or activities by assessing process in a system. Consequently, LCA has shown its potential in assessing impacts throughout a product's life (i.e. cradle to grave) from raw material acquisition, processing, manufacturing, use, and finally its disposal. The method may aid in the determination of factors important for impact assessment of the value chains in fisheries and aquaculture and support in decision-making and policy formulation.

The overall objective of this PhD projects will be to develop comprehensive seafood specific methods for both, social and environmental LCA.
Successful candidates will learn on how to develop the method and characterize impact categories distinctive to seafood production. The work load will be divided for each student based on social and environmental LCA. In addition, the students will be exposed to various alternative production models for comparison and sensitivity analysis.

This topic does not include a PhD stipend. However, we can support you with a CSC application.

Requirements/Qualifications

Seeking two highly motivated students with interest in research of social and environmental assessment of fish production leading to a PhD. Required M.S. in aquaculture, fisheries, agriculture, supply chain, material flow industrial ecology, food engineering, environmental sciences, social sciences or closely related field. Application prerequisites include a completed M.S. degree and sufficient English language.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Description

The project will be involved within the main research focus at Institute of Animal Breeding and Husbandry, University of Kiel and Gesellschaft für Marine Aquakultur (GMA). The topic can (based on their willingness) be using life cycle assessment (LCA) method for identifying the environmental impact of fish production in their own country or region and to develop environmentally and socially sustainable expansion guidelines for seafood production. Students will need 3 years for completing their research.

Research group

Prof. Dr. Carsten Schulz is a Professor and Chair of Marine Aquaculture at the Christian-Albrecht-Universität zu Kiel in Kiel, Germany. At the same time, he also serves as a scientific supervisor of a public research company called Gesellschaft für Marine Aquakultur (GMA) mbH in Büsum, Germany. He is also a member of the Kiel Cluster of Excellence "Future Ocean". His research interests are mainly focused on biological and technological innovations in aquaculture and its influence on the environment. Prof. Dr. Schulz was awarded the ISH-Transferprämie prize for his efforts in facilitating business and science knowledge transfers.

The project will be co-supervised by Dr. Biniam Samuel-Fitwi who is a postdoctoral researcher at the Kiel University. He is an associate member of the Kiel Cluster of Excellence "Future Ocean". His research interests span a broad range within the field of food production, with special emphasis on life cycle assessment (LCA) of food production, incorporation of ecosystem design in food production, and sustainable development of aquaculture.

Prof. Dr.
Carsten Schulz

Dr. Biniam
Samuel-Fitwi

Location

Institute for Animal Breeding and Husbandry, Christian-Albrechts-Universität zu Kiel and

Gesellschaft Für Marine Aquakultur (GMA)
GMA was founded in 2004 in Büsum (North Germany) as a research and development institution for aquaculture. It has in its facilities state-of-the-art recirculating aquaculture system (RAS) and undertakes several basic and applied research projects. One of the strong activities of GMA is the science and technology transfer of sustainable aquaculture activities. GMA is owned by Entwicklungsgesellschaft Brunsbüttel (egeb), the Christian-Albrechts-Universität zu Kiel (CAU), the Fraunhofer-Gesellschaft and the GEOMAR Helmholtz-Zentrum for Oceanforschung in Kiel.

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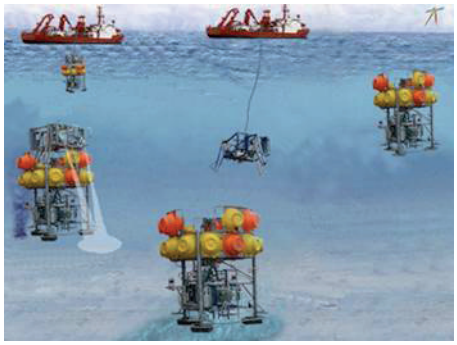

Nutrient cycling in marine sediments

Prof. Dr. Klaus Wallmann

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Helmholtz Centre for Ocean Research Kiel
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email: kwallmann@geomar.de

Research Topic

Nutrient concentrations in seawater are controlled by sediments consuming nitrate and releasing phosphate and iron into the water column. The fluxes of these dissolved nutrients across the seabed are affected by oxygen conditions in ambient bottom waters and additional factors such as the deposition of marine and terrestrial particles. Against this background, the PhD student will take part in research cruises to the Baltic Sea and other seas to measure benthic fluxes at the seabed and to take sediment cores for on-shore geochemical analysis. He/she will evaluate the data using numerical transport-reaction modeling. Models will be calibrated and employed to predict benthic fluxes under changing environmental conditions.

Picture: Benthic lander deployed at the seabed to measure fluxes of oxygen and nutrients (nitrate, nitrate, phosphate, iron, silica) across the seabed

Requirements/Qualifications

The student should have a solid background in chemistry/geochemistry/biogeochemistry and mathematics (differential equations).

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

Marine surface sediments act as a dynamic interface between oceans and geological reservoirs. They are inhabited by a rich microbial ecosystem regulating the exchange of matter across the seabed. Biogeochemical cycles in the ocean, the composition of seawater and the formation of seabed resources are strongly affected by the fluxes between surface sediments, the overlying water masses and the underlying geological reservoirs. Understanding the mechanisms and feedbacks that are controlling these fluxes is the major challenge for research unit Marine Geosystems. The research unit develops and applies advanced technologies to determine the fluxes across the seabed and the biogeochemical turnover in marine sediments. These include lander systems for in-situ flux measurements, microbial rate measurements, molecular studies and numerical modeling to predict benthic turnover under dynamic boundary conditions. New elemental and isotopic proxies are applied to better understand mineralization processes and geochemical sediment-water interactions.

Prof. Dr. Klaus Wallmann

GEOMAR

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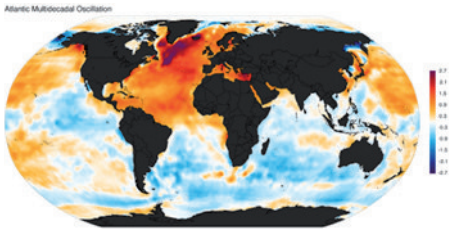

Remote Influences on Tropical Pacific Climate Variability

Prof. Dr. Mojib Latif

GEOMAR
Helmholtz Centre for Ocean Research Kiel
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24105 Germany

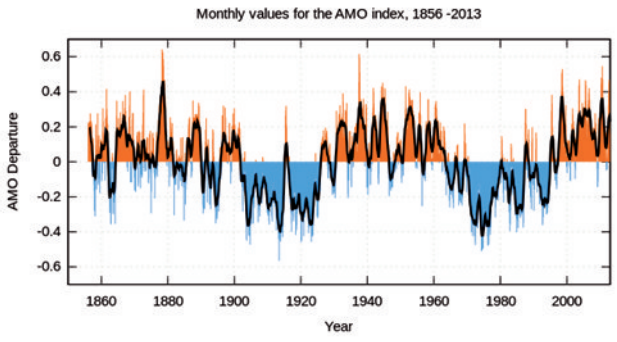
email: mlatif@geomar.de

Research Topic

This PhD project deals with remote factors which influence climate variability in the Tropical Pacific sector. Special emphasis will be placed on the El Niño/Southern Oscillation (ENSO) phenomenon, the strongest climate signal in the Tropical Pacific on interannual timescales. The ENSO has far-reaching consequences for countries surrounding the Tropical Pacific and even beyond, as it does not only influence climate (e.g., surface temperature and rainfall) but also marine and terrestrial ecosystems, and the economies of many countries. One long-standing problem is the irregularity of ENSO, in particular its decadal amplitude modulation. Different competing hypotheses have been put forward to explain ENSO irregularity. However, no consensus about the mechanisms has been reached so far.

We wish to understand the role of decadal variability outside the Tropical Pacific in impacting Tropical Pacific interannual to decadal variability. One example is the Atlantic Multidecadal Oscillation (AMO), a mode of natural variability occurring in the North Atlantic Ocean. The AMO is identified as a coherent pattern of variability in North Atlantic sea surface temperatures (SSTs) with a period of 60-80 years. We shall use a state-of-the-art global climate model, the Kiel Climate Model (KCM[1]) to obtain insight about how such decadal modes impact the Tropical Pacific. The plan is to conduct so called "pacemaker" experiments in which SST variations are specified from observations in certain regions outside the Tropical Pacific. As the instrumental record is rather short, idealized SST forcing additionally will be used. The methodology enables identifying impacts that remote SST variability has on the Tropical Pacific.

[1]http://www.geomar.de/en/research/fb1/fb1-me/research-topics/climate-modelling/kcms/)



Requirements/Qualifications

The successful candidate should hold a Bachelor (8 semesters) or Master's degree in Physics, Oceanography, and Meteorology or in another area of Applied Physics. Good English skills are required..

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The Earth's climate and its variability arise from a complex interplay between the ocean, the atmosphere, sea ice, land vegetation and the influence of external factors. Research in Prof. Latifs group aims at quantifying the relative importance of atmospheric and oceanic processes in controlling climate variability and climate change on a large range of timescales: from monthly, through decadal, to centennial and millennial timescales. They maintain a strong focus on modeling the complex atmosphere-ocean interactions to understand the atmospheric and oceanic role in climate variability on this wide range of timescales. A spectrum of numerical models is applied, with a strong focus on sophisticated 3-dimensional coupled ocean-atmosphere-sea ice general circulation models. They study on the one hand internal variability that is often associated with dynamical modes such as the Madden Julian Oscillation (MJO), the North Atlantic Oscillation (NAO), the El Niño/Southern Oscillation (ENSO), the Atlantic Multidecadal Oscillation (AMO) or the Pacific Decadal Oscillation (PDO) that superimpose the red background spectrum, and on the other hand the climate response to (natural and anthropogenic) external forcing. The study area ranges from the middle atmosphere to the sea surface and through the whole water column of the ocean.

Prof. Dr. Mojib Latif

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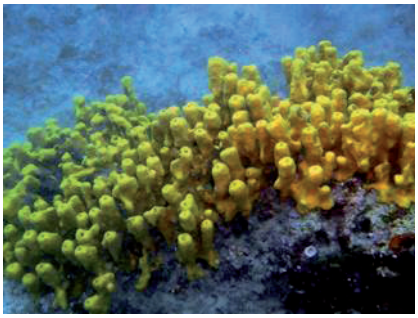

Elicitation of secondary metabolism in marine sponge-associated actinomycetes

Prof. Dr. Ute Hentschel Humeida

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Research Topic

Marine sponges (Porifera) are a rich source of secondary metabolites with diverse biologically and pharmaceutically relevant activities. Research in the Hentschel Humeida lab focuses on a group of marine sponge-associated actinomycetes as these are still an underexplored source for secondary metabolites and lead molecules with biotechnological, therapeutic and industrial applications. However, a plethora of secondary metabolites encoded in the actinomycete genomes remain undiscovered presumably because these genes are not transcribed under conventional laboratory conditions. Accordingly, intensive research efforts are directed at de-silencing the underlying gene clusters with the aim to identify new natural products and molecular scaffolds, which could produce novel drug candidates.
The aim of this PhD thesis is the isolation and structure elucidation of novel, anti-infective secondary metabolites from marine sponge-associated actinomycetes. Experiments will involve the biological or chemical elicitation of actinomycetes as a strategy to provoke the expression of unexpressed or poorly expressed bioactive metabolites and further, the diversification of secondary metabolite profiles. Genomic and metagenomic mining for genes/gene clusters encoding for secondary metabolism will further be employed.
One major goal of this PhD thesis is to unravel the molecular mechanisms that regulate secondary metabolism. Tools of microbiology, natural products chemistry, and molecular biology will be used complementarily in the course of this PhD thesis.

Requirements/Qualifications

- Excellent degree in microbiology, molecular biology, or natural products chemistry
- Solid background in bacterial secondary metabolism
- Willingness to learn new methods and concepts in the course of an ambitious dissertation
- Ability to interact and communicate with peers in an interdisciplinary research setting.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The PhD candidate will work in the group of Ute Hentschel Humeida who has recently been appointed as Professor for Marine Microbiology. Her lab focusses on the group of marine sponge-associated actinomycetes as these are interesting and relevant candidates for anti-infective drug discovery. Following isolation from sponge source material, the bacteria are screened against various clinically relevant microbial pathogens and parasites. We have experience in chemical structure elucidation and we also collaborate with natural products chemistry groups towards this goal. In order to render the large fraction of uncultivated sponge-associated microbiota accessible for small molecule discovery, metagenomic/metatranscriptomic strategies are being employed. Gene clusters encoding for indicator genes of secondary metabolism have so far been identified. Draft genomes of bioactive bacteria are being produced to identify and characterize the potential of silent gene clusters. Our long-term goals are to understand the role and function of secondary metabolism in the original ecological context.

Prof. Dr. Ute Hentschel Humeida

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Development of CRISPR/Cas mediated gene editing in the marine flatworms *Macrosotmum lignano*

Prof. Dr. Thomas Roeder

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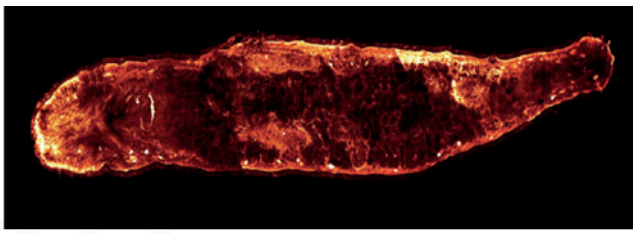
PD Dr. Ulf Bickmeyer

Alfred-Wegener Institute
Biosciences, Ecological Chemistry
27570 Bremerhaven

email: Ulf.Bickmeyer@awi.de

Research Topic

The goal of this research topic is to construct transgenic marine flatworms (*Macrostomum lignano)* to study stress dependent signaling systems in this model organism. The simple, genetically tractable marine invertebrate, the flatworm Macrostomum lignano, lives in coastal environments and can easily be adapted to lab cultures. *Macrostomum* can cope with a number of different stressors, but the underlying mechanisms are not understood.
A major aim of this study is to establish and utilize novel approaches for gene editing. A special focus should be on the CRISPR/Cas system that should be employed to produce either knock-out animals or to introduce reporter constructs.
CRISPR/Cas mediated gene editing offers the unique possibility to manipulate non-model organisms such as *Macrostomum lignano* in order to characterize the stress sensing system as well as those factors that lead to the high stress resistance. Moreover, a toolbox for gene editing in this highly interesting marine model organism should be developed and made available for other projects utilizing this organism.



Macrostomum lignano

Requirements/Qualifications

- excellent degree in Biology, Biochemistry or Molecular Biology
- strong background in Molecular Biology
- good skills in laboratory work
- background in Genetics and Microscopy desirable
- high motivation to conduct research in an international and interdisciplinary work group

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The PhD project will be jointly supervised by Prof. Dr. Thomas Roeder (CAU Kiel) and PD Dr. Ulf Bickmeyer (AWI Bremerhaven). Thomas Roeder is a full member of the Kiel Future Ocean Cluster of Excellence and Professor at the Zoological institute of the Christian-Albrechts University of Kiel. Ulf Bickmeyer is Research Scientist at the Alfred Wegener Institute, Helmholtz Centre for Polar- and Marine Sciences. Whereas the research focus of Thomas Roeder is in the field of general molecular biology and generation of transgenic animals, Ulf Bickmeyer is an expert in physiological studies and the use of high-end microscopic technologies.
Both, the CAU Kiel as well as the AWI Bremerhaven provide excellent research environments for PhD students.

Conoidean Peptides - Novel ion channel targeted peptides from the ocean

Prof. Dr. Heinrich Terlau

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University of Kiel
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Research Topic

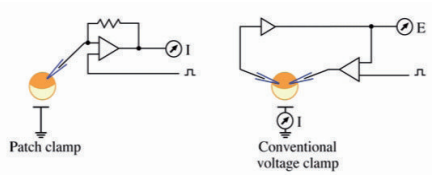
Ocean as a valuable resource contains a large amount of biological active substances. In the ocean there are different species of predatory marine snails of the superfamily Conoidea. The conoideans (cone snails, terebrids and turrids) are a hyperdiverse group of marine gastropods. During the evolution Conoidea have obtained capability to produce high effective and specific peptide-rich venoms and use these venoms to capture their prey. It is known, that most of these peptides are targeted selectively to ion channels. However, only a very small part of these peptides is identified so far and the pharmacological profile of most of the peptides is still elusive. The ion channels are membrane proteins and present in all kingdoms of life, demonstrating their central role in maintaining physiological functions. Correspondingly, ion channels are regarded as important therapeutic targets for treating a number of different diseases such as neurological diseases, cardiac disorder and diabetes mellitus.

The objective of this PhD project is to investigate the pharmacological properties of conoidean peptides which have been evolutionarily optimized for the native ion channel compositions and to elucidate the functional properties of these peptides. Especially potential pharmaceutical applications of these peptides will be investigated by using appropriate in vitro systems.

This topic does not include a PhD stipend. However, we can support you with a CSC application.

Requirements/Qualifications

- a Master's degree in Natural Sciences, qualifications in electrophysiology, molecular biology and cell biology would be advantageous
- high motivation and interest in interdisciplinary research areas
- an integrative and cooperative personality
- very good communication skills in English



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Research Group

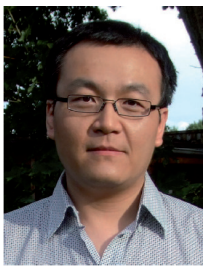
The research group of Prof. Dr. Heinrich Terlau focuses on the analysis of the physiological and pharmacological properties of ion channels. Prof. Dr. Heinrich Terlau and his coworker Dr. Jie Song are highly interested in the identification and characterization of pharmacologically active substances from the ocean e.g. conoidean peptides, which interact with these membrane bound proteins. The pharmacological profile of such substances is investigated by several assays including electrophysiological measurements in expression systems.

Prof. Dr. Heinrich Terlau was senior scientist at the Max-Planck-Institute for Biophysical Chemistry and the Max-Planck-Institute for Experimental Medicine, Göttingen, Germany until 2005. Since 2005 senior scientist at the Institute of Experimental and Clinical Pharmacology and Toxicology of the University of Lübeck. Since 2009 acting as an associate professor for Physiology at the Christian-Albrechts-University Kiel. He has published over 50 scientific papers including in leading journals e.g. Nature, PNAS, EMBO Mol. Med., J. Biological Chemistry.

Dr. Jie Song joined the group in 2012. He obtained his PhD at the Department of Pharmaceutical Chemistry, University of Kiel. He is specialized in chemistry, molecular biology for membrane proteins. He is member of the Kiel Cluster of Excellence „The Future Ocean“. He is now establishing an international network for the further cooperation in this research field.

Location:
The Institute of Physiology is part of the Medical Faculty of the University of Kiel and conducting several projects within the Cluster of Excellence „The Future Ocean“. The institute has widely national and international cooperations and is specialized in the functional and pharmacological characterization of membrane proteins by using a whole range of different techniques including electrophysiology from molecular level to animal experiments. Cooperation between the different departments and research groups within the Institute of Physiology are fully established as part of the intense interdisciplinary scientific approach within the institute but also with other faculties and scientific institutions within Kiel.

Prof. Dr. Heinrich Terlau



Dr. Jie Song

Prof. Dr. Heinrich Terlau and Dr. Jie Song

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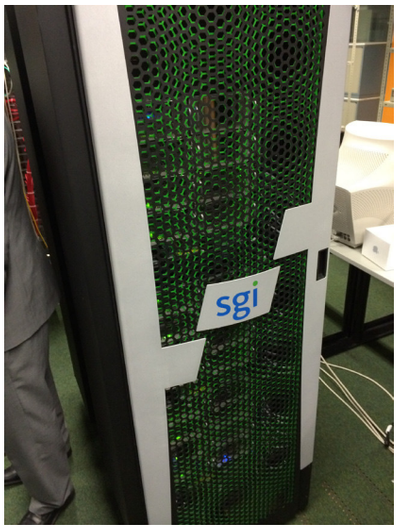

Simulation, parameter identification and optimization in marine research

Prof. Dr. Thomas Slawig

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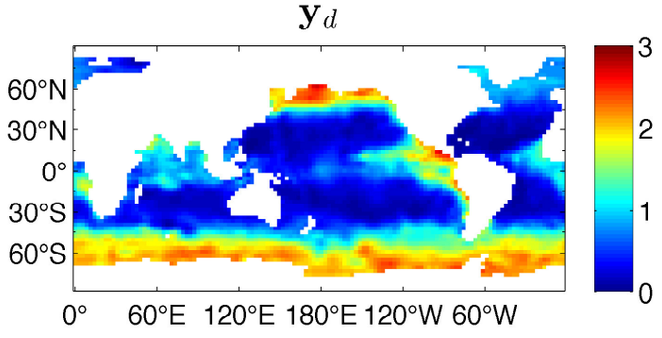
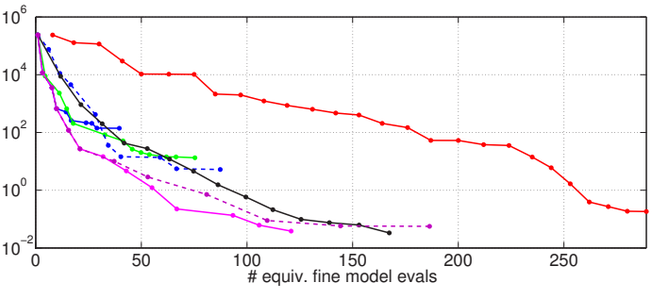
email: ts@informatik.uni-kiel.de



Research Topic

To a great extent, climate and marine research rely on modeling and model simulations. Most climate models are formulated in or translated to the language of mathematics: They are written as ordinary or partial differential equations. These equations are the basis for all kind of simulations, ranging from paleo reconstructions over sensitivity studies for process understanding to prognostic runs. From the viewpoint of applied mathematics and computer science, there arise many both exciting and challenging questions: Are the model equations well-defined? What about existence and uniqueness of solutions? What is the appropriate way to solve the equations numerically, i.e., to perform a simulation? And how can the solution developments in computer science as GPU computing? How can the models be optimized by identifiying parameters that generate reasistic output? How to assess different models? And how to optimize climate and ocean management?

This topic does not include a PhD stipend. However, we can support you with a CSC application.



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Requirements/Qualifications

- degree in (Applied) Mathematics, Computer Science, Physics or related
- strong ackground in numerical mathematics
- strong background and affinity to programming
- optional: background in optimal control of differential equations
- willingness to work in an interdisciplinary group

Research Group

Prof. Dr. Thomas Slawig

Thomas Slawig is applied mathematician and Professor for Algorithmic Optimal Control at Kiel University. Together with the other groups working in Applied Mathematics, his research group is integrated in the Department of Computer Sciences at Kiel University, in close contact with the Mathematics Department. He is a full member in the Kiel Future Ocean Cluster of Excellence. His research interests include optimal control of partial differential equations, numerical mathematics, and high performance computing, especially in the field of climate and ocean science. A main focus of his group's research is the parameter identification of marine ecosystem models, describing the interaction of biogeochemical tracers with the ocean circulation. Since these models are very time-consuming in simulation and optimization runs, the efficient usuage of mathematical algorithms and parallel hardware is crucial. The research is conducted in close cooperation with groups from the Helmholtz Centre for Ocean Research GEOMAR and other university departments. In addition, the group also is engaged in the development of apps for mobile devices, with different applications.Thomas Slawig's group consists of 4-6 PhD students and several BSc+MSc candidates, mostly from applied mathematics and computer science.

The Department of Computer Science

In 1971, our department was founded as one of the first departments of Computer Science in the Federal Republic of Germany and has since been the focal point of research and educational activities in Computer Science at the Kiel University. Currently, the department consists of 19 working groups, covering all central aspects of computer science, business information technology and parts of algorithmical and numerical mathematics. Additionally, the workgroups are engaged in numerous externally funded projects.

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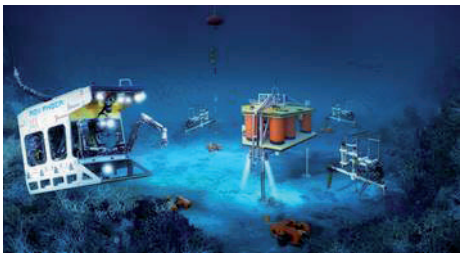

Water mass dynamics and biogeochemistry in arctic/boreal cold-water coral reef settings off northern Europe

Prof. Dr. Christian Dullo

GEOMAR
Helmholtz Centre for Ocean Research Kiel
Wischhofstr. 1-3
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email: cdullo@geomar.de

Research Topic

Cold-water corals are an object of world-wide research. Active exploration of the reef-building coral species has begun in the 20th century with the development of the digital sea bottom mapping techniques which found that cold-water corals can thrive in a wide range of depth levels below the photic zone from 43 m down to 3 380 m. Crucial ecological parameters governing the distribution are still not fully understood. In the focus of this proposed study are the living cold-water coral reefs, off Norway.
By deploying an underwater 4D Modular Laboratory (MoLab) consisting of 5 landers and 2 moorings, was especially designed at the GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany, to investigate the living coral communities of e.g. the Stjernsund and Trondheimsfjord.

Photo caption: The MoLab observatory and its components in a cold-water coral reef setting.

The underwater observatory was installed in different reef settings to monitor the water masses and their variabilities in the vicinity of living cold-water corals within the regional hydrographic context. The modular laboratory recorded the following physical and biochemical parameters during several months of deployment: velocities and directions of the water flow, temperature, salinity, pH, turbidity, fluorescence, oxygen concentration and saturation. In this work data sets from 7 modules are analyzed in order to determine the ecological factors governing the uneven distribution of the living corals on the slopes of the sill and in order to reconstruct the water mass dynamics in the sound.

Within the proposed study we aim to investigate the controlling physical and biogeochemical parameters of cold-water coral reef growth and distribution.

Requirements/Qualifications

The candidate should have a master degree in physical- or chemical oceanography with an interest in paleoceanography and earth history.

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Research group

The discipline of Paleoceanography investigates the variability of water masses of the ocean in time and space and their interaction with climate. Signals recorded in natural archives are used to reconstruct and to better understand the dynamics and controlling factors of the system Earth, in particular with respect to oceanography and climate on time scales ranging from seasons to millions of years in order to improve predictions of its future development.
The project will be supervised by Prof. Dr. Christan Dullo and co-supervised by Dr. Sascha Flögel and Dr. Johannes Karstensen.

Prof. Dr. Christian Dullo
http://www.geomar.de/en/mitarbeiter/fb1/po-z/cdullo/

Dr. Sascha Flögel
http://www.geomar.de/en/mitarbeiter/fb1/po-z/sfloegel/

Dr. Johannes Karstensen
http://www.geomar.de/en/mitarbeiter/fb1/po/jkarstensen/

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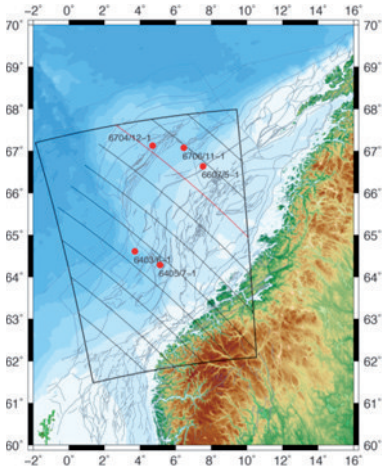

Effects of sedimentation on strain partitioning and mantle melting during passive margin formation

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Research Topic

Despite a recent surge in academic research and industrial hydrocarbon exploration at passive continental margins, the rupture of continents and the creation of new oceanic basins remains a poorly understood component of the plate tectonic cycle. This PhD project aims at investigating an often-overlooked aspect of margin formation namely the role of sediment supply in controlling the strength of the lithosphere and thereby strain partitioning during continental rifting. Based on existing codes, improved geodynamic models that resolve feedbacks between large-scale geodynamic and basin-scale sedimentary processes will be developed in order to assess the role of sedimentation in focusing deformation and modulating mantle melting. The overall objective is to test the hypothesis that the observed differences between volcanic and different types of non-volcanic margins around the Atlantic can be ascribed to differences in sediment supply.
In addition, this project will evaluate the importance of resolving feedbacks between shallow sedimentary and deep tectonic processes in basin-scale petroleum system and lithosphere-scale geodynamic models.
This dissertation will be carried out at the GEOMAR Helmholtz Centre for Ocean Research Kiel and the PhD candidate will be enrolled at the University of Kiel. Access to state-of-the-art geodynamic models and to high-performance computational facilities will ensure the technical feasibility of the project. The PhD candidate will be supervised by Prof. Dr. Lars Rüpke within the Dynamics of the Ocean Floor research unit at the GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany.

Picture: Basemap of the Norwegian passive margin - one of the target regions of the proposed modeling work.

Requirements/Qualifications

- excellent degree in geology, geophysics, or related field
- good background in geodynamics
- interest in code development and numerical modeling
- willingness to perform demanding technical work

curiosity about how the earth works

Important Notice: This topic does not include a PhD stipend. Interested students should bring a scholarship or contact us to find possibilities for funding.

Please send your application, preferably by e-mail, to: lruepke@geomar.de

In this application, please also provide at least two scientific contacts with full postal and email addresses for the request of reference letters.

Research group

The PhD candidate will work in the Seafloor Modeling group led by Prof. Dr. Lars Rüpke. The group uses numerical modeling techniques to investigate the key geological processes that shape the formation, evolution, and destruction of the ocean floor. Research foci include deep-sea hydrothermal systems and associated massive sulfide deposits, mid-ocean ridge process, marine gas hydrate deposits, and passive continental margins. The group actively develops 2D and 3D numerical models and maintains a large number of reactive-transport and geodynamical modeling codes. One of the key advantages of the GEOMAR Helmholtz Centre for Ocean Research is the strong link between various geophysical, geological, and geochemical research groups, enabling cooperation between disciplines and ensuring close in-house model-data integration.
Prof. Lars Rüpke has been working at GEOMAR since 2007. He previously worked at the Centre of Excellence "Physics of Geological Processes" in Oslo, Norway, where he headed the geodynamics group and worked on joint industry projects regarding the evolution of sedimentary basins and passive continental margins.

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