

ECC 2014

5th Early Career Scientists Conference
for Marine and Climate Research:
Natural and Social Aspects of the Earth System

Bremen, 21-24 September 2014



book of abstracts

including glossary of scientific terms



Contents

Preface	6
Welcome to the ECC 2014	7
Information	8
Abstracts	8
Glossary	8
One sentence	8
Organizing committee	10
Contributions from clusters, graduate schools and scientific networks	11
The Integrated Marine Postdoc Network (IMAP) within the Cluster of Excellence 'The Future Ocean'	
<i>Gesche Braker</i>	12
YOUMARES and the working group on Studies and Education of the DGM	
<i>Jasmin Heiden</i>	12
Introducing the Earth Science Women's Network ESWN	
<i>Amélie Kirchgaessner</i>	13
Academic and non-academic career options for marine scientists - Services and programmes offered at MARUM	
<i>Christina Klose</i>	13
Young Earth System Scientists community (YESS)	
<i>Vera Schemann</i>	14
The Ocean in the Earth System: MARUM – Center for Marine Environmental Sciences, University of Bremen	
<i>Jana Stone</i>	14
Preparing Young Scientists for the Policy Impacts of their Research	
<i>Stephanie Stratil</i>	15
IMPRS-ESM - the structured doctoral programme in Earth system sciences and modellingOpening Ceremony	
<i>Antje Weitz</i>	15
Scientific presentations	16
Salinity gradient energy at river mouths. From theoretical potential to extractable energy	
<i>Oscar Alvarez</i>	17

Ecophysiological role of an abundant gammaproteobacterium of the genus <i>Reinekea</i> during a spring phytoplankton bloom in the North Sea <i>Burak Avci</i>	17
Tracing the interplay of oceanographic variability and glacial activity in Woodfjorden (northern Spitsbergen) through the late Weichselian and the Holocene <i>Martin Bartels</i>	18
Distribution of Rare Earths and Yttrium in Diatom Shells: An Experimental Study <i>Benjamin Birner</i>	18
The IUP nadir ozone profile retrieval <i>Stefan Bötzel</i>	19
The role of coastline-induced precipitation in the tropics <i>Martin Bregemann</i>	19
Climate variability of the Last Interglacial (125,000 years ago) interpreted from southern Caribbean fossil corals. <i>Will Brocas</i>	20
Little Things Become Big - Bacterial mats reconquer coral reefs <i>Hannah Brocke</i>	20
The Brewer-Dobson circulation and polar ozone depletion <i>Martin Budde</i>	21
Impact of harbor Seals on the Sylt-RømøBight food web: a modelling approach. <i>Camille de la Vega</i>	21
Geological evidence of deglaciation during the last millennium, Admiralty Bay, West Antarctica <i>Ewa Demianiuk</i>	22
Climate change impacts on Antarctic benthos: ecological impacts of ice-shelf collapse on sponge communities. <i>Rachel Downey</i>	22
Evolution of late Miocene to early Pliocene equatorial Pacific sea surface conditions: deciphering the state of the El-Niño-Southern-Oscillation <i>Anna Joy Drury</i>	23
Molecular Biogeochemistry of DOM in the Lena River Delta <i>Ivan Dubinenkov</i>	23
Glass sponge communities and the role of their environment in the Weddell Sea, Antarctica <i>Luisa Federwisch</i>	24
Climate engineering- uncertainty, optimization and application <i>Ellias Feng</i>	24
Central Arctic Primary Production and its limiting factors during the record sea ice minimum in 2012 <i>Mar Fernandez-Mendez</i>	25

Last 1000 years of palaeo-environmental reconstruction via lake sediment analysis in the Eastern Carpathians, Northern Romania <i>Gabriela Florescu</i>	25
Dissolved neodymium isotopic composition of Hawaiian coastal Waters and the water column at an offshore station <i>Henning Fröllje</i>	26
Real-time Evaluation of Natural Gas Composition and Origin from up to 2000 Meter Below the Seafloor <i>Sebastian Hammerschmidt</i>	26
Assessment of eukaryotic communities in environmental samples: A workflow comparison for Next Generation Sequencing data <i>Kristin Hardge</i>	27
Impact of Orbital Forcing on Marine Productivity during Interglacials <i>Yunchang He</i>	27
Molecular sensor-based monitoring of toxic algae species <i>Johanna Hessel</i>	28
Western Sahel: Separating natural variability from anthropogenic changes <i>Ulrike Holzwarth</i>	28
Paleoceanography and Environmental Conditions in the Baffin Bay since the last ice age <i>Rebecca Jackson</i>	29
Satellite-based retrieval of desert dust deposition into the Atlantic Ocean <i>Malte Jäger</i>	29
Quantifying the volume and frequency of bubble release from hydrocarbon seeps in the Gulf of Mexico <i>Caroline Johansen</i>	30
Coupling a regional climate model with the Finite Element Sea Ice -Ocean model for an Antarctic Ice Sheet study-ideas, expectations, challenges. <i>Marta Kasper</i>	30
Investigating changes in the climate- and ecosystem of Arctic sea ice using remotely operated vehicles <i>Christian Katlein</i>	31
Monitoring shipping emissions with in-situ measurements of trace gases <i>Lisa Kattner</i>	31
Climate and CO ₂ effects on the vegetation of southern tropical Africa over the last 37,000 years <i>Vyacheslav Khon</i>	32
The role of the Black Sea Commission in the protection of the Black Sea against pollution - instruments of legal and institutional regulation <i>Nina Khuchua</i>	32
Tracing ice-algae produced carbon in a changing Arctic Ocean using biomarker analyses <i>Doreen Kohlbach</i>	33
Modeling the effect of meltwater on the habitat of Arctic planktonic foraminifera <i>Kerstin Kretschmer</i>	33

Greenhouse gas emission rate estimates from airborne remote sensing <i>Thomas Krings</i>	34
Quantification of dissolved organic sulfur in the East Atlantic and Southern Ocean <i>Kerstin Ksionzek</i>	34
Characterising the sea ice environment using a newly developed sensor array mounted on an under-ice trawl <i>Ben Lange</i>	35
Surface-specific laser spectroscopy at the sea surface - seasonality and methodological development <i>Kristian Laß</i>	35
Tropical tropospheric ozone from satellite observations with the Convective Clouds Differential (CCD) technique <i>Elpida Leventidou</i>	36
How will resource and diversity patterns alter benthic ecosystem functions in the Southern Ocean? <i>Heike Link</i>	36
Developing a new tool for ecological niche analysis and Habitat Suitability Maps. <i>Chiara Magliozzi</i>	37
Feeding performance and energetic requirements of <i>Desmophyllum dianthus</i> - a cold-water coral thriving under low pH <i>Sandra Maier</i>	38
Sea surface and subsurface temperature reconstructions off northern Chile (27.5°S) from 970,000 years to present <i>Gema Martínez Méndez</i>	39
Large impact on simulated terrestrial precipitation due to uncertainties in plant stomata sensitivity to rising atmospheric CO ₂ concentrations <i>Nadine Mengis</i>	39
Submarine groundwater discharge from tropical islands - a hidden nutrient pathway from land to sea <i>Nils Moosdorf</i>	40
On the tracks of man-made radionuclides in the Indonesian Throughflow sediments <i>Daniela Pittauerová</i>	40
Transcriptomics of iron limitation in <i>Phaeocystis antarctica</i> <i>Mariam R. Rizkallah</i>	41
Interconnections of the different sub-surface carbon pools in wetlands <i>Norman Rüggen</i>	41
Coccolithophores in the Southern Ocean <i>Mariam Saavedra-Pellitero</i>	42
Discovering new seepage processes <i>Jens Schneider von Deimling</i>	42
Biogeochemical investigation of terrestrial permafrost cores from the North-Eastern Siberian Arctic <i>Janina Stapel</i>	43

Coral reef functioning in upwelling-influenced Northwestern Costa Rica <i>Ines Stuhldreier</i>	43
Leaching of Organic Plastic Additives under Marine Conditions <i>Tim Jesper Suhrhoff</i>	44
Automatic Oil seep location estimation using satellite- borne Synthetic Aperture Radar images <i>Gopika Suresh</i>	44
Microbial carbon transformation and the response of the involved microbial communities to a changing climate <i>Nadja Torres Reyes</i>	45
Multi-frequency imaging and quantification of shallow free gas <i>Zsuzsanna Toth</i>	45
Effect of rewetting on methane and nitrous oxide emissions at different microtopes in Schleswig-Holstein, Germany <i>Olga Vybornova</i>	46
Do mangrove crabs compete for Rhizophora mangle propagules? <i>Siel Wellens</i>	46
Source area and age of particulate organic matter (POM) from an Arctic permafrost watershed (Lena Delta, Siberia) <i>Maria Winterfeld</i>	47
Better understanding and planning for change: marine spatial planning as a tool for interdisciplinarity <i>Sarah Wise</i>	47
Simulating variations of oceanic oxygen minimum zones in Holocene <i>Xu Xu</i>	48
A Model for Behavioral Economics of Adaptation to Climate Change in Forestry <i>Rasoul Yousefpour</i>	48
Glossary	49
List of participants	62

Preface

Welcome to the ECC 2014

The Organising committee welcomes you to the 5th Early Career Scientists Conference for Marine and Climate Research: Natural and Social Aspects of the Earth System. We are delighted that so many scientists are participating to this conference and we wish everyone an enjoyable and informative time in Bremen.

This conference continues the Early Career Scientists Conference series initiated by the three German Marine and Climate Science Clusters of Excellence in Bremen (MARUM), Hamburg (CliSAP) and Kiel (Future Ocean). The conferences take place on an annual basis with the three cities as alternating venues; this year in Bremen from the 21st to the 24th of September 2014. This conference is organised by and for early career scientists from the three Excellence Clusters and other institutes.

ECC 2014 aims at bringing together and promoting exchange of ideas between early career scientists in the fields of Marine and Climate Research. It is an interdisciplinary and international conference with a special focus on the Natural and Social Aspects of the Earth System. The sessions were designed to foster discussion and exchange between the different disciplines of Marine and Climate Research in an interactive and innovative way. We encourage all participants to be inquisitive about the research presented, be inspired by the content and style of presentations and to engage with the other participants.

We would like to thank all participants for their contributions. We also acknowledge MARUM for its support. Finally, we thank our partners Future Ocean, CliSAP and the institutes of the people from the organising committee.

Information

Abstracts

All abstracts were studied by two independent reviewers who provided comments and suggestions to improve the understandability of the abstracts to an interdisciplinary audience. Following the reviewers' suggestions, the authors could correct their abstracts. Both reviewers and authors put a lot of effort in the process and therefore we are proud of the quality of the abstracts available within this book; we would like to thank both reviewers and authors for their commitment.

Glossary

The authors had the possibility to define 3 words or expressions from their abstracts. Those words/ expressions form the glossary present at the end of this book. The glossary offers the opportunity to better define some words/expression that are specialised to a field and allows an interdisciplinary audience to better understand and communicate science.

One sentence

Authors were asked to contribute a "one sentence" summary of their work. These "one sentences" are provided with the title of the presentation in the printed booklet. They are meant catch the attention of the audience, and to summarise the research in a few words while providing more information than the title only.

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Contributions from clusters,
graduate schools and scientific
networks

The Integrated Marine Postdoc Network (IMAP) within the Cluster of Excellence 'The Future Ocean'

Gesche Braker

The Future Ocean, Kiel University

The Integrated Marine Postdoc Network (IMAP) within the Cluster of Excellence "The Future Ocean" is a network of scientists on non-permanent positions whose expertise ranges from early career scientists to experienced researchers working on temporary contracts for 10 years or more. All IMAP members are associated members of the Cluster and engage in the diverse disciplines of marine sciences in Kiel – in natural, social and medical sciences, computing, economics, law and the arts. Postdoctoral research in the Cluster is independent and project-driven aiming at interdisciplinary approaches with the overall objective of improving ocean system understanding, determining past, ongoing and future ocean changes, as well as the interaction with society with regard to marine resources, services and risks. The mission of IMAP is increasing the awareness and attractiveness of marine sciences in Kiel nationally and internationally and strengthening the scientific output and career development of young researchers in marine sciences in Kiel by improving their working environment. IMAP is professionally coordinated and aims at maintaining an active postdoc network in marine sciences in Kiel including alumni, communicating and addressing the needs of postdocs, supporting their career development, and helping to establish a performance-based career advancement pathway at Kiel University and nationwide.

YOUMARES and the working group on Studies and Education of the DGM

Jasmin Heiden

YOUMARES

Due to the Bologna-Process which attempts to create a European Higher Education Area, the German university degrees are being changed from the traditional "Diploma" to Bachelor and Master. The current coexistence of these different programmes leads to scepticism of students, lecturers and private enterprises. Nevertheless, the new modularly-arranged courses offer a big potential in the case of innovative lectures and a new permeability between universities. The working group on Studies and Education of the German Society for Marine Research (DGM) generates a network between experienced scientists, newbies and potential students interested in the marine sector. The DGM, with 450 members, has a long tradition in German marine sciences and builds an organisational framework for the exchange of ideas and information concerning issues of the marine environment. Within this fruitful atmosphere the DGM working group for Studies and Education established the YOUMARES (The convention for young marine scientists and engineers) conference in 2009. Ever since then, YOUMARES takes place yearly with shifting venues. This conference is a place for networking for young marine scientists and engineers. The 200 participants of the YOUMARES convention have the opportunity to inform themselves on fields of studies, doctoral positions, and careers. The working group on Studies and Education aims to build a network for young scientists in Germany and worldwide.

Introducing the Earth Science Women's Network ESWN

Amélie Kirchgaessner

British Antarctic Survey

The Earth Science Women's Network is an international peer-mentoring network of women in the Earth Sciences, many of whom are in the early stages of their careers. Members work in all areas of earth sciences, come from all career levels, from academia as well as from public and private institutions. The network's mission is to promote career development, build community, provide informal mentoring and support, and facilitate professional collaborations. Since 2002 we have accomplished this through online networking, initially over email and a listserv, on facebook, in-person networking events, and professional development workshops. At the heart of this 1700 member strong community is a web-centre (eswnonline.org), which provides a discussion platform and resource centre. Here, ESWN members can connect and create an online community of support and encouragement for themselves as women in a demanding career. Started by a group of five friends, grown through word of mouth, now in its 12th year, ESWN is in the progress of becoming a non-for-profit organisation. The network is a place to meet others, discuss issues e.g. faced in creating work-life balance, and share best practices through peer mentoring. It's easy to join: Just go to the webpage: eswnonline.org

Academic and non-academic career options for marine scientists - Services and programmes offered at MARUM

Christina Klose

MARUM, Bremen

Early career scientists at MARUM cover a wide range of research topics. Just as colourful as the disciplinary background of the people, are their ideas for their personal careers. With our services and programmes, we aim to address some important career planning needs of PhD students and early career Postdocs. For PhD students aiming to stay in science, MARUM offers a range of courses to prepare for their first Postdoc position. This includes trainings in research funding, proposal writing and interview skills. Mentoring programmes for women in science and for MARUM scientists working on the Postdoc level offer an opportunity to train interpersonal skills and personal career strategies. Following the MARUM special seminars which are held once a month, early career scientists are offered the opportunity to talk to senior scientists from all over the world in an informal Meet & Greet. Scientists aiming for a non-academic career find support through funding opportunities for placements in industry and courses addressing e.g. job hunting strategies. For a deeper insight into different kinds of jobs, we invite professionals for informal fireside chats and career days. A fundamental component of our career programmes is the active involvement of MARUM alumni.

Young Earth System Scientists community (YESS)

Vera Schemann

MPI-Meteorology, Hamburg

The community of Young Earth System Scientists (YESS) is a network originating in the three graduate schools of the climate and marine science related excellence clusters of northern Germany (SICSS, GLOMAR, ISOS) and the International Max Planck Research School on Earth System Modelling at the Max Planck Institute for Meteorology in Hamburg. It has been founded in 2010 to facilitate exchange between young researchers from these schools and all related institutions in Germany, and - in the meantime - also world-wide. To do this, YESS has implemented an independent communication infrastructure, a web community that allows for exchange and communication between YESS members. YESS is a platform that allows each member to achieve what s/he wants to do in her/his professional network within YESS. Multiple seminars, meetings, a retreat and the Interdisciplinary Conference of Young Earth System Scientists (ICYESS) 2013 have been organized using YESS resources. YESS is your easy contact option for German and international Earth System Science related institutions and agencies; we are, after all, the future of Earth system research. YESS extends your existing alumni networks of your respective school, institute or university and gives you a unique opportunity to shape the leading network community in a very active way. We do not compete with any existing solution but aim to extend and bridge gaps in the current community. We are the first of an interdisciplinary cohort of Earth system researchers, and we should try to improve exchange and communication with each another - for the science, and for our professional development. The YESS community is a place to do this, organized by you, for you. At ECC 2014, we would like to discuss further plans, demands and ideas for YESS.

The Ocean in the Earth System: MARUM – Center for Marine Environmental Sciences, University of Bremen

Jana Stone

MARUM, Bremen

MARUM has the overarching scientific goal to achieve a better understanding of key processes in the marine environment in order to provide information for sustainable use of the ocean. The research themes are: Ocean and Climate, Geosphere-Biosphere Interactions, and Seafloor Dynamics. MARUM studies past and present environmental changes from the coast to the deep sea on a global scale. Training of young scientists is of major importance and embraces natural and social sciences and law. The graduate school GLOMAR is an integral part of MARUM. MARUM also develops and provides technology and infrastructure for marine research in cooperation with industry. MARUM is one of the few research institutions worldwide that operates underwater technologies, including remotely operated vehicles, underwater drill rigs, and autonomous underwater vehicles. Through the development and operation of cutting-edge underwater instruments MARUM has established itself as a leading center of marine research technology. Furthermore, MARUM operates one of the three IODP core repositories in the world.

Preparing Young Scientists for the Policy Impacts of their Research

Stephanie Stratil

ISOS, 'The Future Ocean', Kiel University

The current generation of young climate and ocean scientists find themselves in a field that is part of societal discussions and can have wide-reaching socio-economic and policy-related impacts. This requires a reflection on the role of scientific research in relation to societal and in the end political challenges. Therefore scientists require additional, novel competences that are often remote from their immediate research and should be included in their education. We report here on a PhD retreat entitled “Science when facts are uncertain yet decisions urgent” in which PhD students from the natural sciences, law, economics and philosophy took part in. The doctoral students were sensitized to how science is used in policy and challenged to ask themselves what role they may play in addressing and communicating uncertain scientific results. The event combined lectures, interactive elements and game playing and gave the students direct access to senior scientists from geosciences, politics, ethics and an NGO. This paper presents and analyses our experience and discusses how to build on these to anchor such events in trans-disciplinary doctoral education.

IMPRS-ESM - the structured doctoral programme in Earth system sciences and modellingOpening Ceremony

Antje Weitz

IMPRS-ESM @ MPI-Meteorologie

The Max Planck Institute for Meteorology (MPI-M) and the University of Hamburg (UHH) jointly run the International Max Planck Research School on Earth System Modelling (IMPRS-ESM) to promote high-quality doctoral research into the Earth's climate system. The School conducts research in four primary research areas: atmosphere, land, ocean, and the human dimension. As part of their research, doctoral candidates may build and apply Earth system models that range in complexity and scale. The IMPRS-ESM offers doctoral candidates prime research facilities, advanced academic training in the Earth system sciences, and a structured supervision programme. Candidates enjoy ample opportunities to participate in national and international conferences and publish their scientific results in high-impact scientific journals. The annual highly competitive IMPRS-ESM selection process favours applicants with strong academic backgrounds and suitable research interests. Successful candidates will graduate with a doctoral degree from the University of Hamburg (Dr. rer. nat. or Dr. rer. pol.) and a certificate from the IMPRS-ESM. IMPRS-ESM alumni have taken up successful careers in both research and business sectors.

Scientific presentations

Salinity gradient energy at river mouths. From theoretical potential to extractable energy

Oscar Alvarez

Universidad Nacional de Colombia

The [Salinity Gradient Energy \(SGE\)](#) is a clean and renewable energy source that can be harnessed from the [controlled mixing](#) of two waters with different salt concentration. River mouths potentially are abundant locations for the exploitation of this energy source, as here perpetually fresh water mixes with saline sea water. However, the ultimate contribution of SGE to the global energy demand will largely depend on the variability of rivers discharge and ocean salinity and temperature, and on the environmental considerations for stability of river mouths ecology. Here we present a comprehensive analysis of the global SGE potential and limitations considering the most important constraints at different spatial scales. We find that the global [theoretical potential](#) is 1.2 TW, but only the 35% corresponding to river mouths in technically suitable zones for exploitation. It is shown that the tide is the most limiting forcing for harnessing SGE in river mouths and only systems with mean tidal range lower than 1.2 m are proper locations for exploitation. We also find that the Mediterranean and the Caribbean Seas are the best ocean basins for SGE exploitation

Scale: Global

Region: not region-specific

Discipline: oceanography

Own keyword: Sustainability

Abstract condensed in one sentence: An analysis of salinity gradient energy potential and constraints at river mouths was done to estimate the global extractable energy

Ecophysiological role of an abundant gammaproteobacterium of the genus *Reinekea* during a spring phytoplankton bloom in the North Sea

Burak Avci

MPI, Bremen

In 2009 we investigated the response of the bacterioplankton to the release of algal-derived organic compounds during a diatom-dominated spring [phytoplankton bloom](#) in the North Sea with high taxonomic and functional resolution. Taxonomic and functional data indicated that changes in substrate availability over time likely triggered a swift succession of distinct bacterioplankton clades (Flavobacteria and Gammaproteobacteria) which have different ecological niches. Within the succession, *Reinekea* spp. increased to 16% relative abundance amidst the bloom in only five days and subsequently vanished again. The reasons for this short-lived competitiveness of *Reinekea* spp. remained elusive. Recently, we could isolate a closely related *Reinekea* species (strain Hel1_31_D35) from the same sampling site. We conducted growth experiments, sequenced its genome and analyzed the [genome](#) in combination with the [in situ expression data](#). The combined results showed that *Reinekea* sp. Hel1_31_D35 is a generalist and unlike many Flavobacteria does not specialize on macromolecule degradation. Instead, *Reinekea* sp. Hel1_31_D35 could thrive due to its wide substrate spectrum and effective phosphorous acquisition. Furthermore *Reinekea* sp. Hel1_31_D35 possibly inhibits other bacteria and features a flexible lifestyle as it can live both in free-living and attached planktonic fractions and thus rapidly increased its abundance during the bloom event.

Scale: Regional

Region: Europe

Discipline: ecology

Own keyword: coastal

Abstract condensed in one sentence: Investigation of metabolic adaptations of *Reinekea* species that allowed for a rapid increase in abundance during a spring diatom bloom.

Tracing the interplay of oceanographic variability and glacial activity in Woodfjorden (northern Spitsbergen) through the late Weichselian and the Holocene

Martin Bartels

MARUM, Bremen

The Svalbard area can be considered as a key region of Arctic heat transfer since the archipelago is bathed in warmer water than anywhere else at similar latitudes. This is the case since warm currents from the Atlantic – the northernmost branch of the Gulf Stream – transport warm water far into the Arctic Ocean; resulting in comparable mild conditions and less sea ice coverage especially western of Spitsbergen. Therefore the Svalbard archipelago is well suitable to study the climatic and oceanographic variations that the region experienced since the end of the last ice age. Sediment archives allow reconstructing the interplay of Atlantic and Arctic waters around Svalbard during the [Holocene](#), when Atlantic waters reached even northern Svalbard. Investigating such archives from the shelf off northern Svalbard does not only allow to trace this interplay back in time (e.g. by studying the [foraminiferal](#) fauna), but also to estimate its impact on the glaciers of the archipelago (e.g. by analyzing [ice rafted debris](#) and geochemical data). This project will focus on sediment cores collected off northern Svalbard.

Scale: Regional

Region: Arctic Ocean

Discipline: geology

Own keyword: ocean aa glacier interaction

Abstract condensed in one sentence: Did warm Atlantic Water reach the Arctic Ocean and affect glacial activity around N-Svalbard since the Holocene?

Distribution of Rare Earths and Yttrium in Diatom Shells: An Experimental Study

Benjamin Birner

Jacobs University, Bremen

Diatom opal has been suggested to be a major [rare earth elements and yttrium \(REY\)](#) carrier in the marine REY cycle and the fractionation of REY during uptake from ambient seawater to be responsible for the typical shale-normalized REY distribution pattern of seawater. However, only limited data has been published on the REY concentrations in diatoms which could be used to validate the significance of diatom opal in REY cycling. Here we present an approach to evaluate the methodological possibility of direct measurements of REY concentrations in diatom shells. Furthermore, the results of our experimental study on REY partitioning between diatoms and REY-enriched artificial seawater allow us to verify the extent of [REY fractionation](#) during REY uptake from ambient medium. Our dataset indicates a four to five orders of magnitude higher REY concentration in the diatom shell relative to the growth medium. Most importantly, we did not observe any significant fractionation along the REY series during incorporation into the diatoms. Thus, while our results show that diatoms may play a role in regulating the dissolved REY concentration in seawater, our data do not suggest any impact on the characteristic REY distribution patterns of seawater.

Scale: Local

Region: not region-specific

Discipline: chemistry

Own keyword: Rare earth elements

Abstract condensed in one sentence: Results of partitioning experiments with rare earth elements and yttrium (REY) between diatoms and ambient aqueous media

The IUP nadir ozone profile retrieval

Stefan Bötzel

IUP, Bremen

Stratospheric ozone (O₃), located in the stratosphere (between approximately 10-15 km and 50 km) shields the earth's surface completely or partially from [ultraviolet \(UV\) radiation](#) which can be harmful for plant and animal life on earth. The discovery of the Antarctic ozone hole in 1985 and the increased understanding of the impact of chlorofluorocarbons (CFCs) on ozone depletion have lead to the Montreal Protocol of 1987 aimed at protecting stratospheric O₃ by phasing out CFCs and other ozone depleting substances. In order to evaluate the success of the Montreal Protocol and to better understand dynamical processes, as well as variations in them, in the stratosphere it is necessary to have a long-term dataset of the ozone distribution which is resolved horizontally and vertically. One method to create such a dataset is the use of O₃ profiles retrieved from nadir, i.e. downward looking, satellite instruments operating in the UV range. The decreasing absorption of light by O₃ with increasing wavelength in the UV leads to an increased penetration depth of light with increasing wavelength and thus altitude dependant information contained in the [radiance spectra](#) measured by such instruments. The application of this type of [retrieval](#) to various instruments will be demonstrated.

Scale: Global

Region: not region-specific

Discipline: atmospheric sciences

Own keyword: Ozone

Abstract condensed in one sentence: The algorithm used at the IUP to retrieve ozone profiles from nadir with some select validation results will be presented.

The role of coastline-induced precipitation in the tropics

Martin Bregemann

Monash University

The representation of tropical coastal rainfall in weather and climate models remains a challenge. For example over the Indonesian region, which is referred as Maritime Continent (MC), most climate models do poorly predict timing and spatial structure of rainfall. One factor that contributes to difficulties in the representation of precipitation over tropical coastal regions is the diurnal-cycle of precipitation, which is often associated with land-sea-breeze and [orographic circulations](#). This study develops and applies an algorithm to objectively identify precipitation due to land-sea interaction. Pattern-recognition techniques are applied to the satellite based rainfall estimations to determine the occurrence and intensity of coastline-affected rainfall features. Having identified precipitation affected by coastlines, its climatological features and diurnal behaviour are studied. We find that a significant percentage of rainfall in the tropics results from coastline effects. We also find that large-scale modes of climate variability, such as the [Madden-Julia-Oscillation \(MJO\)](#) and the El Niño/Southern Oscillation (ENSO) have a strong effect on the existence of coastal precipitation features. We find that suppressed conditions of the MJO favour coastline-induced precipitation over the MC to the extent that differences in rainfall between active and suppressed MJO conditions over the islands are small.

Scale: Global

Region: Tropical/Subtropical

Discipline: atmospheric sciences

Own keyword: Coastal tropical Rainfall, [Land-Sea-Breeze Circulation](#) Systems

Abstract condensed in one sentence: This study presents a new way of detecting and investigating the characteristics of rainfall associated with land-sea interaction.

Climate variability of the Last Interglacial (125,000 years ago) interpreted from southern Caribbean fossil corals.

Will Brocas

MARUM, Bremen

The effects of a future warmer world on tropical residing communities are poorly understood, and so we explore natural archives of the past for indications. Climatic conditions during the Last Interglacial (~125,000 years ago, LIG) were partially analogous to those predicted by future climate change scenarios. Seven rare fossil *Diploria strigosa* coral colonies that date to between 120,000 and 130,000 years ago (ka) from the southern Caribbean island of Bonaire, Netherlands Antilles, contain insights into the tropical LIG. Our coral archives contain [geochemical proxies](#) that reconstruct time windows of up to 37 years of sea surface temperature (SST) and hydrological balance. These records are monthly resolved and allow LIG climate variability to be explored in unique detail for this region, supplementing lower resolution sedimentary records. Compared to previous studies of similar modern and Holocene (the present interglacial) Bonaire corals, we identify two periods within the LIG of higher SST seasonality. Coinciding with peak insolation seasonality at the latitude of our site, we find the highest coral SST [seasonality](#) at 125.8 ± 1.6 ka. We find that variability results from a combined influence of astronomical forcings, with the fluctuating nature of climatic phenomena such as the [Inter-tropical Convergence Zone](#) and oceanographic currents.

Scale: Regional

Region: Tropical/Subtropical

Discipline: climatology (past, present or future)

Own keyword: Geochemical proxies

Abstract condensed in one sentence: Coral records indicate larger variability in annual sea surface temperatures in the past compared to modern times.

Little Things Become Big - Bacterial mats reconquer coral reefs

Hannah Brocke

MPI, Bremen

This presentation will be no normal scientific talk. Instead it is an example of public outreach in a cheerful style. In science slams, scientists present their own research in a given time frame - usually 10 minutes - in front of a non-expert audience. All scientists battle with one another to win over the audience to get the loudest applause. Anything that you can physically carry onto the stage can be used. Most scientists present their research with a Power Point show. The aim of this slam is to hopefully encourage other scientists for more public outreach. This particular slam deals with bacterial mats on coral reefs. The first part addresses the decline in coral cover worldwide and the increase of algae and cyanobacteria. The second part presents (in a simple way) the ongoing research to causes of cyanobacterial blooms in the Caribbean (Curaçao). The findings of this research will be linked to the recent collapse of many coral reefs, but especially the vast influence of mankind.

Scale: Global

Region: Tropical/Subtropical

Discipline: ecology

Own keyword: coral reef

Abstract condensed in one sentence: This talk presents a science slam performance - a great tool for public outreach.

The Brewer-Dobson circulation and polar ozone depletion

Martin Budde

IUP, Bremen

The [Brewer-Dobson Circulation \(BDC\)](#) plays a major role in ozone transport from the tropics to the poles and by that in the global distribution of total column ozone. Climate models predict a strengthening of the BDC in times of climate change. This would lead to an accelerated recovery of ozone abundance in higher latitudes. However so far there is no clear evidence of this strengthening. Another major driver of the global ozone distribution is the photochemical destruction of ozone, due to ozone depleting substances (ODS) such as chlorofluorocarbons (CFCs). A special case of this is the rapid depletion of ozone in the presence of [polar stratospheric clouds](#). These clouds build up inside the polar vortices, are highly temperature dependent and influence the efficiency of ODS. In order to analyse the evolution of the higher latitude ozone abundance as a function of dynamical changes and the change in the abundance of ODS it is necessary to quantify both effects separately. In this work this is done by tracking the [polar vortex](#) and correlating total ozone column changes inside and outside the vortex with the strength of the BDC.

Scale: Regional

Region: not region-specific

Discipline: atmospheric sciences

Own keyword: ozone

Abstract condensed in one sentence: Estimating the influence of chemical and dynamical processes on the total column ozone in polar regions.

Impact of harbor Seals on the Sylt-Rømø Bight food web: a modelling approach.

Camille de la Vega

AWI, Sylt

The food web of the Sylt-Rømø bight, situated on the German coast in the northern Wadden Sea has been modeled (Baird et al. 2012). Due to difficulties to determine their diet harbor seals (*Phoca vitulina*) were not included in the model. This study aims to determine if seals take significant part in the ecosystem. Their diet was estimated performing [stable isotope](#) analyses on potential prey items and seal's muscle and vibrissae. The seal compartment was then included in the existing [food web](#) model. Stable isotope results revealed seasonal variations in the use of the Sylt-Rømø bight vs. North Sea food resources by seals as well as a switch from benthic to pelagic prey items in spring. Preliminary results of the model showed a relatively low top-down effect and an increase of the ecosystem stability when the seals are present. Seals don't seem to be strong competitors to fisheries as the negative effect on the fish stock appears to be relatively low. Stability indices show that the ecosystem is less impacted by external perturbations and have a better resilience when seals are present. These results help to better understand the ecosystem functioning and can be used for management issues.

see also: [Top predator](#)

Scale: Local

Region: Europe

Discipline: ecology

Own keyword: food web

Abstract condensed in one sentence: The diet of seals was estimated with stable isotope method and included in the Ecological Network Analysis model.

Geological evidence of deglaciation during the last millennium, Admiralty Bay, West Antarctica

Ewa Demianiuk

Institute of Paleobiology, Polish Academy of Sciences

For a few decades now, a lot of research has been focusing on global climate changes. Geological and micropaleontological data collected in polar regions may provide significant insights into climatic systems of these key areas. The aim of this study is to reconstruct glacial retreat history in Admiralty Bay (King George Island, South Shetlands), and to contribute to a reconstruction of West Antarctic climatic history of the last millennium. Multiple cores were taken along two transects in Martel and Ezcurra Inlets. Different sections were correlated based on unique down-core changes in chlorophyll concentrations. They were analyzed for [foraminiferal assemblages](#) that were combined with other ecological proxies to strengthen a reliability of paleoenvironmental reconstructions. Our studies revealed regression of near glacier-proximal environments, exhibited by a presence of an index species [Cribroelphidium webbi](#), followed by subtle changes in more open-water conditions. Our data could provide a background for discussion on environmental manifestation of potential future climatic changes.

Scale: Regional

Region: Southern Ocean

Discipline: geology

Own keyword: paleoenvironment

Abstract condensed in one sentence: Foraminiferal record of deglaciation during the last millennium in the Admiralty Bay, West Antarctica.

Climate change impacts on Antarctic benthos: ecological impacts of ice-shelf collapse on sponge communities.

Rachel Downey

Senckenberg Research Institute, Wilhelmshaven

Regional warming in the western sector of the Antarctic has been observed since the 1950s. In 1995, this warming led to the collapse of the Larsen A ice-shelf, followed by the Larsen B ice shelf in 2002. Research expeditions in 2007, 2011, and 2013 were conducted by a multi-disciplinary team to track and monitor the ecological and oceanographic changes in this region, both from the former Larsen AB ice-shelves, but also from the still intact Larsen C ice-shelf and the adjacent Antarctic Peninsula. Sponges play a key role in Southern Ocean [benthic](#) communities, important both for biomass and as habitat for many other organisms. Recent studies utilising ROV in this region have shown that [glass sponges](#) have rapidly increased their abundance after ice-shelf collapse. This project aims to taxonomically identify all sponges collected in these expeditions to determine the biological diversity of these communities and how, during this time period, they have ecologically responded to the loss of permanent ice-shelves. Utilising all known sponge records from the Southern Ocean, faunal analyses will also be applied to understand the uniqueness of these former ice-shelf communities.

Scale: Regional

Region: Southern Ocean

Discipline: ecology

Own keyword: climate change

Abstract condensed in one sentence: Ecological changes in sponge communities will be analysed to determine the impacts of the collapse of the Larsen AB ice-shelves.

Evolution of late Miocene to early Pliocene equatorial Pacific sea surface conditions: deciphering the state of the El-Niño-Southern-Oscillation

Anna Joy Drury

MARUM, Bremen

The Pacific Ocean, which covers 50% of Earth, is the world's largest nutrient, heat and water reservoir. The equatorial Pacific represents half of the tropical oceans and is essential in global heat transport and carbon cycling. Modern equatorial Pacific sea surface conditions (sea surface circulation and temperatures) were established during the late Miocene to early Pliocene. However, the exact evolution of these conditions is not fully understood. An important equatorial Pacific phenomenon with global consequences is the [El-Niño-Southern-Oscillation \(ENSO\)](#), where the east-west equatorial sea surface temperature gradient changes considerably between the warm [El Niño](#) and the cool [La Niña](#) phase. Past research suggests that a permanent El-Niño-like state dominated the equatorial Pacific during the [late Miocene to early Pliocene](#). This study investigates the evolution of equatorial Pacific surface-water conditions between 8.0 and 4.4 Ma. Temperature-dependent [oxygen stable isotope ratios](#) of planktic foraminifera ($\delta^{18}\text{O}_{\text{planktic}}$) from the east and west equatorial Pacific suggest that a low east-west temperature gradient existed before 7.0 and after 5.7 Ma, which suggests more El-Niño-like conditions. However, an increased east-west $\delta^{18}\text{O}_{\text{planktic}}$ gradient between 7.0 and 5.7 Ma could indicate dominant La-Niña-like conditions. Improving understanding of the ENSO-state in a warmer world could aid studies into future ENSO-state.

Scale: Regional

Region: Pacific Ocean

Discipline: oceanography

Own keyword: Surface ocean

Abstract condensed in one sentence: Late Miocene to early Pliocene equatorial Pacific sea surface conditions are investigated to evaluate the state of the El-Niño-Southern-Oscillation.

Molecular Biogeochemistry of DOM in the Lena River Delta

Ivan Dubinenkov

AWI, Bremerhaven

[Dissolved organic matter \(DOM\)](#) plays an important role in the carbon cycle and in a wide range of [biogeochemical](#) processes in the large arctic rivers. The Lena River is one of the largest in the Arctic, and permafrost underlies 78-93% of the watershed. Permafrost soils store considerable amounts of fossil carbon (~1700 Pg globally). Permafrost thaw and degradation are affecting Lena River biogeochemistry. Understanding of regional biogeochemical behavior of DOM on different levels is of great importance. A range of natural waters and permafrost sediments were sampled (Expeditions of 2009/2010/2012/2013) in the Lena Delta and inner Laptev Sea. Fresh waters were analyzed for dissolved organic carbon, total dissolved nitrogen and nutrients. DOM samples were concentrated and analyzed by Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS). FT-ICR MS allows identification of thousands of organic compounds within one DOM sample. DOM from different fresh and saline waters showed distinct and systematic molecular signatures. Origin-specific (river, lake, creek, bay) molecular markers were identified. Recorded DOM molecular transformations in the estuary highlighted predominance of conservative mixing of riverine and marine DOM. Biodegradable DOM molecular components of permafrost melt waters were identified and characterized. The presence of biodegradable DOM molecular components was observed in a variety of ice complexes suggesting high lability of permafrost-emitted organic matter.

Scale: Regional

Region: Arctic Ocean

Discipline: chemistry

Own keyword: environmental

Abstract condensed in one sentence: Non-targeted organic analytics revealed directions of biogeochemical processes involving dissolved organic matter in the Lena Delta (East Siberia) region.

Glass sponge communities and the role of their environment in the Weddell Sea, Antarctica

Luisa Federwisch

AWI, Bremerhaven

Glass sponges (Porifera, Hexactinellida) are one of the oldest existing animal groups. Today, these marine sessile filter feeders mainly inhabit the deep sea, but they also occur in considerable numbers on the Antarctic shelves and along the eastern North Pacific coast. Especially in the Antarctic, they are of substantial ecological relevance, as vast sponge beds dominate the benthic biomass of some areas where they play a significant role in silicon cycling and provide structural heterogeneity for a diverse associated fauna. It is still unknown, however, which factors determine glass sponge distribution and, consequently, how environmental changes might affect Antarctic glass sponge communities. In order to fill these knowledge gaps, we conducted video transects using a [remotely operated vehicle \(ROV\)](#) and measured various environmental parameters at corresponding stations in the Weddell Sea during expedition PS82 with RV Polarstern in January/February 2014. First results suggest a connection of glass sponge occurrence with bottom water temperatures and dissolved silicate, factors also considered important for glass sponge distribution in western Canada. In this presentation, some preliminary results on glass sponge abundance and community composition are discussed in relation to abiotic (water mass characteristics, currents, pack ice cover, dissolved silicate) and biotic factors (food, predators) to assess their role on glass sponge distribution in the eastern Weddell Sea.

Scale: Regional

Region: Southern Ocean

Discipline: ecology

Own keyword: benthos

Abstract condensed in one sentence: distribution, abundance and community composition of Antarctic glass sponges were investigated in relation to environmental parameters

Climate engineering- uncertainty, optimization and application

Ellias Feng

GEOMAR, Kiel

The efforts to mitigate future CO₂ emission are likely failing, yet climate change threats are still remaining. Therefore, [climate engineering \(CE\)](#) proposals, for example [solar radiation management \(SRM\)](#) and [artificial ocean alkalization \(AOA\)](#), are brought up to modify climate system in large scale as alternative to human adaptation in the future. In this research, I used University of Victoria Earth System Climate Model to simulate the two climate engineering proposals cited above (SRM and AOA) in both global and regional scale under Representative Concentration Pathway 8.5 CO₂ emission scenario from the year 2020 to 2100 respectively, and discovered the following preliminary results: 1) SRM and AOA's effectiveness are strongly affected by climate sensitivity and oceanic vertical mixing processes, which leads to large uncertainties for future SRM & AOA predictions; 2) an optimal scheme on SRM & AOA coupling deployment can be achieved in order to minimize their economic costs and maximize climate mitigation effectiveness; 3) SRM & AOA can be utilized in regional scale for marine biota conservation, however the "termination effect" they induce can trigger negative biogeochemical side effects, which has to be considered in future implement.

Scale: deployment strategies and possible side-applications"

Region: Global

Discipline: Tropical/Subtropical

Own keyword: climatology (past, present or future)

Abstract condensed in one sentence: This is a numerical model assessment which investigates two climate engineering proposals: 'Solar Radiation Management' and 'Artificial Ocean Alkalization'

Central Arctic Primary Production and its limiting factors during the record sea ice minimum in 2012

Mar Fernandez-Mendez

AWI, Bremerhaven

The Central Arctic Ocean is known for its low [primary productivity](#) due to light and nutrient limitations. It has been speculated that the recent reduction in ice thickness and cover could lead to a substantial increase in primary production and sea-ice algal carbon export to the sea floor. Photosynthesis vs. irradiance curves were used to measure net primary productivity (NPP) in water column, [sea ice](#) and melt ponds of the Central Arctic during summer 2012, when sea-ice reached a minimum extent. Results show that ice-covered waters had lower NPP rates than open waters probably due to light limitation. Nitrate was limiting NPP in the Siberian Seas, while silicate was the main limiting nutrient at the ice margin. Ice algae and sub-ice algal aggregates can contribute 50-90% to NPP in some parts of the Central Arctic at the end of the season. However, the patchiness of sub-ice algae makes the upscaling difficult. Although sea-ice cover was substantially reduced in 2012, total annual production in the Eurasian Basin was similar to previous estimates. However, when including the previously ignored sub-ice algal aggregate production, the annual production doubles. Our data suggests that sub-ice algae might be responsible for potential local increases in NPP due to higher light availability under the ice and their ability to harvest nutrients from a wider area as they drift with the ice. Further studies are needed in the undersampled Central Arctic to be able to predict if the Arctic Ocean will become a source or a sink of carbon in the future due to climate change.

Scale: Regional

Region: Arctic Ocean

Discipline: biology

Own keyword: Oceanography

Abstract condensed in one sentence: Changes in photosynthetic production in the Central Arctic due to sea-ice retreat are studied under different light and nutrient conditions.

Last 1000 years of palaeo-environmental reconstruction via lake sediment analysis in the Eastern Carpathians, Northern Romania

Gabriela Florescu

Stefan cel Mare University of Suceava

Climate changes and anthropogenic activities are projected to have a great impact on mountain environments due to their ecosystems's sensitivity and increased response. That is why modifications in the patterns of climatic elements and human actions can impact heavily on mountain ecosystems and result in perturbations to the local communities. The present study generates high resolution, [multi-proxy](#) (geochemical, physical and biological) [analyses](#) from a lake sediment sequence located in the Eastern Carpathians, Northern Romania, with the purpose of reconstructing local environmental history in response to climatic variability and human impact, over the last millennium. Our preliminary results clearly show three distinct evolution stages of the local environment, which correspond to the main climatic intervals of the last 1000 years: the termination of the Mediaeval Warm Period (950-1250 AD) – a warm and wet interval; cold and dry conditions during the Little Ice Age (1350 to 1850 AD) and the recent climatic warming (the last 150 years). The extent of impact of rapid climate change and anthropogenic disturbance on local mid-elevation mountain forest composition, species distribution and catchment erosion is ongoing. Combining the geochemical and palaeoecological records will ultimately lead to a fundamental climatic, ecological and biogeographical understanding and offer greater predictive capacity of future environmental changes.

Scale: Local

Region: Europe

Discipline: ecology

Own keyword: paleolimnology

Abstract condensed in one sentence: Local [climatic variability](#) and environmental response to natural and anthropogenic factors have been determined via [multi-proxy](#) palaeolimnological techniques.

Dissolved neodymium isotopic composition of Hawaiian coastal Waters and the water column at an offshore station

Henning Fröllje

ICBM, University of Oldenburg

Terrestrial material provides an important source of [micronutrients](#) to the ocean. Knowledge of the origin and seasonality of this input is therefore crucial for our understanding of biogeochemical cycles. Neodymium isotope ratios ($^{143}\text{Nd}/^{144}\text{Nd}$, expressed in ϵNd) are a useful [tracer](#) for the source region of dissolved and particulate material input to the ocean, since ϵNd has a geographically distinct distribution in different source rocks. Near Hawaii, the potential sources of trace elements to the surface ocean are local input from Hawaii and eolian supply from Asia. The different ϵNd of Asian and Hawaiian sources should allow for a clear differentiation of these contributions. Our investigation can therefore be considered a case study for the importance of trace element input to the ocean from volcanic islands versus dust. It has been suggested that high iron concentrations 100km north of OâŽahu are due to Asian dust input. Here we show that the surface water at that site has the same ϵNd as groundwater and coastal water of OâŽahu. In summer, following the highest annual dust input, however, we find a contribution from Asian dust. This suggests, that local input from Hawaii is the dominant Nd source, but that Asian dust contributes seasonally.

Scale: Regional

Region: Pacific Ocean

Discipline: oceanography

Own keyword: isotopes

Abstract condensed in one sentence: The Neodymium isotopic composition of seawater is studied and provides insight into the importance of Hawaiian input to the ocean.

Real-time Evaluation of Natural Gas Composition and Origin from up to 2000 Meter Below the Seafloor

Sebastian Hammerschmidt

MARUM, Bremen

The Japanese drilling vessel Chikyu allows geoscientists to access deep parts of the earth using [riser drilling](#) technology. Riser drilling is particularly valuable to understand the physico-chemical properties of rocks and fluids and their changes over different time scales. Here we focus on fluids from the Nankai Trough subduction zone, particularly on natural gases, that were monitored in real-time as part of the riser drilling system. Additionally, gases were sampled with the SciGas system and analyzed onshore for their composition. Deuterium analyses were conducted by isotope ratio gas chromatography/mass spectrometry. The gas composition was clearly dominated by methane, followed by ethane and propane. The datasets were compared using the [Bernard parameter](#) and [total wet gas ratios](#) to investigate the contribution of bacterial hydrocarbon gases, and hydrocarbons that are generated under high temperatures (âŽthermogenic gasâŽ). All datasets imply an immature (i.e. dominated by bacterial hydrocarbon) gas composition. Our results suggest that the downhole increase in thermogenic gas is influenced by mixing with bacterial methane. Thermogenic gas production at depths shallower 2000 mbsf is unlikely

Scale: Local

Region: Asia

Discipline: chemistry

Own keyword: monitoring

Abstract condensed in one sentence: Real-time information of drilling mud gas composition highlights fluid generation and transport in the subsurface

Assessment of eukaryotic communities in environmental samples: A workflow comparison for Next Generation Sequencing data

Kristin Hardge

AWI, Bremerhaven

To understand function and stability of ecosystems it is crucial to gain insights into their species composition, particularly in the face of global warming. [Next Generation Sequencing \(NGS\)](#) is the method of choice for getting fast overviews of species diversity in a high number of samples. Currently, there are lively discussions about bioinformatic techniques to enhance the quality of sequencing outputs and how to post process these data in order to estimate the “real” diversity as precisely as possible. In this study, we analyzed the protist composition of three water samples, collected in the Fram Strait in 2010. We compared different potential [sequencing error](#) corrected and uncorrected datasets, which were generated with widely used open-source software: QIIME, mothur and PhyloAssigner. Relative abundance of protist phyla was hardly affected by the choice of the software, quality filtering and error correction. However, the outputs differed strongly in relative abundance of diatom genera and were not comparable to dominant diatoms observed with light microscopy. Our main findings are beneficial for the enhancement of study design, data preparation and interpretation and gives insights into the optimization potential of NGS experiments in general.

Scale: Global

Region: not region-specific

Discipline: biology

Own keyword: Next Generation Sequencing

Abstract condensed in one sentence: This study aims to improve the practical setup of 454 pyrosequencing experiments to estimate the [protist](#) diversity in environmental samples.

Impact of Orbital Forcing on Marine Productivity during Interglacials

Yunchang He

Kiel University

In the present study we use an ocean biogeochemical model forced by two transient simulations of Eemian (~126-116 kyr BP) and Holocene (~9.5-0 kyr BP), obtained from the Kiel Climate Model. Both climate periods underwent similar transient changes in the [orbital parameters](#). The amplitude of solar insolation anomalies is two times larger in the Eemian than in the Holocene due to the overall higher eccentricity. At seasonal and annual scale, the other two orbital parameters (precession, obliquity) play different roles on the insolation separately. Although climate at the global scale was rather constant in both periods, the global marine productivities have different trends. Although the climate forcing is weaker in the Holocene simulations, there is decrease in global mean [net primary production \(NPP\)](#) (approx. -10%), while NPP in Eemian simulation is rather constant. We investigate that stronger upwelling in the tropical Indian Ocean driven by the walker circulation brings higher nutrients from deep water in the Eemian than in the Holocene, which contributes the unexpected NPP behaviors. Furthermore, we will quantify implications for the global carbon cycle and estimate how potential changes in the seasonality of NPP and [EP](#) may have influenced proxy reconstructions. Finally, possible implications for anticipated future climate change will be assessed.

Scale: Global

Region: not region-specific

Discipline: climatology (past, present or future)

Own keyword: interglacials

Abstract condensed in one sentence: Orbital forcing caused the different trend of global mean net primary productivity

Molecular sensor-based monitoring of toxic algae species

Johanna Hessel

AWI, Bremerhaven

Planktonic algae are the most abundant photosynthetic organisms on earth. They are the basis of the marine food web, and changes in phytoplankton communities generally provide an early indication for climate-driven modifications of ecosystems. Harmful algal blooms (HAB) are blooms of planktonic algal species that have negative impacts on humans and aquatic environments. Several climate and environmental drivers influence timing and frequency of these algal blooms. There is some evidence that the occurrence of HAB might become more intense, widespread, frequent and unexpected in future decades due to climate variability. In North ocean regions, global climate change is reflected by changing environmental conditions, such as increasing sea surface temperature, modified water mass stratification and rising freshwater content. Within this study the occurrence, abundance and dispersal of toxic algae species is monitored in Nordic seas and the Arctic Ocean, via molecular detection of a nucleic acid biosensor. Alongside with this it will be assessed whether biosensors can serve as early warning indicators for human health policies in the field of water resource management.

Scale: Regional

Region: Atlantic Ocean

Discipline: biology

Own keyword: monitoring

Abstract condensed in one sentence: The biogeographic distribution and abundance of marine harmful algae in the North Atlantic and Arctic Ocean is studied.

Western Sahel: Separating natural variability from anthropogenic changes

Ulrike Holzwarth

MARUM, Bremen

The African Sahel is a semiarid ecosystem extremely prone to precipitation fluctuations and therefore one of the most vulnerable regions of the world with respect to changes during the Anthropocene. With our study, we aim at disentangling land-use effects from natural variations. We present a record of the past 3100 years from a marine sediment core off Mauritania. Pollen grains are used to reconstruct continental vegetation changes and hydrological variability whereas the organic-walled dinoflagellate cysts (dinocysts) reflect local oceanographic conditions and input of material from land. Variations between BC and 1700 AD are used as a baseline and deviations from this natural variability within the last 300 years may be considered as anthropogenic influence. From BC to ~ 1700 AD pollen and dinocyst associations suggest rather small changes in continental rainfall and terrestrial input. From ~ 1700 AD onward, relative abundances of a dinocyst species typical for agricultural activities increase continuously. After the onset of the Sahel droughts in the 1970s and 1980s, relative abundances of Savannah pollen as an indicator for more humid conditions decrease. It can be concluded that it was the natural hydrological variability which induced the vegetation change during that time.

Scale: Regional

Region: Africa

Discipline: climatology (past, present or future)

Own keyword: Hydrology

Abstract condensed in one sentence: The Sahel droughts in the 1970s and 1980s were induced by natural climate variability.

Paleoceanography and Environmental Conditions in the Baffin Bay since the last ice age

Rebecca Jackson

MARUM, Bremen

The Arctic regions are experiencing a greater-than-average response to climatic change. Baffin Bay, located between Greenland and the Canadian Arctic Archipelago, is a key region for understanding the complex interaction between ocean circulation and the Greenland Ice Sheet (GIS). Circulation and surface water characteristics in the basin reflect the extent of seasonal sea-ice, changes in inflow from the Labrador Sea and freshwater transport from both the Arctic Ocean and the GIS. These environmental conditions vary not only between major cold (glacial) and warm (interglacial) periods but also more rapidly on millennial to centennial-timescales. Complex feedbacks and phase-relationships between changes in the cryosphere and ocean systems remain unclear. $\delta^{18}\text{O}$ isotope records from [foraminifera](#) and [dinoflagellate cyst](#) assemblages are utilised to assess paleoceanographic conditions such as temperature, salinity and sea ice cover, whilst sediment properties give clues to material transported into the bay via meltwater and ice from both Greenland and the Canadian Archipelago. From these, rapid changes in the climatically-sensitive Baffin Bay region will be placed in the context of wider climate variability covering the last glacial (20,000 years before present) to the current interglacial period and allow for better understanding of this region's interaction with the North Atlantic synoptic system.

Scale: Regional

Region: Arctic Ocean

Discipline: climatology (past, present or future)

Own keyword: paleoceanography

Abstract condensed in one sentence: Assessing the interplay between ocean circulation and the Greenland Ice Sheet in the Baffin Bay

Satellite-based retrieval of desert dust deposition into the Atlantic Ocean

Malte Jäger

IUP, Bremen

Desert dust has a strong influence on climate as it influences the radiation budget in the atmosphere and, if being transported to the ocean, has an influence on the ecosystem there, e.g. by acting as fertilizer. One prominent example are desert dust outflows from the Sahara being transported westwards over the Atlantic Ocean, especially during summertime. Measurements of dust deposition are usually performed using collectors on land and on buoys as well as sediment traps in the ocean. However, large regional to continental coverage can be achieved only with satellites. We present a new methodology for the assessment of desert dust deposition from top-of-atmosphere reflected solar irradiance measured by satellite. This methodology is based on the observation of changes in columnar [aerosol optical thickness \(AOT\)](#) along the transport path of dust outflows. The guiding idea is that, if transport orientation is estimated correctly, a decrease in [AOT](#) across the Atlantic can be linked to the deposition of aerosols onto the ocean surface. Optical models of mineral dust and wind fields from models are used in order to derive deposition rates from [AOT](#) datasets. The Bremen Aerosol Retrieval, developed at the Institute of Environmental Physics of University of Bremen (IUP/U-Bre), serves as primary [AOT](#) retrieval algorithm, using multispectral measurements by the Sea-viewing Wide Field-of-view Sensor. It has been seen that seasonal patterns of [AOT](#) are correctly reproduced, both in space and time. For example the largest peak in [AOT](#) mass loss is observed at summer.

Scale: Regional

Region: Atlantic Ocean

Discipline: atmospheric sciences

Own keyword: desert dust

Abstract condensed in one sentence: Mass deposition rates of desert dust shall be estimated by the analysis of aerosol optical thickness along the transportation path.

Quantifying the volume and frequency of bubble release from hydrocarbon seeps in the Gulf of Mexico

Caroline Johansen

Florida State University

Numerous studies describe the behavior of gas bubbles released from marine sediments. However, the formation of individual bubbles at the sediment interface, the rate of release, and the effect of oil and gas hydrate require further investigation to understand the impacts of methane and oil on benthic ecosystems. This research resolves the formation and release of individual bubbles over periods of 3 and 60 hours. [Autonomous video cameras](#) captured images of oily bubbles as they escaped from discrete openings on the surface of [hydrate](#) outcroppings at two sites in the Gulf of Mexico. We used image processing techniques to determine volume and release rate, as well as the variability of bubble formation. A 3-h camera deployment, at a site known as Birthday Candles, indicated a bubble release rate of 1.15 bubbles/sec. A second camera deployment of 48 hours at a more active site known as Mega-Plume exhibited release rates of 64 bubbles/sec. Although Mega-Plume was more active than Birthday Candles, the average bubble size fell within the same range. Quantifying the release rate, and magnitude of the oil and gas from these conduits, can help us understand the larger complex structures of [natural seeps](#) in the Gulf of Mexico.

Scale: Regional

Region: Americas

Discipline: oceanography

Own keyword: Bubbles

Abstract condensed in one sentence: Video data used to determine release rate and volume of oil released from natural seeps in the Gulf of Mexico.

Coupling a regional climate model with the Finite Element Sea Ice-Ocean model for an Antarctic Ice Sheet study-ideas, expectations, challenges.

Marta Kasper

Utrecht University/AWI, Bremerhaven

Observations from recent decades show that [Antarctic Ice Sheet \(AIS\)](#) loses mass at an accelerating rate. The most of the mass is removed by fast-flowing glaciers, transporting the ice towards the coast. The flow velocity of the glaciers is controlled by the temperature of the ocean. As the atmosphere circulation is changing in the warming climate, it impacts also the ocean circulation. Climate models are a very useful tool to understand the mechanisms that govern this complex atmosphere-ocean-ice system. However, the resolution of the most available models is much too coarse to resolve the processes in the coastal regions in the Antarctic. The PhD project aims to access the atmosphere-ocean-ice interaction using high-resolution models. The task is to couple the [regional atmospheric model \(RACMO2\)](#) with [Finite Element Sea Ice-Ocean Model \(FESOM\)](#). Both models provide realistic results for atmosphere and the ocean, respectively. The coupled model will allow to estimate the contribution of Antarctic Ice Sheet to future sea level rise. The poster shows the advantages of these two models as well as the expectations and the challenges concerning combining these models.

Scale: Regional

Region: Southern Ocean

Discipline: oceanography

Own keyword: modelling

Abstract condensed in one sentence: Investigating the impact of highly resolved atmosphere on ocean circulation around and below Antarctic Ice Sheet in the warming climate.

Investigating changes in the climate- and ecosystem of Arctic sea ice using remotely operated vehicles

Christian Katlein

AWI, Bremerhaven

The Arctic Ocean is currently undergoing a dramatic change. Decreasing sea-ice extent, thickness and age are changing important processes in the climate system. An increasing coverage of the [sea ice](#) by melt ponds and an increased amount of light transmitted to the upper ocean are also affecting the ice associated ecosystem. To document these changes, we operated different [remotely operated vehicles \(ROV\)](#) underneath the drifting sea ice of the Central Arctic Ocean. The newest underwater technology combined with a highly interdisciplinary sensor suite was successfully used for scientific investigations directly under the sea ice. The unique dataset of novel observations provided insights into the partitioning of solar shortwave radiation in and under sea ice, the deformation and topography of the ice cover, the distribution of sea-ice algae and ice algal aggregates and the ice associated primary production. The large range covered by the ROV surveys enabled us to quantify the spatial variability of physical as well as habitat properties. Despite the harsh climatic conditions and logistical difficulties in the high Arctic, the latest ROV technology proved to be a valuable tool for interdisciplinary sea-ice research.

Scale: Regional

Region: Arctic Ocean

Discipline: physics

Own keyword: Arctic, sea ice, new technology, solar radiation

Abstract condensed in one sentence: The Ecological Niche Factor Analysis, performed with R and GRASS-GIS, is applied to map the distribution of *Holothuria arguinensis*.

Monitoring shipping emissions with in-situ measurements of trace gases

Lisa Kattner

IUP, Bremen

Air pollution from [shipping emissions](#) contributes to overall air quality problems and has direct health effects on the population especially in coastal regions and harbor cities. In order to reduce these emissions, the [International Maritime Organisation \(IMO\)](#) has tightened the regulations for air pollution from ships. However, until now there is no regular monitoring system available to verify that ships are complying with these new regulations. The aim of the project MeSMarT (Measurements of shipping emissions in the marine troposphere) is to estimate the influence of shipping emissions on the chemistry of the [atmospheric boundary layer](#) and to establish a monitoring system for main shipping routes. Within the project, two permanent sites have been set up to measure shipping emissions in Northern Germany: (1) in Wedel near the Hamburg harbor, close to the Elbe River and (2) on the island Neuwerk, about 6 km south of the main shipping route through the German Bight. In this study, we show that [shipping emission](#) peaks measured by in-situ instruments can be associated with individual ships and that this information may help to monitor the compliance of ships with IMO regulations.

Scale: Regional

Region: Europe

Discipline: atmospheric sciences

Own keyword: pollution

Abstract condensed in one sentence: Air pollution from individual ships is measured at the German coast to test a potential pollution monitoring system.

Climate and CO₂ effects on the vegetation of southern tropical Africa over the last 37,000 years

Vyacheslav Khon

University of Kiel

Tropical savannas cover a substantial fraction of the earth's land surface. Future changes in the proportion between woody and grassy vegetation in the savannas remain highly uncertain. Hence, mechanisms controlling variations of the tropical rainfall and savanna vegetation are studied using climate model simulations and [paleoreconstructions](#). For the model-data comparison we use paleoreconstructions of stable deuterium (dD) isotope values of terrestrial plant leaf waxes preserved in a marine sediment core close to the mouth of the Zambezi over the last 37,000 years. The estimated rainfall based on dD suggests a gradual increase in rainy season precipitation over the Zambezi basin from the early to late [Holocene](#). A similar trend is well reproduced by the climate model simulations using orbital configuration changes. We use a vegetation model to explain the reconstructed vegetation changes in tropical Africa during the last 37,000 years, applying individual and combined forcings of precipitation, temperature, and CO₂. In our simulations, variations in temperature along with precipitation and atmospheric CO₂ reconcile the evolution of vegetation observed in the Zambezi catchment during the last 37,000 years. In consequence, the effect of temperature changes on tropical savanna vegetation should be taken into account with respect to modeling past or future climates. see also: [Paleoclimate modeling](#)

Scale: Regional

Region: Africa

Discipline: climatology (past, present or future)

Own keyword: Paleoclimate

Abstract condensed in one sentence: Factors that caused long-term variations of the vegetation in southern tropical Africa are studied

The role of the Black Sea Commission in the protection of the Black Sea against pollution - instruments of legal and institutional regulation

Nina Khuchua

GLOMAR, Bremen

Since the beginning of 1970ies, the Black Sea has been suffering a severe pollution by excessive input of nutrients and chemicals. To improve the situation, the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention) was signed in 1992. The Black Sea Commission (BSC), which is the implementing body of the Convention, was established. In the Baltic Sea, which is known to be one of the most polluted seas in the world, a comparable protection regime exists already since 1974, in the form of the [Helsinki Commission \(HELCOM\)](#) and the Helsinki Convention (HC). During the last years, the BSC strengthened its position as a regional actor in the protection of the Black Sea. However, there is still considerable potential for further improvements. The author claims that (a) improvements in the performance of the BSC can be achieved, among others, through optimizations in its structure and (b) analysis of the historical development and present work of HELCOM can give valuable impulses for such reforms. In this presentation, some possible changes to the structure of the BSC and its Permanent Secretariat (PS) shall be discussed.

Scale: Regional

Region: Europe

Discipline: law

Own keyword: governance

Abstract condensed in one sentence: The role of the [Black Sea Commission](#) in the environmental protection of the Black Sea against pollution is studied.

Tracing ice-algae produced carbon in a changing Arctic Ocean using biomarker analyses

Doreen Kohlbach

AWI, Bremerhaven

The underside of sea ice in polar regions represents a natural habitat for heterotrophic organisms constituting the under-ice community. This fauna plays a key role in transferring ice algae-produced carbon into pelagic and benthic food webs of polar ecosystems. Animals at higher [trophic levels](#) are adapted to feed on the under-ice fauna as well as on zooplankton and nekton. Therefore, they show an indirect dependency on microalgae-produced biomass. In order to improve our understanding of the potential ecological consequences of a changing sea ice environment, we aim to quantify the extent to which ice algae-produced carbon is channelled into the under-ice community, and from there to pelagic food webs. Sample collection was carried out during ARK XXVII-3 expedition of RV Polarstern (August-September 2012) within the Amundsen and Nansen Basins of the Eastern Central Arctic Ocean north of 80°N. Trophic interactions of abundant under-ice zooplankton were studied using stable isotope analysis (SIA) of natural abundance carbon and nitrogen, lipid fingerprinting, and [compound-specific SIA \(CSIA\)](#) of fatty acid trophic markers ([FATM](#)). Based on preliminary results of fatty acid patterns and carbon stable isotope signatures, several amphipod species demonstrated a high dietary dependency on ice algae.

Scale: Regional

Region: Arctic Ocean

Discipline: ecology

Own keyword: sea-ice-algae

Abstract condensed in one sentence: Trophic flux of sea ice-derived carbon in Arctic food webs considering species-specific fatty acid signatures and stable isotope compositions

Modeling the effect of meltwater on the habitat of Arctic planktonic foraminifera

Kerstin Kretschmer

MARUM, Bremen

Fossil shells of planktonic foraminifera serve as the prime source of information of surface water conditions in the Arctic. For instance, by using oxygen isotopes on planktonic foraminiferal shells past large-scale meltwater events have been identified. In this study the potential bias of foraminifera-based oxygen-isotope records due to meltwater-induced variations in the depth habitat and seasonal succession of planktonic foraminifera will be assessed. Thereby, an existing [planktonic foraminifera ecosystem model](#) will be combined with a depth-habitat module. Additionally a module will be developed to calculate the species-specific oxygen-isotope composition of the modeled foraminiferal shells. This geochemical-foraminiferal model will be used to assess the impact of meltwater injections into the Arctic and North Atlantic Ocean on the foraminiferal oxygen-isotope records during Heinrich Event 1 (~15-18 cal. kyr B.P.), the Younger Dryas (~11.5-13 cal. kyr B.P.), and the 8.2kyr event. By comparing the model output with existing paleoceanographic reconstructions based on [Neogloboquadrina pachyderma \(sinistral\)](#) and meltwater histories, it will be possible to correct for the habitat effect on oxygen-isotope composition and to obtain more robust estimates of past meltwater fluxes in the high northern latitudes.

Scale: Regional

Region: Arctic Ocean

Discipline: climatology (past, present or future)

Own keyword: foraminifera

Abstract condensed in one sentence: The impact of meltwater injections on the habitat of Arctic planktonic foraminifera is studied via an ecosystem modeling approach.

Greenhouse gas emission rate estimates from airborne remote sensing

Thomas Krings

University of Bremen

The greenhouse gases carbon dioxide (CO₂) and methane (CH₄) are the most important anthropogenic greenhouse gases contributing to climate change. Large parts are emitted from localised sources such as power plants or fossil fuel mining and production sites. However, these emissions are often not well quantified and large differences exist between process based inventories and measurement derived release. Airborne and satellite remote sensing with the aim of quantification and discrimination of CO₂ and CH₄ sources and sinks can lead to a better understanding of the processes that control the carbon cycle dynamics and can give an independent estimate of strong local greenhouse gas emissions. The airborne optical remote sensing instrument [MAMAP](#) operating in the short wave infrared at a wavelength of around 1.6 μm is used to develop and demonstrate quantification techniques for point source emissions. Using a few examples, these techniques and future perspectives will be presented giving also an outlook to a proposed next step, a dedicated greenhouse gas satellite mission with high spatial resolution and coverage, that is a candidate for the [Earth Explorer 8](#) mission by the European Space Agency (ESA): [CarbonSat](#).

Scale: Local

Region: not region-specific

Discipline: atmospheric sciences

Own keyword: greenhouse gas emissions

Abstract condensed in one sentence: Inversion techniques to obtain CO₂ and CH₄ emission rates from localised sources using remote sensing total column data.

Quantification of dissolved organic sulfur in the East Atlantic and Southern Ocean

Kerstin Ksionzek

AWI, Bremerhaven

A number of studies on dissolved organic carbon, -nitrogen or -phosphorus (DOC, DON or DOP) were previously conducted. There is a lack of knowledge on the biogeochemical role of dissolved organic sulfur (DOS). The aim of our research was method development for the quantification and molecular characterization of DOS in natural waters. Solid-phase extraction (SPE) is a simple and efficient method for isolation, desalting and enrichment of [DOM](#). The extraction efficiency of DOC is well known (40-60%) but it's still unknown for DOS. SPE-DOM samples were analysed by [ICP-MS](#) for sulfur content. We extracted peat water samples by SPE and will present the results of comparison of extraction selectivities for DOC and DOS. We also analysed solid-phase extracted marine dissolved organic matter (DOM) samples from the R/V Polarstern cruises ANT XXV/1 and ANTXXV/2. Results of DOS concentrations on a transect covering the East Atlantic Ocean and the Atlantic sector of the Southern ocean will be presented. We are planning to link the quantitative information of ICP-MS with the structural and compositional information analyzed by [FT-ICR-MS](#) for further molecular characterization of DOS.

Scale: Regional

Region: Atlantic Ocean

Discipline: chemistry

Own keyword: Dissolved organic matter

Abstract condensed in one sentence: Solid phase extracted marine dissolved organic matter samples were analyzed for dissolved organic sulfur concentrations by ICP-MS

Characterising the sea ice environment using a newly developed sensor array mounted on an under-ice trawl

Ben Lange

AWI, Bremerhaven

One of the most pronounced impacts of climate change is the changing sea ice cover which has implications for sea [ice-associated ecosystems](#) that depend on carbon produced by ice-associated algae. In order to fully understand these ecosystems there is a need to understand both the physical and biological components. We present preliminary results from Polarstern cruises to the Eastern Central Arctic Ocean (summer 2012) and Weddell Sea (fall-winter 2013). Biological samples were acquired from the under-ice environment using the [Surface and Under-Ice Trawl \(SUIT\)](#) and from within the ice by extracting ice cores. [Biophysical properties](#) of sea ice and under-ice environments were characterized using a sensor array mounted on the SUIT that measured ice thickness, under-ice light spectra, water properties and chlorophyll a biomass (in- and under-ice). Modal ice thicknesses were between 0.45-1.38 m (Arctic) and 0.23-0.70 m (Weddell Sea). Sea ice properties were related to the distribution of some key under-ice species (e.g. Polar Cod and Antarctic Krill). Previous studies have used under-ice light spectra to derive ice-algal biomass but were limited to local-scale point measurements. We present a new method for calculating ice-algal biomass from under-ice spectra on local- to meso-scales and compare the results using both methods.

Scale: Regional

Region: Southern Ocean

Discipline: ecology

Own keyword: sea-ice

Abstract condensed in one sentence: Biophysical properties of the sea ice environment, sampled using an under-ice net with mounted sensor array, are indicators of the distribution of ecological key species.

Surface-specific laser spectroscopy at the sea surface - seasonality and methodological development

Kristian Laß

Christian-Albrechts-Universität zu Kiel

The term “sea surface nanolayer” describes the very thin layer of organic material found at the air-sea interface, on top of the “sea surface microlayer” (roughly the uppermost millimeter of the oceanic water column). Although it comprises only a very small amount of material with predominantly surfactant character, it has a considerable influence on the wave-formation behaviour at the air-sea interface and thus the gas exchange between ocean and atmosphere. Nevertheless, its small vertical dimension requires surface-specific methods for its investigation. As such a surface-specific method, [sum frequency generation spectroscopy](#) allows background-free [vibrational spectroscopy](#) of this layer. During the last years, the seasonality in the formation of this layer has been investigated at Boknis Eck time series station (Eckernförde bay, southwestern Baltic sea) and it appeared that nanolayer formation does not directly correlate with primary productivity. In addition, further methodologic developments of this and closely related varieties of this technique for marine scientific use will be discussed, such as extension to the visible light range for [CDOM](#) application and to the surfaces of particulate oceanic matter found inside and above the water column, such as dust particles, microorganisms and the surface of aerosol particles formed from the sea surface layer

Scale: Local

Region: Europe

Discipline: chemistry

Own keyword: Sea surface nanolayer

Abstract condensed in one sentence: Seasonality of the sea surface nanolayer was investigated by optical sum frequency generation spectroscopy, and further methodological development is discussed.

Tropical tropospheric ozone from satellite observations with the Convective Clouds Differential (CCD) technique

Elpida Leventidou

IUP, Bremen

Ozone influences most of the chemical reactions in the [Troposphere](#). Its abundance can be retrieved from space-borne observations of vertically integrated ozone measurements and cloud cover. The CCD technique takes advantage of the frequent occurrence of convective clouds in the western Pacific region by subtracting the above-cloud from the clear-sky ozone measurements to derive a monthly mean tropospheric amount. An important assumption here is that the above-cloud ozone in the western Pacific simulates the stratospheric ozone and that this amount is invariant with latitude; which is approximately true in the tropics. A CCD algorithm has been developed and is applied to optical remote sensing observations from three satellite instruments (1995-2012), so that a unique long-term record of monthly averaged tropical (20°S – 20°N) tropospheric vertically integrated ozone is created. First results of the CCD application, including validation by comparisons with ozone data from balloon-borne instruments, are presented.

Scale: Regional

Region: Tropical/Subtropical

Discipline: atmospheric sciences

Own keyword: ozone, tropics, Pacific Ocean, Deep convective clouds

Abstract condensed in one sentence: Using the total vertically integrated ozone data and cloud properties we have created a new long term tropospheric ozone dataset

How will resource and diversity patterns alter benthic ecosystem functions in the Southern Ocean?

Heike Link

University of Kiel

[Ecosystem functions](#) fulfil specific roles in the overall network of functioning of our ecosystems. Recent results from the Arctic suggest that food supply, rather than diversity, influences [benthic](#) functions such as remineralisation dynamics. To assess the relation between food supply, diversity and [ecosystem functions](#) in the [Southern Ocean](#) we used an observational approach, measuring nutrient and oxygen fluxes across the sediment-water interface, food supply and macrobenthic diversity in regions with different environmental regimes (Weddell Sea, Bransfield Strait and north of the South Shetland Islands). In parallel, we conducted experiments to test the influence of increasing macrofaunal abundance and food supply on the benthic functions under study. Early results from the experiments suggest that increased fauna rather than food supply leads to higher benthic respiration (oxygen uptake), while food supply is more important for nutrient remineralisation. Regional differences in benthic functioning modify the ecosystem's responses. Our results contribute to a better understanding of ecosystem functioning and to nutrient budgets, and will help in defining hot spots in the Southern Ocean.

Scale: Regional

Region: Southern Ocean

Discipline: ecology

Own keyword: benthic functions

Abstract condensed in one sentence: observational and experimental study on the relation of sediment-water-interface fluxes, food supply and macrofaunal diversity; conducted around the Antarctic Peninsula

Developing a new tool for ecological niche analysis and Habitat Suitability Maps.

Chiara Magliozzi

EMBC student

Mapping current species distribution is becoming a critical issue for conservation ecology . Indeed, many problems arise when trying to relate the habitat with observations of species distribution. Habitat Suitability Maps make a great contribution in studying niche characteristics relating the observed distribution of species to sets of environmental variables. As for previous studies the existing software was unable to cope with large geospatial data, we aimed at providing a new method interfacing the Geographic Information System GRASS-GIS and R, an object-orientated programming language. This new computational and graphical approach has been used to study species-environment relationships using the [Ecological Niche Factor Analysis \(ENFA\)](#). An R-package, ENiRG (Ecological Niche in R-GRASS), was developed to directly compute ENFA. In order to test and validate the performance of ENiRG we used two fieldwork presence datasets on the sea cucumber *Holothuria arguinensis* (Ria Formosa, Portugal). Our results attest the capability of ENiRG in performing ENFA over high resolution and wide area, without technical constraints. The study also shows its potential in the identification of species-habitat relationships offering a tool for future use in the management of the area.

Scale: Local

Region: Europe

Discipline: ecology

Own keyword: species distribution models

Abstract condensed in one sentence: The Ecological [Niche](#) Factor Analysis, performed with [R](#) and [GRASS-GIS](#), is applied to map the distribution of *Holothuria arguinensis*

Feeding performance and energetic requirements of *Desmophyllum dianthus* - a cold-water coral thriving under low pH

Sandra Maier

AWI, Bremerhaven

Ocean acidification (OA) challenges marine calcifying organisms, and cold-water corals (CWC) have been considered particularly vulnerable. Since maintaining calcification under low pH requires more energy and concomitantly more food, their nutritional and energetic requirements need to be studied to predict their reaction to a changing environment. The Patagonian fjord Comau therefore represents a perfect study-site, with cosmopolitan CWC *Desmophyllum dianthus* occurring exceptionally shallow, under naturally low pH. In laboratory experiments, *D. dianthus* specimens collected in this fjord were exposed to various types and amounts of natural zooplankton and krill food, to determine feeding behaviour and energetic balance. Results show that *D. dianthus* needs to capture relatively large amounts of zooplankton food to sustain metabolism and tissue growth. However, corals are capable to capture, ingest and digest a lot of zooplankton in a very short time. It is furthermore likely that through regular capture of larger, highly-nutritious krill, they reduce capture effort, and further increase carbon uptake. This study indicates that efficient capture and assimilation of various prey items provides an energy surplus that allows *D. dianthus* to grow in aragonite undersaturated Patagonian waters. It underlines the important role of energetic balance in determining the fate of marine calcifiers facing OA.

Scale: Regional

Region: Pacific Ocean

Discipline: ecology

Own keyword: Scleractinian cold-water coral

Abstract condensed in one sentence: Feeding behaviour and energetic balance of cold-water coral *Desmophyllum dianthus* are studied and discussed with respect to ocean acidification.

Sea surface and subsurface temperature reconstructions off northern Chile (27.5°S) from 970,000 years to present

Gema Martínez Méndez

MARUM, Bremen

The southeast Pacific can be viewed as a crossroad where waters coming from sub-Antarctica and the sub-Tropics interact throughout the [water column](#). The degree of northwards/southwards movement of antarctic/tropical waters varies on geological time scales, it is climate related, global cooling favors northwards movement of antarctic waters, and influences itself the climate, e.g. through alteration of precipitation patterns. In order to study these effects in the past we need to rely on indirect measurements, the so-called "[proxies](#)". The chemical composition of the fossilized shells of foraminifera as well as their abundance gives information about the living conditions of these marine organisms (temperature, nutrients). We made use of these principles in a sedimentary record located off northern Chile to reconstruct surface and subsurface conditions from 970,000 years ago to present. The record provides information about past changes in source waters (sub-antarctic vs sub-tropical), mixing of surface/subsurface layers and linkage to climate. During warm periods (interglacials), [foraminifera](#) are scarce indicating oceanic conditions non-favourable for their proliferation, potentially due to stronger arrival of nutrient-poor tropical waters. Surface and subsurface water temperatures became progressively colder in cold periods (glacials) towards modern times, in line with other Pacific records pointing to a Pacific-wide signal.

Scale: Regional

Region: Pacific Ocean

Discipline: climatology (past, present or future)

Own keyword: Paleoceanography

Abstract condensed in one sentence: Sea conditions were non-favourable for planktonic foraminifera in warm periods of the last 1 Ma

Large impact on simulated terrestrial precipitation due to uncertainties in plant stomata sensitivity to rising atmospheric CO₂ concentrations

Nadine Mengis

GEOMAR, Kiel

While terrestrial precipitation is a societally highly relevant climate variable, there is little consensus about its projected 21st century change in current climate models. Vegetational transpiration amounts for 35-45 % of today's terrestrial [evapotranspiration](#), the main source of precipitable water over land. It is controlled by the plants' regulation of the [stomata](#) opening. The sensitivity of this process to increasing CO₂ concentrations is highly uncertain. To assess the impact of this uncertainty on future climate, we perform a set of experiments with an intermediate complex Earth system model ([UVic-ESCM](#)) for a range of model-imposed CO₂-sensitivities of stomata. Changing evapotranspiration from being insensitive to ambient CO₂ to the large CO₂-sensitivity normally employed in UVic-ESCM, causes simulated terrestrial precipitation to change respectively by -10 % to 27 % in 2100 relative to simulated present-day amounts. The simulated terrestrial carbon uptake between 2000 and 2100 under a high emission scenario varies from 1.69 to 3.38 Pg C / yr, with differently applied scaling factors. This study emphasizes the importance of an improved assessment of stomata's CO₂-sensitivity to enable more profound predictions on the development of the terrestrial hydrological cycle.

Scale: Global

Region: not region-specific

Discipline: atmospheric sciences

Own keyword: Future development of the terrestrial Ecosystem

Abstract condensed in one sentence: Terrestrial Ecosystems' sensitivity to stomata closing is studied. This parameter is highly uncertain, having a large impact on future climate.

Submarine groundwater discharge from tropical islands - a hidden nutrient pathway from land to sea

Nils Moosdorf

University of Hamburg; ZMT, Bremen

Submarine groundwater discharge (SGD) is often neglected as pathway for nutrients from land to sea. However, nutrient fluxes by SGD can strongly alter the functionality of adjacent coastal ecosystems. Recently, a junior research group started to comprehensively assess SGD from tropical islands, its associated nutrient fluxes and the resulting effects in coastal ecosystems at regional to global scale. The project starts with simulating ecological effects of SGD at aquaria scale, and it will use field work in Java (Indonesia) to improve our understanding of the processes that quantitatively control SGD-associated nutrient fluxes at regional scale. Finally, the findings will be extrapolated to global scale using global spatial datasets representing current and future scenarios of the identified controls. The project will identify coastal ecosystems around tropical islands, which are subject to strong current or future impacts of SGD-associated nutrient fluxes. Here, I present the project ideas and first results from a literature review of local SGD assessments from tropical islands.

Scale: Global

Region: Tropical/Subtropical

Discipline: oceanography

Own keyword: Submarine groundwater discharge

Abstract condensed in one sentence: A new junior research group will try to find out if submarine groundwater discharge is important for coastal ecosystems of tropical islands.

On the tracks of man-made radionuclides in the Indonesian Throughflow sediments

Daniela Pittauerová

IUP, Bremen

The Indonesian Throughflow (ITF), a complex array of passages within the Indonesian archipelago, represents a pathway for radionuclide transport along with the water masses between the Pacific and the Indian Ocean. Natural and man-made radionuclides were studied in the ITF sediment cores off Indonesian island of Sumba as chronometers to cover the Anthropocene and to provide a combined age model together with radiocarbon in order to support paleoclimate interpretations. In the sediments unusually high ^{241}Am inventories and $^{241}\text{Am}/^{137}\text{Cs}$ activity ratios were discovered, which do not correspond to the global nuclear weapon fallout signature. If the high ^{241}Am inventory also corresponds to plutonium isotopes is unclear and the sources and processes leading to this anomaly are not understood. The possible regional radionuclide contributions are the U.S. tests performed at the Pacific Proving Grounds (1946-62) or British bomb tests at Australian Monte Bello Islands (1952-56). The SNAP-9A satellite carrying plutonium batteries burnt in the atmosphere (1964) and affected plutonium fallout globally. Each of these sources have unique isotopic fingerprints and their individual contributions preserved in the sediment archives will be studied at several ITF locations. The project will additionally evaluate suitability of artificial radionuclides as sediment chronometers at other Indo-Pacific area sites.

Scale: Regional

Region: Tropical/Subtropical

Discipline: oceanography

Own keyword: radionuclides

Abstract condensed in one sentence: Artificial radionuclides in the sediments of the Indo-Pacific area are studied in order to trace their sources and transport

Transcriptomics of iron limitation in *Phaeocystis antarctica*

Mariam R. Rizkallah

AWI, Bremerhaven

Phytoplankton, the hidden trees of the ocean, are responsible for nearly half of global oxygen production. Phytoplankton growth and productivity in high-nitrate low-chlorophyll regions have been demonstrated to be limited by iron availability. In the Southern Ocean, the nanoflagellate *Phaeocystis antarctica* has been reported as the first to bloom following iron fertilization. The present study aims to assess the effect of iron repletion on the transcriptome of *P. antarctica*. Iron was supplemented to an iron-limited *P. antarctica* clone endemic in the Ross Sea and mRNA was extracted at 5 timepoints before and after iron addition. The generated sequences were assembled into ~88,000 putative genes, providing the first reported transcriptome of *P. antarctica*. Physiologically, iron-limited *P. antarctica* recovered its photosynthetic fitness, colony-forming ability, and chlorophyll a, particulate organic carbon and nitrogen contents shortly after iron addition. At the gene expression level, following iron repletion, *P. antarctica* repressed its iron-economic enzymes and photosystems and overexpressed iron-dependent alternatives and nitrate utilization enzymes. Transcriptomic data supports the previously suggested mechanisms of ocean iron utilization by *P. antarctica* explaining its success in its iron-limited habitat.

Scale: Regional

Region: Southern Ocean

Discipline: biology

Own keyword: nanoflagellates

Abstract condensed in one sentence: The effect of iron limitation and enrichment on *Phaeocystis antarctica* is studied based on physiological and transcriptomic data

Interconnections of the different sub-surface carbon pools in wetlands

Norman Rüggen

CEN, Hamburg

Rising atmospheric concentrations of carbon dioxide and methane are the most important agents of increasing radiative forcing and hence of higher surface temperatures. A warmer arctic could lead to increasing positive methane fluxes from wetlands into the atmosphere. Understanding the interconnection of sub-surface carbon pools is important for predicting their role in future climate scenarios. To quantify how methane and other C-compounds are affected by recent photosynthesis, a stable isotope labelling technique is used. In a wetland ecosystem on Samoylov Island (Republic Sakha, Russian Federation), $^{13}\text{CO}_2$ has been introduced into the soil ecosystem in a transparent closed-chamber. The label was taken up by plants and propagated into sub-surface carbon pools by plant roots. Sampling of gaseous pore water carbon pools as well as dissolved organic carbon (DOC) from the soil pore water in different depths and determination of C-content and $^{13}\text{C}/^{12}\text{C}$ ratio of these samples show how the sub-surface carbon pools are affected by fresh photosynthates. Preliminary data analysis indicates a swift effect on methane and carbon dioxide pore water pools within days after the photosynthetic up-take of the carbon dioxide, thus demonstrating the connection of those carbon pools to soil-atmosphere carbon fluxes.

Scale: Local

Region: Asia

Discipline: ecology

Own keyword: carbon pools

Abstract condensed in one sentence: In situ ^{13}C -labelling as a method of source partitioning of climate-relevant gases (methane, carbon dioxide) is studied, with a focus on methane in the sub-surface carbon cycle.

Coccolithophores in the Southern Ocean

Mariem Saavedra-Pellitero

University of Bremen

This research aims to provide new insights into the late Pleistocene Marine Isotope Stage 11 (MIS 11, between ca. 424 and 374 kyr) in the Southern Ocean, where little information is available. MIS 11 is a long interglacial period often regarded as an analogue of what the Holocene (11.7 kyr to present) would have been like without any anthropogenic interference; accordingly MIS 11 studies are relevant for future climate change models. Thick white layers with high carbonate content have been observed at high southern latitudes during this period. We are generating a multi-parameter record of [coccolithophores](#) for MIS 11 sediments retrieved during the Expedition ANT XXVI/2 of the Research Vessel Polarstern to the Antarctic. Coccolithophores play an important role in marine biogeochemistry influencing Earth's climate system through two basic mechanisms: the [biological](#) and the [physical pump](#). In order to characterize the coccolithophore palaeoproductivity during MIS11 two independent proxies were chosen: the Nannofossil Accumulation Rate and the coccolith Sr/Ca ratio measured in the <20µm (coccolith) size fraction. All the information retrieved together with the ongoing research will allow us to evaluate if the coccolithophores modified the equilibrium of the inorganic carbon system during MIS 11 in the Pacific Southern Ocean.

Scale: Regional

Region: Southern Ocean

Discipline: oceanography

Own keyword: Coccolithophore

Abstract condensed in one sentence: Marine Isotope Stage 11 is characterized through the study of coccolithophores in sediments retrieved from the Pacific Southern Ocean.

Discovering new seepage processes

Jens Schneider von Deimling

GEOMAR, Kiel

In the FUTURE OCEAN postdoc proposal GQ2 large uncertainties are pointed out to exist in the understanding of greenhouse gas methane and/or carbon dioxide bubble emissions from the seabed (seepage) and their fate towards the atmosphere. To evaluate this uncertainty multidisciplinary datasets were acquired within the FUTURE OCEAN and associated research projects. First results reveal very distinct mismatching between numerical methane gas bubble dissolution simulations and field observations exist. By thorough evaluation of ray-traced 3D hydro-acoustic data a hitherto unknown seepage process could be discovered that is likely to play a major role in the mismatch between numerical simulations and observation. In the future we pursue multidisciplinary evaluation of gas seepage sites to disclose all important governing processes associated with such gas releases from the seabed.

Scale:

Region:

Discipline:

Own keyword:

Abstract condensed in one sentence:

Biogeochemical investigation of terrestrial permafrost cores from the North-Eastern Siberian Arctic

Janina Stapel

GFZ

Within the last decade climate change science has increasingly focused on [permafrost](#) areas. These cover approximately 25 % of the exposed land areas of the Northern Hemisphere. Roughly one third of the global carbon is stored in the northern high latitude ecosystems. With the predicted thawing of permafrost huge amounts of stored carbon become again bioavailable to [methanogens](#) and other microbial communities which convert it into greenhouse gases such as methane and carbon dioxide. In this study, [biomarkers](#) of the methanogens are investigated in recent and fossil permafrost deposits in order to characterize the distribution and composition of these microbial communities with respect to past climate variability. Furthermore, the quantity and quality of the free and bounded organic components in the sediments will be investigated to evaluate the future substrate potential of the permafrost soils for the methanogenic communities. Finally, all findings will be used to predict future changes in the methane producing communities in response to the global climate warming and permafrost landscape evolution.

Scale: Regional

Region: Arctic Ocean

Discipline: climatology (past, present or future)

Own keyword: permafrost research

Abstract condensed in one sentence: Biogeochemical investigation of microbial lipid biomarkers and evaluation of substrate potential of the organic matter in recent and fossil terrestrial permafrost deposits.

Coral reef functioning in upwelling-influenced Northwestern Costa Rica

Ines Stuhldreier

ZMT, Bremen

Anthropogenic impacts like global warming and land-derived eutrophication lead to rapid changes of ocean temperature, pH and nutrient concentrations worldwide. It is, however, under debate how ecosystems such as coral reefs will respond. The northern Pacific coast of Costa Rica is a natural laboratory for changes in water temperature, pH and nutrient concentrations because it experiences wind-induced seasonal upwelling. This study monitored water quality and benthic community composition in a reef of Papagayo Bay weekly over one year from April 2013 until April 2014. Findings revealed a decrease in water-temperature and an increase in nutrient and chlorophyll a concentrations during upwelling in February and March 2014. Benthic surveys showed a sharp decrease in fleshy macroalgal cover in April 2013 after the upwelling season 2013, and a moderate increase in March 2014 in response to significantly elevated nutrient concentrations during upwelling. Over the year, live coral cover increased drastically. Findings revealed a highly dynamic reef ecosystem, which is likely primarily controlled by inorganic nutrient availability. The relatively short upwelling season and absence of other stressors during the study period supported substantial reef recovery. This proves that corals are highly adaptable to quick changes in water-parameters and suggests that a reduction in stressors like sedimentation and nutrient input can support coral reef recovery in a very short time.

Scale: Local

Region: Tropical/Subtropical

Discipline: ecology

Own keyword: coral reef

Abstract condensed in one sentence: Corals are highly adaptable to quick changes in water-parameters

Leaching of Organic Plastic Additives under Marine Conditions

Tim Jesper Suhrhoff

Jacobs University, Bremen

Marine plastic pollution has become an increasing threat to marine life in the past few decades. This study aims to investigate the impact of physical parameters such as turbulence, salinity and UV irradiance on leaching of organic plastic additives. Four plastic samples (PE, PET, PS and PVC) were leached under four conditions each: DI water, saltwater, saltwater under turbulence and saltwater exposed to UV irradiance. Concentrations of additives in aqueous phases were measured by [GC-FID](#) analysis, analytes were identified via a phthalate standard or using [GC-MS](#). A variety of additives, mostly plasticizers, were detected in initial plastics and aqueous extracts. The most prominent additives were phthalates found in PE, PET and PVC. Besides TOTM, PVC also contained Bisphenol A which has been criticized for its high toxic potential. About 22% of Bisphenol A found in the dissolved PVC sample was released into the aqueous phase. Turbulence was found to increase migration of additives by up to 79 times. UV irradiance showed little impact in most samples due to shielding of UV-B radiation by the experimental setup or breakdown in aqueous phase. Effects of salinity vary for each analyte due to complex interactions.

see also: [POP](#)

Scale: Global

Region: not region-specific

Discipline: oceanography

Own keyword: geochemistry

Abstract condensed in one sentence: In this study the impact of turbulence, UV radiation and salinity on leaching of plastic additives was investigated.

Automatic Oil seep location estimation using satellite- borne Synthetic Aperture Radar images

Gopika Suresh

MARUM, Bremen

The Woods Hole Oceanographic Institution states that 'as much as one half of the oil that enters the coastal environment comes from natural seeps of oil and gas'. The locations of many active oil seeps have been discovered by time consuming field sampling techniques. [Synthetic Aperture Radar \(SAR\)](#) equipped satellites provide an alternative with global coverage in high horizontal resolution, independence of weather and daylight conditions and wide availability of data. Oil slick detection in SAR images is possible because oil dampens the [Bragg waves](#) present on the ocean surface, thus reducing the backscattered radar signal. Hence oil slicks appear dark in SAR images. Automatic detection and identification of oil slicks in SAR images is challenged by the presence of [look-alikes](#). The presented automatic oil seep location estimation system is the first of its kind, has been implemented in the programming language Python, and uses a novel technique for discriminating between slicks and look-alikes. Spatial and temporal clustering of recurrently detected oil slicks provides the sea-bed locations of the associated oil seep. Oil seeps in the Gulf of Mexico and the Black sea have been investigated using the designed algorithm and results will be reported.

Scale: Global

Region: not region-specific

Discipline: oceanography

Own keyword: Remote Sensing

Abstract condensed in one sentence: An automatic system has been designed that estimates the locations of offshore oil seeps from SAR images

Microbial carbon transformation and the response of the involved microbial communities to a changing climate

Nadja Torres Reyes

GFZ, Potsdam

The Arctic plays a key role in the Earth's climate system, because roughly one third of the global carbon is stored in permafrost soils of the northern hemisphere. Due to rising temperatures, a huge amount of the formerly frozen **organic carbon** becomes bioavailable for the microbial transformation. The end products are the relevant greenhouse gases carbon dioxide and methane. The aim of this study is to understand the role of microorganisms involved in the transformation of organic carbon with special emphasis to the Arctic warming. Furthermore, we want to investigate the link between substrate composition and bioavailability in the microbial metabolic pathways within the carbon cycle. Therefore, we will characterize the microbial communities from terrestrial permafrost soils of the Siberian Laptev Sea region with respect to their diversity, distribution and function using molecular-biological approaches. This study is part of the multidisciplinary CarboPerm project, which aims to understand how permafrost-affected landscapes respond to global warming and how this further affects the local, regional and global trace gas balance. In the framework of the project, my research will give an insight into microbial communities and processes associated with climate changes.

Scale: Regional

Region: Asia

Discipline: biology

Own keyword: Permafrost

Abstract condensed in one sentence: The microbial community structure and their function in the carbon cycle in Siberian **permafrost** soils will be studied using molecular-biological approaches.

Multi-frequency imaging and quantification of shallow free gas

Zsuzsanna Toth

University of Bremen

The assessment of methane gas in marine sediments is important for a better understanding of the methane cycle and gas formation, and for providing better estimates as an input to climate models. We investigate the edge of a small **acoustic blanking** zone in the Bornholm Basin (Baltic Sea) to estimate gas content and characterize gas bubbles in the Holocene mud. The effect of gas bubbles on seismic wave propagation offers a remote sensing method to study the gassy sediment. We use therefore sediment echosounder and multi-channel **seismic** data with different frequencies. Compressional wave attenuation caused by the presence of free gas is estimated from reflection amplitudes beneath the gassy sediment layer. In the frequency range where gas bubbles resonate (oscillate radially), high scattering causes complete acoustic blanking beneath the top of the gassy sediment layer. Using a geoacoustic model, the observed **resonance frequency** peak suggest gas bubble sizes between 1 and 4-6 mm, and gas volume fractions up to 0.0002% in a ~2 m thick sediment layer.

Scale: Regional

Region: Europe

Discipline: physics

Own keyword: Geophysics, Methane, Baltic Sea, Quantification

Abstract condensed in one sentence: Methane gas content and bubble sizes are estimated in shallow Baltic Sea sediments using seismo-acoustic data.

Effect of rewetting on methane and nitrous oxide emissions at different microtopes in Schleswig-Holstein, Germany

Olga Vybornova

CEN, Hamburg

Peatlands are the most important terrestrial ecosystems for long-term carbon storage and hence they play an important role in the global balance of methane and nitrous oxide (CH₄ and N₂O), two important greenhouse gases. A major and growing source of anthropogenic greenhouse gas emissions is peatland drainage and degradation. All biogeochemical processes, along with the amount of exported carbon and nitrogen compounds, the peatlands are strongly influenced by changes in the water levels. The restoration project, currently implemented in the Himmelmoor (N-Germany), offers the possibility to characterize and document the development of the fluxes at five sites with variable water table before, during and after rewetting. Using small-scale gas **closed-chambers**, and sampling of gas and pore water from the soil in three different depths, CH₄ and N₂O fluxes as well as **DOC**, also physical and chemical soil properties of different microtopes were determined. This allows us to investigate the impact of groundwater table changes and rewetting on the methane and nitrous oxide emissions, offers the possibility to find the appropriate method for restoration of bogs and for restoring their ecological functions on the example of Himmelmoor.

Scale: Local

Region: Europe

Discipline: ecology

Own keyword: greenhouse gases

Abstract condensed in one sentence: The influence of water table fluctuation on methane and nitrous oxide fluxes were investigated

Do mangrove crabs compete for *Rhizophora mangle* propagules?

Siel Wellens

University of Ghent

Mangrove forests are highly productive coastal ecosystems that support local fisheries, protect against coastal erosion, provide commercial forest products and act as important carbon sinks. Consumption of mangrove propagules can have a strong influence on mangrove establishment and recruitment and may therefore play an important role in distribution of mangrove ecosystems worldwide. This study provided the first volumetric quantification of **herbivory rates** on red mangrove (*Rhizophora mangle*) propagules with the purpose of detecting food competition between *Goniopsis cruentata* and *Ucides cordatus*, two dominant mangrove-litter consuming crab species in the New World. We hypothesize that herbivory rates in mangroves where *G. cruentata* and *U. cordatus* coexist will be lower than in mangroves where *U. cordatus* is absent. A comparison of herbivory rates was carried out between mangrove stands with varying crab abundance. *R. mangle* propagules were consumed rapidly, herbivory rates were overall high and increased through time. Herbivory rates did not differ significantly between mangroves with and without the possible food competitor *U. cordatus*. Our study did not support previous literature indications of food competition between the two crab species, which have most probably developed competition avoidance strategies.

Scale: Local

Region: Americas

Discipline: ecology

Own keyword: Animal Behaviour, Mangroves, Food Competition, Herbivory

Abstract condensed in one sentence: The food competition between crabs on **propagules** is assessed using size measurements before and after subjection to herbivory in the field.

Source area and age of particulate organic matter (POM) from an Arctic permafrost watershed (Lena Delta, Siberia)

Maria Winterfeld

AWI, Bremerhaven

About 50% of the global soil organic matter (OM) are currently stored frozen in permafrost soils of the high northern latitudes and are excluded from biogeochemical cycling. Due to recently observed and projected amplified warming of the Arctic, carbon cycling and the fate of OM released from thawing permafrost soils have received growing attention. The Lena River in central Siberia is one of the major pathways translocating the previously frozen soil OM from its vast catchment to the coastal zone of the Laptev Sea and Arctic Ocean. Additionally, erosion of permafrost coasts supplies OM to coastal sediments. The quantities and qualities of OM contributed by the two terrestrial sources (riverine vs. coastal erosion) are still under debate. We used the [lignin biomarker](#) composition of soils, surface water suspended particulate matter (SPM) and surface sediments to assess the state of OM degradation and distinguish between taiga (southern catchment) and tundra (northern catchment) sources. Moreover, we determined the [radiocarbon](#) age of surface water POM and estimated the age of the soil-derived POM fraction. Our results characterize the OM exported by the river more precisely and thereby improve the understanding of the fate of terrestrial OM in arctic coastal sediments.

Scale: Regional

Region: Arctic Ocean

Discipline: geology

Own keyword: lignin biomarker

Abstract condensed in one sentence: composition and age of POM from a [permafrost](#) watershed are studied providing a baseline for future change in the Arctic

Better understanding and planning for change: marine spatial planning as a tool for interdisciplinarity

Sarah Wise

GLOMAR, Bremen

The oceans are changing. Human demands on the world's oceans continue to grow worldwide. Acidification, increased shipping, melting polar ice, energy installations, commercial fishing, and mining are just some of the growing pressures placed on our marine systems. In order to adapt to these changing oceans, policy makers and planners are turning toward marine spatial planning (MSP) as a tool to integrate economic, ecological, and social management objectives. This paper asks if MSP may also be a tool for interdisciplinary research. To better understand [global change](#), scholars are calling for a transformation in the ways we conduct science. Berkes (2012) calls for a "revolutionary" approach to managing global change: one that incorporates creativity and social learning to co-produce new visions for transformation. Identified by marine managers as having, "the potential to transform the way the oceans are managed" (CBD 2012); marine spatial planning is a process of knowledge production, knowledge exchange, and negotiation. Based on a review of the literature on MSP projects worldwide, I argue that MSP has the capacity to drive truly integrative and interdisciplinary research on marine systems and the people who live, work, and benefit from them. see also: [governance](#)

Scale: Global

Region: not region-specific

Discipline: sociology

Own keyword: marine spatial planning

Abstract condensed in one sentence: This paper asks if [marine spatial planning](#) may be a driver for interdisciplinary research on complex marine systems.

Simulating variations of oceanic oxygen minimum zones in Holocene

Xu Xu

University Kiel

The tropical oxygen minimum zones (OMZs) are the major areas of suboxic regions in today's ocean, which are caused by sluggish circulation and high oxygen consumption by the biochemical processes. It constitute ~1% of global ocean volume, but have profound impact on the oceanic nutrient budgets, biological productivity and CO₂-fixation. Holocene, the current warm period, has a globally relative stable climate and characterized by pronounced reorganizations of seasonal and interannual variability. Therefore it is an ideal background scenario to assess future changes in the extent and intensity of OMZs. In our study a global state-of-the-art atmosphere-ocean-sea ice general circulation model KCM in combination with a marine biogeochemical model PISCES is used to simulate oceanic dissolved oxygen, nutrients and [marine productivity](#) in the late Holocene (preindustrial), mid-Holocene (6K BP) and early Holocene (9.5K BP). An [anomaly method](#) is applied in the simulations to improve the large circulation biases in KCM's ocean field. Under the relatively stable global climate conditions of the Holocene, the changes in oxygen concentration are up to 10% in OMZs, which is significant in low oxygen regions. The variations of OMZs during Holocene agree with [Paleo-data](#), which shows stronger OMZs in preindustrial during Holocene.

Scale: Global

Region: Pacific Ocean

Discipline: climatology (past, present or future)

Own keyword: biogeochemical modelling

Abstract condensed in one sentence: The variations of seawater oxygen concentrations at preindustrial, middle and early Holocene are modelled, with particular interest in the oxygen minimum zones.

A Model for Behavioral Economics of Adaptation to Climate Change in Forestry

Rasoul Yousefpour

MPI-Meteorology, Hamburg

Adaptation to climate change in action depends crucially on the behavior of decision-makers in how they perceive the risk and include this risk in the process of decision-making. Perception evolves over time as novel information about the climate state becomes available and may ask for revisiting the former decisions. [Behavioral](#) decision-making deals with this problem and integrates knowledge level of decision-makers and economic performance of alternative decisions into the process of adaptation. Performance of decision alternatives (alternative forest management strategies) under diverse sets of climate development scenarios, (some realizations of IPCC scenarios A1, B2) affects the final [adaptive decisions](#). The objectives and constraints of decisions, e.g. max. forest timber production, least labor employment, are further factors affecting the final [optimal decisions](#). However, individual decision-makers may not act quite rational and their attitude towards risk and considering past, current and novel information in the process of decision-making determines the decisions. The more divergent climate change scenarios regarding one or a set of climate variables such as temperature and precipitation, the easier distinguishing among them and recognizing the actual climate scenario becoming true over time and consequently easier making [optimal decisions](#). We apply this concept to adaptive forest management under climate change aiming at finding the most appropriate species for regeneration.

Scale: Local

Region: Europe

Discipline: economics

Own keyword: Forestry

Abstract condensed in one sentence: Decision-makers Perception about Climate Change affects Adaptation Strategies

Glossary

$\delta^{18}\text{O}$ (*Rebecca Jackson*)

measure of the ratio of stable oxygen isotopes: $^{18}\text{O}/^{16}\text{O}$. This ratio varies throughout geological time and indirectly reflects ocean temperature and global ice volume. [29](#)

^{137}Cs (*Daniela Pittauerová*)

A major fission product and one of the long lived nuclear fallout radioisotopes (half-life of 30 years) is easily detectable by a non-destructive gamma spectrometry.. [40](#)

^{241}Am (*Daniela Pittauerová*)

A less common nuclear fallout radioisotope (half-life of 432 years), present usually as a decay product of ^{241}Pu , which is formed during a nuclear explosion by neutron activation.. [40](#)

Acoustic blanking (*Zsuzsanna Toth*)

A part of a high-frequency acoustic profile where reflections are absent in the sediment due to high scattering of gas bubbles.. [45](#)

Adaptive decisions (*Rasoul Yousefpour*)

These decisions are made to adapt (decisions are changed) to the new conditions in the decision space.. [48](#)

Anomaly method (*Xu Xu*)

Only the circulation anomalies of the KCM simulations (6K and 0K, 9.5K and 0K) are passed to the biogeochemical model while retaining the constant climatological circulation field.. [48](#)

Antarctic Ice Sheet (AIS) (*Marta Kasper*)

the ice mass, that covers Antarctic continent. The melting of AIS contributes to sea level rise.. [30](#)

Anthropocene (*Ulrike Holzwarth*)

Semi-official geologic time period characterized by the evidence of human activities that have had a significant impact on the Earth's ecosystems. May be considered to start with the Industrial Revolution (late 18th century).. [28](#)

Aquaria scale (*Nils Moosdorf*)

At the scale of laboratory experiments in aquaria. Measures about 0.5 to 3 m³.. [40](#)

artificial ocean alkalization (*Ellias Feng*)

Synonyms for 'weathering enhancement'. It is a method to accelerate geochemical weathering process by artificially adding alkalinity minerals into ocean, by this process atmospheric CO₂ can be ultimately transported and stored into deep ocean.. [24](#)

atmospheric boundary layer (*Lisa Kattner*)

lowest part of the atmosphere with a height of about a couple of hundred meters, which is influenced by the planet's surface, natural and human emissions. [31](#)

Autonomous video (*Caroline Johansen*)

Video cameras that are pre-programmed at specific settings to take time-lapse video footage.. [30](#)

Behavior (*Rasoul Yousefpour*)

The way individuals act and in the context of behavioral economics make their decisions.. [48](#)

Benthos/benthic

related to the seafloor (mostly concerning biological processes) (*Heike Link*)

Organisms which live on, in, or near the seabed. (*Rachel Downey*)

organisms that live in or on the bottom of the ocean, lakes or rivers; they can be mobile or sessile (i.e. attached to the ground). (*Luisa Federwisch*). [22](#), [36](#)

Bernard parameter (*Sebastian Hammerschmidt*)

= (i.e. methane/(ethane + propane)) . Helps to differentiate between thermogenic and bacterial hydrocarbon gases. [26](#)

Biogeochemistry (*Ivan Dubinenkov*)

the discipline that involves the study of the chemical, physical, geological and biological processes and reactions that govern the composition of the natural environment. [23](#)

Biological pump (*Mariem Saavedra-Pellitero*)

(organic carbon pump) Photosynthetic production of organic matter in the surface layer and its subsequent transport to the deep sea.. [42](#)

Biomarker (*Janina Stapel*)

here, biochemical molecule indicating a relation to source molecules or organisms due to their specific molecular structures. [43](#)

Biophysical properties (*Ben Lange*)

Any properties of the environment that influence physical and biological processes. E.g. snow and ice properties control under-ice light which influences energy for melting ice and Photosynthetically Active Radiation (PAR) for photosynthetic organisms.. [35](#)

Black Sea Commission (*Nina Khuchua*)

The Commission on the Protection of the Black Sea Against Pollution (Black Sea Commission or BSC) is the implementing body of the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention).. [32](#)

Bragg waves (*Gopika Suresh*)

These waves have wavelengths in the centimetre to decimetre range and produce radar backscatter according to Bragg scattering theory.. [44](#)

Brewer-Dobson Circulation (BDC) (*Martin Budde*)

Circulation in the stratosphere, which transports air from the equator to the poles. With rising air masses at the equator and descending air at the poles.. [21](#)

CarbonSat (*Thomas Krings*)

Earth Explorer-8 candidate mission aiming to image and quantify the distribution of the two most important greenhouse gases in the atmosphere released through human activity: carbon dioxide and methane.. [34](#)

CDOM (*Kristian Laß*)

Acronym for 'coloured dissolved organic matter'. Organic material dissolved in (sea)water that absorbs visible light and hence may be termed 'coloured'. Humic material is a good example for this type of matter.. [35](#)

climate engineering (*Ellias Feng*)

In planetary scale, using non-emission control method to mitigate climate change either by carbon capture and storage or reflecting solar radiation. [24](#)

Climatic variability (*Gabriela Florescu*)

variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. (IPCC TAR, 2001). [25](#)

Clone (*Mariam R. Rizkallah*)

A cell, group of cells, or organism that is descended from and genetically identical to a single common ancestor, such as a bacterial colony whose members arose from a single original cell.. [41](#)

closed-chambers (*Olga Vybornova*)

closed metal-chambers for quantifying gas fluxes between soils or low-stature canopies and the atmosphere. [46](#)

Coccolithophores (*Mariem Saavedra-Pellitero*)

marine unicellular, flagellated and autotroph algae belonging to the division Haptophyta and the class Prymnesiophyceae that produce highly characteristic calcified scales called coccoliths at some stage of their life cycle. [42](#)

Cold-water coral (CWC) (*Sandra Maier*)

Azooxanthellate (without symbiotic dinoflagellates), heterotrophic corals in oceanic waters of 4 - 12 °C, usually in the deep sea, that mainly feed on zooplankton; here: Scleractinian CWC that deposit calcium carbonate skeletons and create 3D-habitats.. [38](#)

Controlled mixing (*Oscar Alvarez*)

Is the mixing of solutions by means of selective membranes, limiting the mixing to one of the components, either the solvent or the solutes. In this way the mixing is done (partly) reversibly and some work can be obtained from the process.. [17](#)

Criboelphidium webbi (*Ewa Demianiuk*)

Antarctic foraminiferal species for detecting climate change in sub-Recent glacier-proximal sediments. [22](#)

CSIA (*Doreen Kohlbach*)

Compound-specific Stable Isotope Analysis of FATM carbon stable isotope ratios for clarifying trophic interactions, i. e., quantifying the relative contribution of ice algae-produced carbon. [33](#)

Dinoflagellate cyst (*Rebecca Jackson*)

the casing produced, often with organic matter, by this type of phytoplankton during its dormant stage which accumulates in sediments. The range (or assemblage) of species can depend on temperature, salinity and sea ice cover. [29](#)

Dissolved organic matter (DOM)

DOM is defined based on filtration. Usually the size limit, which differentiates DOM from particulate organic matter, is 0.45 μm . (*Kerstin Ksionzek*)
a highly complex mixture of organic compounds of diverse origins found in different natural waters in form of solution. (*Ivan Dubinenkov*). [23](#), [34](#)

DOC (*Olga Vybornova*)

Dissolved organic carbon. [46](#)

Earth Explorer (*Thomas Krings*)

Research satellite missions by the European Space Agency (ESA) dedicated to specific aspects of the Earth environment whilst demonstrating new technology in space.. [34](#)

Ecosystem functions (*Heike Link*)

Quantifiable products (such as the amount of released nutrients, produced wood, recycled compost, etc.) provided by an ecosystem. [36](#)

Ecosystem model (*Kerstin Kretschmer*)

is a representation of an ecosystem (i.e. biological environment) shown in mathematical form. Such models describe the structure and function of an ecosystem in a simplified manner.. [33](#)

El-Niño-Southern-Oscillation (*Anna Joy Drury*)

atmosphere-ocean system that drives sea surface temperature phenomenons in the Pacific Ocean, which displays variation between a warm phase (El Niño) and a cold phase (La Niña). A complete El-Niño/La-Niña cycle takes 3–7 years.. [23](#)

Energetic balance of *D. dianthus* (*Sandra Maier*)

was estimated from corals' energy (carbon) budgets, i.e. their energy gains from feeding on natural food (zooplankton and krill) minus their energy losses (e.g. organic carbon release) and metabolic expenditures (derived from respiration).. [38](#)

ENFA(EcologicalNicheFactorAnalysis) (*CHIARA MAGLIOZZI*)

Multivariate approach based on presence data and environmental variables. Its principal components are marginality (ecological distance between species optimum and mean habitat) and specialization (ratio of the ecological variance in mean habitat to the focal species).. [37](#)

Evapotranspiration (*Nadine Mengis*)

transfer of water from the land surface to the atmosphere, being the sum of evaporation from soils and vegetation and the vegetational transpiration. [39](#)

Export Production (EP) (*Yunchang He*)

the amount of organic matter produced in the ocean by primary production that is not recycled (rem-
ineralised) before it sinks into the aphotic zone.. [27](#)

FATM (*Doreen Kohlbach*)

Fatty Acid Trophic Markers biosynthesized exclusively by primary producers that are not getting bio-transformed but are originally traceable along food webs. [33](#)

FESOM (*Marta Kasper*)

sea ice-ocean model with variable resolution, which is the highest under ice shelves (4km), including interactions between ice and ocean (e.g. melt rates of ice).. [30](#)

Food Web (*Camille de la Vega*)

Network of food chains or feeding relationships by which energy and biomass are passed on from one species (or compartment) to another.. [21](#)

Foraminifera

single-celled protists. Form shells (tests) of calcium carbonate (CaCO₃) that incorporate elements from the waters in which they live. After deposition and burial at the sea floor they are useful for paleoclimatological and paleoceanographical studies. (*Rebecca Jackson*)

single-celled organisms that live as plankton or at the sea-floor. Most of them precipitate calcium carbonate shells. Helpful tool to reconstruct environmental conditions (by analyzing their species distribution or the chemistry of their shells). (*Martin Bartels*)

‘hole bearers’, shelled unicellular marine organism. There are species living floating at various depths on the ocean (planktonic), and others living on the sea floor (benthic). They are extensively used in paleoceanography. (*Gema Martínez Méndez*). [18](#), [29](#), [39](#)

foraminiferal assemblages (*Ewa Demianiuk*)

collection of species/types of foraminifera characteristic for certain environments in a given area; fossil foraminiferal assemblages are useful as bioindicators for determination of paleoenvironments or for biostratigraphy. [22](#)

FT-ICR-MS (*Kerstin Ksionzek*)

Ultrahigh resolution Fourier transform ion cyclotron resonance mass spectrometry is used to determine the m/z ratio of ions based on their cyclotron frequency in a fixed magnetic field. It is suitable to identify molecular formulae of complex DOM samples.. [34](#)

Gas hydrate (*Caroline Johansen*)

Hydrogen bonded water molecules create a type of cage around a gas molecule, creating ice-like crystalline structures.. [30](#)

GC-FID (*Tim Jesper Suhrhoff*)

Gas chromatography coupled with a flame ionization detector (FID) that measures the concentration of organic species in a gas stream. In this study used to quantify substances of known retention times.. [44](#)

GC-MS (*Tim Jesper Suhrhoff*)

Gas chromatography coupled with a mass spectrometer (MS) measures the mass-to-charge ratio and abundance of gas-phase ions was used to identify unknown organic species by comparing characteristic fragmentation patterns of the samples with known substances. [44](#)

genome (*Burak Avci*)

The genetic material of an organism.. [17](#)

Geochemical proxies (*Will Brocas*)

Measurements made of elemental ratios that are incorporated into the skeletons of corals as a result of changing environmental condition during their lifespan. For example the ratio of Strontium to Calcium varies with sea surface temperature. [20](#)

Glass sponges

Hexactinellida, a class of sponges (Porifera) that form their skeletons from six-rayed SiO₂ needles; they mainly inhabit the deep sea, the Antarctic shelves and the shallow waters of British Columbia, Canada (*Luisa Federwisch*)

Sponges which are composed entirely of a siliceous skeleton, differing from most other sponges, which have skeletons mainly composed of spongin fibre. (*Rachel Downey*). [22](#), [24](#)

global change (*Sarah Wise*)

Global change refers to planetary-scale changes in the Earth system including human society. [47](#)

Global nuclear weapon fallout (*Daniela Pittauerová*)

The testing of nuclear weapons in the atmosphere between 1945 and 1980 (with maximum in 1963) was the most significant source of radionuclides in the environment.. [40](#)

governance (*Sarah Wise*)

‘all processes of governing, whether undertaken by a government, market or network, whether over a family, tribe, formal or informal organization or territory and whether through laws, norms, power or language’ (Bevir, Mark (2013). Governance: A very sh. [47](#)

Harmful algal blooms (*Johanna Hessel*)

Rapid increase or accumulation in the population of algae that cause negative impacts to other organisms via production of natural toxins, mechanical damage, or other means.. [28](#)

Helsinki Commission (HELCOM) (*Nina Khuchua*)

The Baltic Marine Environment Protection Commission (Helsinki Commission or HELCOM) is the governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area, also known as the Helsinki Convention.. [32](#)

Herbivory rate (*Siel Wellens*)

The proportion with which a plant structure has been consumed: $1 - (\text{final size}/\text{initial size})$. [46](#)

Holocene (*Martin Bartels*)

recent epoch; started at the end of the last ice age 11,700 yr BP (‘years before present’, actually before the year 1950) lasting until today.. [18](#)

Holocene (*Vyacheslav Khon*)

a geological epoch which began at 11,700 calendar years before present and continues to the present. [32](#)

Ice rafted debris (IRD): (*Martin Bartels*)

material that has been transported by icebergs and deposited after its melt-out. Can be used to reconstruct glacial activity.. [18](#)

ice-associated ecosystem (*Ben Lange*)

Encompasses all organisms that spend a portion of or all of their life-cycle under or inside sea ice and are largely influenced by the biophysical and biochemical properties of the sea ice environment.. [35](#)

ICP-MS (*Kerstin Ksionzek*)

High resolution inductively coupled plasma mass spectrometry is a highly sensitive method for multi-element analysis with detection limits down to ppt. It's often used for toxic heavy metal or trace element analysis in biological samples.. [34](#)

in situ expression data (*Burak Avci*)

Metatranscriptomics and metaproteomics. Investigation of expressed genes on RNA or protein level within intact microbial communities to reveal microbial gene expression patterns.. [17](#)

Inter-tropical convergence zone (*Will Brocas*)

A tropical weather phenomenon which encircles the earth and seasonally migrates to higher latitudes, affecting regional rainfall. The extent of its migration is thought to vary on centennial time scales.. [20](#)

International Maritime Organisation (*Lisa Kattner*)

a specialized agency of the United Nations and its purpose is to develop and maintain a comprehensive regulatory framework for everything concerning international shipping. [31](#)

Land-sea-breeze circulation (*Martin Bregemann*)

Sea-breeze circulations are caused by differential heating between land and ocean. During the day the air over land heats up and rises quicker than air of the ocean. The resulting pressure gradient establishes a circulation.. [19](#)

late Miocene to early Pliocene (*Anna Joy Drury*)

sub-divisions of the Miocene (23.03–5.33 Ma) and Pliocene (5.33–2.58 Ma) respectively, which are two geological time periods. During this time, the Earth's continents were similar to today, but the climate was different.. [23](#)

lignin biomarker (*Maria Winterfeld*)

polymers derived exclusively from terrestrial vascular plants, used to distinguish woody and non-woody gymnosperms and angiosperms. [47](#)

Look-alikes (*Gopika Suresh*)

These are dark areas which might occur from low wind conditions, from man-made oil spills or biogenic films.. [44](#)

Madden-Julian-Oscillation (*Martin Bregemann*)

The MJO is a circulation phenomenon traversing from the tropical Indian to the tropical Pacific Ocean. It reveals a 30 to 60 day cycle. Deep organized clouds and heavy rainfall occurring during its active phase.. [19](#)

MAMAP (*Thomas Krings*)

(Methane Airborne MAPper) Airborne spectrometer built at the University of Bremen aiming at measuring the greenhouse gases carbon dioxide and methane via optical remote sensing.. [34](#)

Mangrove (*Siel Wellens*)

A tree or shrub that can grow in the intertidal zone of a tropical coastal environment and is adapted to high salinity and low oxygen availability. Many mangrove trees together form a mangrove stand or mangrove forest.. [46](#)

Marine primary productivity (*Xu Xu*)

In our model simulation, it is the sum of primary production of nanophytoplanktons and diatoms.. [48](#)

Marine sediment core (*Ulrike Holzwarth*)

Material deposited at the sea floor retrieved by a coring or drilling device. Contains a lot of measurable parameters which provide insight in both climatic and oceanographic conditions of the past.. [28](#)

marine spatial planning (*Sarah Wise*)

A process that brings together multiple users of the ocean to coordinate informed decisions about how to use marine resources sustainably.. [47](#)

Methanogens (*Janina Stapel*)

microorganisms that produce methane in anoxic environments. [43](#)

mRNA (*Mariam R. Rizkallah*)

Messenger Ribonucleic acid. In the central dogma of molecular biology, genetic information is coded in DNA that is transcribed into messenger RNA. mRNA acts as templates for protein synthesis.. [41](#)

Multi-proxy analysis (*Gabriela Florescu*)

looking back into past climate and environment, by using as many records as possible, in order to gain a wider overview of the situation than could be acquired from a single proxy (Smol 2002). [25](#)

Natural seep (*Caroline Johansen*)

Term used to refer to an area through which oil or gas is escaping through fissures and cracks from an oil reservoir deep beneath the sea floor and finally making its way into the water column.. [30](#)

Neogloboquadrina pachyderma (sin.) (*Kerstin Kretschmer*)

Left-coiling planktonic foraminifera, which is most abundant in the Arctic. This species inhibits saline (>34psu) polar sub-surface waters and feeds on phytoplankton (commonly diatoms).. [33](#)

Net Primary Production (NPP) (*Yunchang He*)

the total energy (or nutrients) accumulated by an ecological unit of interest (such as an organism, a population, or an entire community).. [27](#)

Next Generation Sequencing (*Kristin Hardge*)

High-throughput sequencing approaches (e. g. 454-pyrosequencing, Illumina) where a high number of sequences can be determined in parallel. These methods have replaced the conventional Sanger sequencing method.. [27](#)

Niche (*Chiara Magliozzi*)

volume inside the environmental space defined by the environmental variables. [37](#)

Nucleic acid biosensors (*Johanna Hessel*)

Analytical device that combines a biological component with a physicochemical detector for the detection of specific nucleic acid (DNA/RNA) probes.. [28](#)

Nutrient fluxes (*Nils Moosdorf*)

Nutrients (e. g. nitrogen, phosphorus, silica and others) transported in water (usually in dissolved form). [40](#)

Ocean Acidification (OA) (*Sandra Maier*)

Due to anthropogenic carbon dioxide emissions, oceans become more acidic, potentially causing problems for marine calcifying organisms such as CWC as the process of calcification (the construction of their calcium carbonate skeleton) becomes more difficult.. [38](#)

Optimal decisions (*Rasoul Yousefpour*)

Optimal decisions are the decisions performing better than other alternative decisions based on a measure (e. g. economic return).. [48](#)

Orbital parameters (*Yunchang He*)

Eccentricity: a measure of the departure of this ellipse from circularity, with a period of roughly 95,000 years; Obliquity: the angle of the Earth's axial tilt (obliquity of the ecliptic) varies with respect to the plane of the Earth's orbit, with a period of roughly 26,000 years.. [27](#)

Organic carbon (*Nadja Torres Reyes*)

Total organic carbon forms are derived from the decomposition of biological material. They contain organic compounds whose molecules contain carbon, oxygen, nitrogen and hydrogen.. [45](#)

Organic-walled dinoflagellate cysts (*Ulrike Holzwarth*)

A kind of capsules made of organic material produced by single-celled organisms (dinoflagellates) living in oceans and lakes during their life cycle. The cysts are transported and preserved in the sediment (‘mud’) at the seafloor.. [28](#)

Orographic circulation (*Martin Bregemann*)

Orographic circulation is caused by differential heating between valley and mountain. As the slopes warm during the day air rises and a vertical pressure gradient is established which initiates a up and downward circulation.. [19](#)

oxygen stable isotope ratios (*Anna Joy Drury*)

abundance ratio ($\delta^{18}\text{O}$) of oxygen with an atomic mass of 18 to an atomic mass of 16. As the 18-Oxygen to 16-Oxygen ratio is temperature-dependent, fossil shell $\delta^{18}\text{O}$ is used to reconstruct past temperature variations.. [23](#)

Paleo-data & 6K BP 9.5K BP (*Xu Xu*)

The reconstructed proxies ($\delta^{15}\text{N}$: nitrogen isotope) obtained in sediment cores off Peru. 6 & 9.5 thousands years before present. [48](#)

paleoclimate modeling (*Vyacheslav Khon*)

simulations with a climate model which aims to understand the mechanisms of past climate changes. [32](#)

Paleoreconstructions (*Vyacheslav Khon*)

reconstructions of past climate conditions derived from paleoclimatology proxies. [32](#)

peatlands (*Olga Vybornova*)

Peatlands are wetland areas with a thick water-logged organic soil layer (peat) made up of dead and decaying plant material. [46](#)

Permafrost

soil at or below the freezing point of water (0 °C) for two or more consecutive years (*Janina Stapel*)
soil, sediment or rock that remains below 0 °C for two or more consecutive years (*Maria Winterfeld*)
Is defined as ground (soil, sediment or rock and included ice and organic material) that remains below 0 °C for at least two consecutive years. (*Nadja Torres Reyes*)
a ground (soil, rock, sediment) that remains at or below 0 °C for at least two consecutive years (*Ivan Dubinenkov*). [43](#), [45](#), [47](#)

Physical pump (*Mariem Saavedra-Pellitero*)

(Inorganic carbon pump) Process in which different organisms (phytoplankton and zooplankton) form calcium carbonate skeletal coverings in the ocean. When they die, some fraction of this CaCO_3 is eventually remineralized.. [42](#)

Phytoplankton bloom (*Burak Avci*)

Peak in primary productivity of phytoplankton communities due to increasing solar radiation and nutrient fluxes. [17](#)

Planktonic algae (*Johanna Hessel*)

Photosynthetic microscopic algae floating in aquatic environments.. [28](#)

Planktonic foraminifera (*Kerstin Kretschmer*)

Unicellular organisms, which live in the upper water column and form calcareous shells. Serve as paleoceanographic proxy to reconstruct past climate conditions. Using the oxygen-isotopic composition of their calcareous tests paleo temperatures and salinity.. [33](#)

Polar stratospheric clouds (PSCs) (*Martin Budde*)

Clouds that build up in the winter polar stratosphere in a height of about 20km and with temperatures lower than -78°C. They often consist of nitric acid and water crystals.. [21](#)

Polar vortex (*Martin Budde*)

Stable low pressure system at the winter pole, which is highly separated from the mid latitudes by the polar night jet.. [21](#)

POP (*Tim Jesper Suhrhoff*)

Persistent Organic Pollutants (POPs) are toxic to both animals and humans. Due to their resistance to environmental degradation they are able to bioaccumulate in human and animal tissue and biomagnify throughout the food chain.. [44](#)

Primary Productivity (*Mar Fernandez-Mendez*)

Synthesis of organic compounds from atmospheric or aqueous carbon dioxide. It principally occurs through the process of photosynthesis, which uses light as its source of energy.. [25](#)

Propagule (*Siel Wellens*)

A vegetative structure which will be detached from the mother plant and can be subjected to dispersal before establishing and growing into a new plant.. [46](#)

Protists (*Kristin Hardge*)

Unicellular eukaryotic organisms (e. g. planktonic algae; primary producers that move with ocean currents) which are the food base for higher trophic levels.. [27](#)

Proxy (*Gema Martínez Méndez*)

within the context of paleoenvironmental reconstruction, it is a measurable that is linked to a target parameter, e. g. temperature. The relation between the parameter and the target is established through laboratory or in-situ calibration.. [39](#)

R and GRASS GIS (*Chiara Magliozzi*)

R Project for Statistical Computing, GRASS Geographic Resources Analysis Support System. Coupling two open-source software to perform ENFA.. [37](#)

RACMO2 (*Marta Kasper*)

regional atmosphere model adapted to represent best the atmosphere of Antarctica.. [30](#)

radiocarbon age (*Maria Winterfeld*)

using the decay of the radiocarbon isotope (^{14}C) with a known half-life to derive age of organic material. [47](#)

Rare earths and yttrium (REY) (*Benjamin Birner*)

Common term for the 15 elements of the lanthanide group and yttrium because of their typically low concentrations in ore deposits. Together they behave chemically highly coherent thus warranting their frequent use as geochemical tracers.. [18](#)

Resonance frequency (*Zsuzsanna Toth*)

Gas bubbles in the sediment oscillate under small acoustic perturbations and they can resonate at a fundamental resonance frequency that is determined by their size, sediment physical properties and the acoustic frequency.. [45](#)

REY fractionation (*Benjamin Birner*)

The preferential scavenging of some REY which will lead to changes of the referred elements' relative abundance in the marine environment. The concentrations are commonly given relative to the elements abundance in post Achaean shale.. [18](#)

riser drilling (*Sebastian Hammerschmidt*)

Drilling technology which utilizes different kind of drilling fluids ('drilling mud') to stabilize the borehole, transport rock fragments, and cool the drill bit. [26](#)

ROV

Remotely Operated underwater Vehicle: a tethered underwater vehicle for filming, photographing and potentially sampling marine organisms. (*Rachel Downey*)

Remotely Operated Vehicle, an unmanned underwater vehicle usually bearing cameras and sensors which is connected to the surface (e. g. to a ship) by a tether cable through which it is controlled and data are sent. (*Luisa Federwisch*)

A remotely operated vehicle is a remote controlled underwater diving robot equipped with cameras and various sensors controlled from a pilot at the surface. (*Christian Katlein*) . [22](#), [24](#), [31](#)

Salinity gradient energy (*Oscar alvarez*)

Power production from the chemical potential between two waters with different salt concentration. [17](#)

Sea ice

Ice formed by freezing of the ocean surface. (*Christian Katlein*)

Frozen seawater that covers large parts of the Arctic Ocean providing an ecosystem for various polar species, such as sea-ice unicellular algae. (*Mar Fernandez-Mendez*) . [25](#), [31](#)

Seasonality (*Will Brocas*)

A measure of climate variability. Within an annual sea surface temperature cycle, this is the average difference between the summer maximum and the previous winter's minimum.. [20](#)

Seismics (*Zsuzsanna Toth*)

Seismics is a method of exploration geophysics where the structure of subsurface is mapped by using the time required for an elastic wave to return to the surface after reflection from an interface between two different materials.. [45](#)

Sequencing errors (*Kristin Hardge*)

Common errors generated by sequencing machines; i. e. miscalled bases which lead to inaccurate sequences with a low quality score (= confidence of correct base calls).. [27](#)

shipping emissions (*Lisa Kattner*)

Most ships are powered by large engines that burn marine diesel or heavy fuel oil and the emissions produced by combustion contain for example hazardous trace gases like sulfur dioxide, nitrogen oxides and carbon dioxide. [31](#)

solar radiation management (*Elias Feng*)

Using stratospheric aerosols (or other materials to change the surface albedo) to reflect solar radiation in order to reduce the climate warming. [24](#)

Southern Ocean (*Heike Link*)

Ocean surrounding the Antarctic continent, including the Antarctic shelf seas like the Weddell Sea, Ross Sea, Amundsen Sea. [36](#)

Stomata (*Nadine Mengis*)

pores of plants and leaves to allow for gas exchanges with the ambient air. [39](#)

Submarine groundwater discharge (*Nils Moosdorf*)

Submarine groundwater discharge (SGD) is defined as: "SGD includes any and all flow of water on continental margins from the seabed to the coastal ocean, regardless of fluid composition or driving force." (Burnett et.al. 2003. Biogeochem.66:3-33)". [40](#)

SUIT (*Ben Lange*)

Surface and Under-Ice Trawl is towed next to ship and rides along the underside of the ice catching organisms and measuring properties of the environment using the sensor array.. [35](#)

Sum frequency generation (*Kristian Laß*)

Optical phenomenon occurring only at very high light intensities (thus requiring short laser pulses), which enables background-free vibrational spectroscopy selectively at interfaces with monolayer selectivity.. [35](#)

Synthetic Aperture Radar (*Gopika Suresh*)

A radar that uses the forward motion of the satellite/aircraft to synthesize a large antenna, thereby producing images in high resolution. Successive pulses of microwaves are transmitted to a target scene, and the echo of each pulse is received and record. [44](#)

Theoretical potential (*Oscar alvarez*)

The theoretical potential of a renewable energy source is the physical maximum usable energy in a specific region. For salinity gradient energy it is given by the Gibbs Free Energy of mixing.. [17](#)

Top predator (*Camille de la Vega*)

Species with the highest trophic level in a food web, which feed on the lower levels and is not consumed by any other species.. [21](#)

total wet gas ratio (*Sebastian Hammerschmidt*)

TWG is defined by $[(\text{ethane} + \text{propane}) / (\text{methane} - \text{propane})] \times 100$, and is a dimensionless measure of the contribution of ethane and propane in the natural gas. [26](#)

Transcriptome (*Mariam R. Rizkallah*)

The entire mRNA content of a cell.. [41](#)

Trophic level (*Doreen Kohlbach*)

Position of an organism within a food web reflecting diet dependencies (producer-consumer) with other organisms and primary producers which define the trophic baseline (i.e. what an organism is feeding on and what is feeding on it). [33](#)

Tropospheric ozone (*Elpida Leventidou*)

A greenhouse gas of the troposphere that is secondarily produced through chemical and photochemical reactions and drives the oxidizing power of the troposphere. At abnormally high concentrations, it can cause problems to human health.. [36](#)

UVic-ESCM (*Nadine Mengis*)

The University of Victoria Earth System Climate Model is a intermediate complex ocean model, coupled to a terrestrial vegetation and soil model, an thermodynamic sea ice model and a two-dimentional simple atmosphere model.. [39](#)

Vibrational spectroscopy (*Kristian Laß*)

Examination of vibrations of molecules by means of radiation, most of the time infrared light. This usually yields information on the presence of certain characteristic structural subunits within these molecules, allowing for conclusions regarding the substance class of the molecule.. [35](#)

Water column (*Gema Martínez Méndez*)

conceptual mode to describe the integral ocean from surface to bottom in any region. This term is commonly used in oceanography and related sciences.. [39](#)