

Open invitation to all
marine science PhD
students

PHD days 2015

22-23rd April '15
Schloss Etelsen
Achim

Discuss your work in a
casual environment

Make contacts and
ask your interdisciplinary
questions

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for Marine Sciences providing

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Welcome to the 8th PhD days in Etelsen castle

The organizing committee wishes a warm welcome to the many and diverse participants of the Bremen PhD Days in Marine Sciences in Etelsen castle. This meeting is jointly organized by the GLOMAR office and the MARUM/GLOMAR PhD representatives.

It is the purpose of the **Bremen PhD Days in Marine Sciences** to provide an excellent opportunity for;

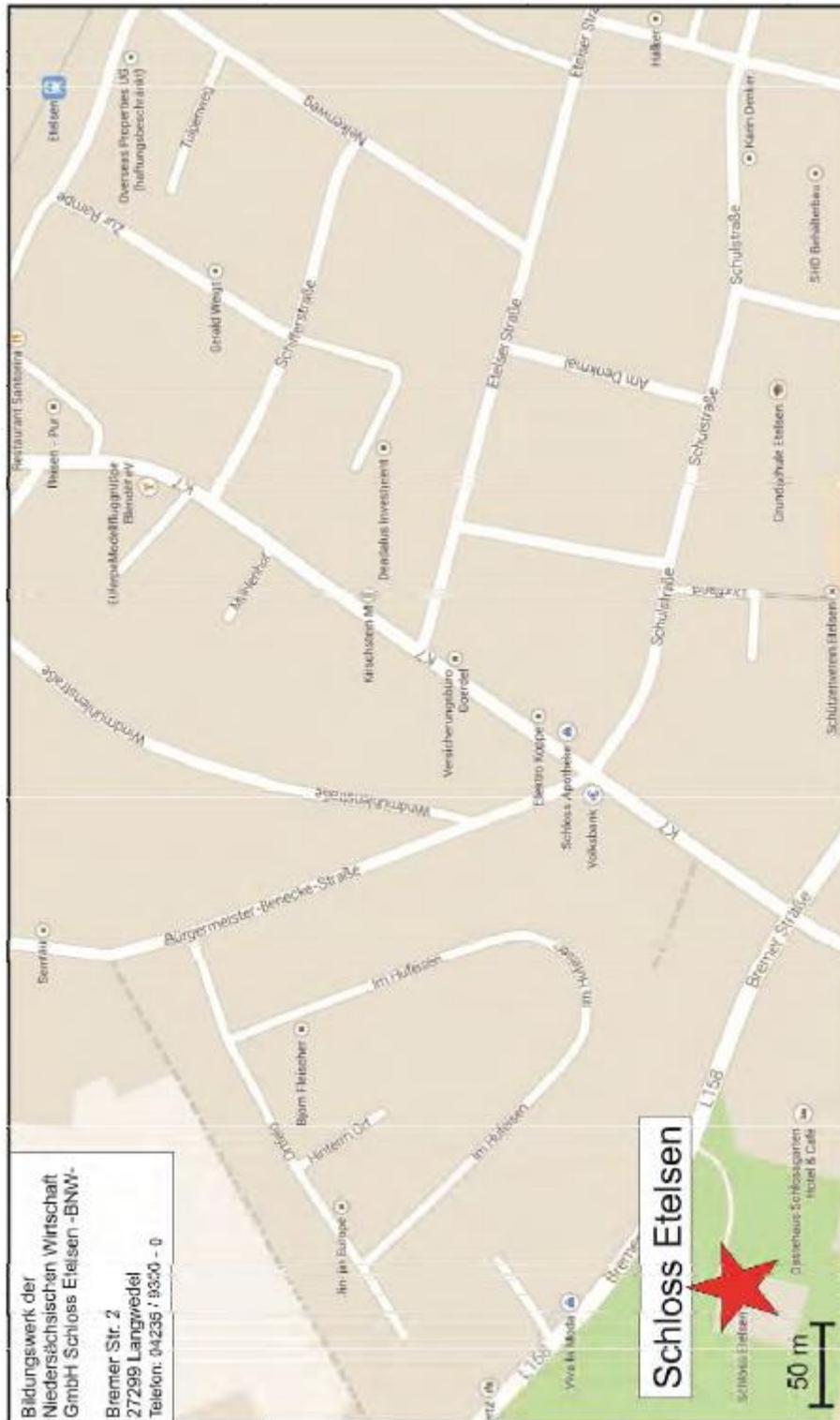
- Experiencing a variety of scientific expertise in and around Bremen
- The presentation of your own work in a casual and relaxed environment from which you can supply and receive feedback.
- Further developing a network between institutes and finding contact persons/institutes for interdisciplinary questions around your own project interests.
- Having a good time in a friendly atmosphere in which to develop an enjoyable working community.

We hope you all enjoy your stay.

We also wish to thank all the participants for their contributions and thank GLOMAR for sponsoring this event

How to find us

This map will help navigate to our venue should you be arriving by train from Bremen to Etelsen (approx. 15mins).



PhD days 2015
Program at a glance

Wednesday 22nd April		
From	Till	
09.30	9.50	Arrival and Poster set-up
09.50	10.00	Welcome by PhD Reps , Dierk Hebbeln and Christina Klose
10.00	11.10	Project game with Post Docs
11.10	12.25	Session 1; 4 speed talks & 3 talks
12.30	13.30	Lunch
13.30	14.18	Session 2; 2 talks & 6 pitches
14.18	16.00	Coffee break and Posters
16.00	17.00	Session 3; 4 talks
18.00	19.00	Dinner
19.30	~21.00	Social with Pub quiz
Thursday 23rd of April		
09.30	12.30	Session 4; 4 speed talks, 6 pitches & 2 talks
10.08	11.45	Posters and coffee
12.30	13.30	Lunch
13.30	15.00	Session 5; 3 talks
14.15	15.00	Coffee and Posters
15.00	15.30	Awards and Closing ceremony

PhD days 2015
Sessions in detail

Session 1; 22.04.15, 11:20 -12:25

Chair: Will Brocas

11:20 – 11:25

Grain size properties and sediment physics in heavy mineral enrichment processes

B. Halstenberg, H. Müller, K. Reek, T. von Dobeneck

11:25 – 11:30

Volcanism of a different sort - Submarine mud volcanos in the Calabrian Arc

M. Loher, M. Römer, H. Sahling, G. Bohrmann

11:30 – 11:35

Proteomics as novel tool for biodiversity research on benthic Foraminifera

M. Stuhr, C. Reymond, M. Kucera, H. Westphal

11:35 – 11:40

Highly dynamic benthic communities in upwelling exposed Costa Rican coral reefs

I. Stuhldreier, C. Sánchez-Noguera, C. Wild

11:40 – 11:55

Late Pleistocene history of Amazonian vegetation recorded by $\delta^{13}\text{C}$ of plant waxes

C. Häggi, C.M. Chiessi, S. Mulitza, E. Schefuß

11:55 – 12:10

The Campi Flegrei caldera - a "supervolcano" in the heart of Europe

L. Steinmann, V. Spiess

12:10 – 12:25

Spatial and temporal variation in Saharan dust grain-size distribution

C. Friese, J.-B. Stuut, M. van der Does, G. Fischer

Session 2; 22.04.15, 13:30 -16.00

Chair: Julia Haberkern

13:30 – 13:45

Disentangling global and local drivers on South Pacific coral reefs

A. Ford, J.-B. Jouffray, A. Norström, B. Moore, F. Magron, S. Ferse

13:45 – 14:00

Two new species of erect growing Bryozoa and the application of non-destructive imaging methods

K. Matsuyama, J. Titschack, A. Freiwald

14:00 – 14:03

Scrutinizing changes in precipitation over tropical South America during Heinrich Stadial 1

Y. Zhang, C.M. Chiessi, S. Mulitza, M. Prange, X. Zhang, M. Zabel, A. Govin, A.O. Sawakuchi, F.W. Cruz Jr., G. Wefer

14:03 – 14:06

Lipid biomarker proxies in sinking particles from the equatorial to the polar Atlantic

E. Park, G. Mollenhauer

14:06 – 14:09

The characteristics of particulate organic carbon in the lower Amazon Basin

S. Sun, E. Schefuss, G. Mollenhauer

14:09 – 14:12

Deglacial sea surface temperature development in the Northwest Pacific reconstructed from TEX86

V. Meyer, J. Hefter, L. Max, R. Tiedemann, G. Mollenhauer

14:12 – 14:15

Diatom Assemblages and Lipid Biomarkers: Towards a More Robust Reconstruction of Diatom Paleoproductivity

C. Santos, J. Hefter, E. Schefuß, G. Mollenhauer, F. Abrantes

14:15 – 14:18

Seasonal variations in foraminiferal fluxes and $\delta^{18}\text{O}$ in the southwestern Atlantic

I. Venancio, S. Mulitza, M. Kucera, M. Schulz

Posters 14:18 – 16:00

Session 3; 22.04.15, 16:00 -17:00

Chair: Lennart van Maldegem

16:00 – 16:15

Governance of Marine Protected Areas in Costa Rica: stability and change of institutions

G. Weber de Morais, A. Schlüter

16:15 – 16:30

Bacterial Community Activity in Intertidal Marine Sediments by a Dual Stable Isotope Labeling

W. Wu, T. Meador, M. Könneke, K.-U. Hinrichs

16:30 – 16:45

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

M. Jäger, L. Lelli, M. Vountas, J.P. Burrows

16:45 – 17:00

Pollen distribution in the mudbelt surface sediments offshore western of southern Africa

X. Zhao, L. Dupont, M. E. Meadow, G. Wefer

Session 4; 23.04.15, 09:30 -12:15

Chair: Lena Steinmann

09:30 – 09:35

Isotope investigation of the Amazon and Plata basin river systems

N. Höppner

09:35 – 09:40

Dynamics of small scale bedforms in tidal environments

K. Krämer, C. Winter

09:40 – 09:45

Western Pacific Warm Pool hydrology and its impact on the Indonesian Throughflow

M. Hollstein, M. Mohtadi, G. Martinez Mendez, S. Steinke, D. Hebbeln

09:45 – 09:50

Quantifying bottom water oxygen concentrations via dinocyst assemblages

D. Gray

09:50 – 09:53

Seismostratigraphy of the Kveithola sediment drift, northwestern Barents Sea

A. Özmaral, M. Rebesco

09:53 – 09:56

Contouritic depositional systems related to topographic heights at the Galician margin (NW Spain)

J. Haberkern, T. Schwenk, T. Hanebuth, V. Spieß

09:56 – 09:59

Evolution of Turbulence Eddies in Tidal Cycles

S.M. Amirshahi, C. Winter

09:59 – 10:02

Environmental impact on the distribution of tetraethers lipids in peatlands of China

W. Ding, H. Yang, J. Xue, X. Wang, S. Xie

10:02 – 10:05

Past results and future directions in the Indonesian throughflow research

M.Y. Awaluddin

10:05 – 10:08

Late Quaternary calcareous nannofossils from the western tropical Indian Ocean

D. Tanguan, K.-H. Baumann

Posters 10:08 – 11:45

11:45 – 12:00

Fossil southern Caribbean corals record tropical climate variability during the Last Interglacial

W. M. Brocas, T. Felis, J. C. Obert, D. Scholz, P. Gierz, G. Lohmann, M. Kölling, S. R. Scheffers

12:00 – 12:15

Coral holobiont responses to elevated dissolved organic carbon concentrations

C. Pogoreutz, N. Rådecker, C.R. Voolstra, C. Wild

Session 5; 23.04.15, 13:30 -15:00

Chair: Daniel Gray

13:30 – 13:45

CO₂ outgassing from peat-draining rivers and its response to anthropogenic change

D. Müller, T. Warneke, T. Rixen, M. Mueller, S. Jamahari, N. Denis, J. Notholt

13:45 – 14:00

Uncovering the pre-Sturtian distribution of life

L. van Maldegem, P. Sansjofre, P. Strother, C. Hallmann

14:00 – 14:15

Evidence for a Red Sea sponge loop?

L. Rix, C. Wild, J. De Goeij, U. Struck, F. Al-Horani, M. Naumann

Posters 14:15 – 15:00

PhD days 2015

Abstracts

Evolution of Turbulence Eddies in Tidal Cycles

S.M. Amirshahi¹ C. Winter¹

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Understanding small scale sedimentary processes plays a key role in different aspects of coastal management such as seafloor geomorphology and navigation. Suspended sediment which is one part of the total sediment load, is carried by the flow in the water column until it settles again if the flow turbulent energy decays. Turbulent flows consist of coherent structures known as eddies. These eddies are considered as being responsible for the instantaneous suspension of sediments. In tidal environments such as estuaries flow characteristics, as the depth and velocity magnitude and direction, continuously change over time. Therefore it is expected that the turbulent structures also change properties, and effect on the bed surface. In this field study, high frequency instantaneous velocity components were measured close to the bed for more than two days –four tidal cycles- by an ADV (Acoustic Doppler Velocimeter).

These data sets were analyzed in order to find the evolution of turbulent structures over the tidal cycles. The results show that the turbulence eddies are highly variable over the tidal cycle. However characteristics are repetitive i.e. during the same tidal phases, eddy characteristics such as their number and strength are approximately similar. The outputs of this study will be later used in order to explore the effects of the turbulence eddies on the suspension of sediments by cross-correlation between the properties of turbulence and suspended sediment events.

Past results and future directions in the Indonesian throughflow research

M.Y. Awaluddin¹

¹*MARUM, Leobener Str., 28359, Bremen*

The tropical Indonesian seas provide an oceanic pathway for the Pacific and Indian inter-ocean exchange known as the Indonesian Throughflow (ITF). This poster provides quantitative reviews to determine trends of ITF research and identify knowledge gaps that need to be addressed. Previous English academic literature on ITF study and the various methods used to undertake the research were reviewed. The Web of Knowledge and the Proquest database were used to search the relevant articles. Academic literature on ITF is dominated by studies investigating in oceanography research area. Scholars from the USA also lead the literature. Encouragingly, the number of ITF research has grown substantially in recent decades especially after INSTANT project in 2004. Yet, there is limited research conducted in the upstream region of the ITF.

Fossil southern Caribbean corals record tropical climate variability during the Last Interglacial

W. M. Brocas¹, T. Felis¹, J. C. Obert², D. Scholz², P. Gierz³, G. Lohmann³, M. Kölling¹, S. R. Scheffers⁴

¹*MARUM - Center for Marine Environmental Sciences, University of Bremen, 28359 Bremen, Germany*

²*Institute for Geosciences, Johannes Gutenberg University Mainz, 55099 Mainz, Germany*

³*Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), 27570 Bremerhaven, Germany*

⁴*Marine Ecology Research Centre, Southern Cross University, Lismore, NSW 2480, Australia*

The Last interglacial (LIG, ~118 – 130 kyr ago) is often considered as a test bed for future climate change scenarios as land and sea surface temperatures (SST) were warmer, greenhouse gases were at pre-industrial levels and slightly differing orbital configurations from the current interglacial dominated. Coral records offer a glimpse into the natural response and variability of climatic conditions at seasonal resolution, supplementing sediment and ice records. We present rare *Diploria strigosa* coral material recovered from the southern Caribbean island of Bonaire (Caribbean Netherlands) and U-series dated to between 120 and 130kyr ago. Due to its semi-arid climate, Bonaire is an excellent site for study and diagenetic screening reveals our coral material to be well preserved. Precision micro-sampling and the annual banding within the growth structure of corals enabled the construction of seven time windows of monthly resolved strontium/calcium (Sr/Ca) records, an established proxy for SST variability. Seasonally resolved records of SST are rare within the LIG tropics.

Previous studies utilised *D.strigosa* corals from Bonaire that dated to the mid- and late-Holocene and modern times, providing a means for comparison with the current interglacial. Relative to today, coral time windows of SST reveal comparable to modern SST seasonality that bound the LIG. Mid-LIG conditions are characterised by 2 corals that express increased SST seasonality. These findings coincide with the evolving seasonal increase to the amplitude of orbitally induced insolation throughout the LIG and are in agreement with our climate model simulations. In a 37 year record from 124 kyr ago we detect quasi-decadal SST variability comparable to that observed in the North Atlantic Ocean today.

Environmental impact on the distribution of tetraethers lipids in peatlands of China

W. Ding¹, H. Yang¹, J. Xue¹, X. Wang¹, S. Xie¹

¹*State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences, Wuhan 430074, China*

Even through the branched and isoprenoidal glycerol dialkyl glycerol tetraether membrane lipids have been widely used to reconstruct paleoenvironmental changes, their environmental impact on the distributions in peatland are still largely unknown. Here, we analyzed the tetraether lipids in 59 surface peat samples from 9 peatlands across a wide range of climate gradient in China. The pH ranges from 3.6 to 8.6, and the mean annual air temperature (MAAT; from 1971 to 2000) varies from -1.6 to 13.5°C for the peatlands investigated. According to the recent research, there are 6-methyl brGDGTs in soils which can impact the relations between the environmental factors and the former MBT and CBT indices. We also used an improved liquid chromatography method to separate the 6-methyl isomers brGDGTs from brGDGTs and some shoulder peaks of unknown structures from iGDGTs. Our results show that excluding the 6-methyl isomers, the

CBT index is primarily related to the pH ($R^2=0.81$) measured for the peatlands, as observed in global soil dataset. And the MBT index is positively correlated ($R^2=0.70$) with MAAT, but shows an insignificant correlation ($R^2 = 0.11$) with the pH. However, the data shows a large scatter within an individual peatland, suggesting that MBT may be also controlled by other unknown factors that await further exploration. Except the CBT index, we also found several novel indices derived from 6-methyl brGDGTs and shoulder peaks of iGDGTs correlated with pH, such as IRIIIa', IRIIa' and IRVI' (isomer ratio of brGDGT IIIa, IIa and iGDGT VI). It means the 6-methyl brGDGTs and the shoulder peaks of iGDGTs are strongly related with peat pH. A more optimized liquid chromatography method to separate these isomers more accurately and identification the exact structures of shoulder isomers will be essential in the future.

Spatial and temporal variation in Saharan dust grain-size distribution

C. Friese¹, J.-B. Stuut^{1,2}, M. van der Does², G. Fischer¹

¹*MARUM – Center of Marine Environmental Sciences, Bremen University, Germany*

²*NIOZ – Royal Netherlands Institute for Sea Research, Marine Geology, Den Burg, Netherlands*

To verify if we can quantify a relationship between the size of mineral dust particles and prevailing environmental conditions, we study "modern" dust. Here we present grain-size distributions of Saharan dust that was collected in two marine sediment traps, which are situated off Cape Blanc, ~100 km and ~400 km offshore the Mauritanian coast. In the traps dust is collected that is sinking through the water column to the ocean floor at 3600 m and 1300 m water depth. Our study focuses on a time series of 3 years (2003-2006) of dust deposition, and the temporal resolution of the traps is 1-3 weeks. The obtained grain-size data was compared to RGB satellite images, wind strength and precipitation data. Our results indicate clear spatial and temporal variability in the grain-size distributions of Saharan dust. Saharan dust sampled in the trap which is located more proximal to the African coast features a coarser mean modal grain-size than the dust sampled in the trap situated more distal to the African coast. The seasonality of the grain-size distributions was studied by focussing on the upper (1300 m) trap samples. In the seasonal plot the "background dust" is characterized by modal grain-sizes of 10-25 μm . The modal grain-sizes peak during the summer season with a maximum value of 55 μm . During the winter season the modal grain-sizes of the "background dust" are positively correlated to the overlying wind strength. The modal grain-sizes during summer are positively correlated to the number of precipitation events occurring at the mooring location. During dust events which could be clearly identified on satellite RGB-images, coarser particles with modal grain sizes $>25 \mu\text{m}$ are deposited in the sediment trap moorings. Coarse modal grain-size events that were observed in winter 2004 are not observed in the grain-size record of the following 2 winter seasons, which is an indication of interannual variation in dust mobilization, transport and deposition.

Disentangling global and local drivers on South Pacific coral reefs

A. Ford¹, J.-B. Jouffray², A. Norström², B. Moore³, F. Magron³, S. Ferse¹

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³ *Secretariat of the Pacific Community (SPC), Noumea 98848*

Coral reefs worldwide are degrading rapidly as a consequence of simultaneous exposure to different global and local stressors. Previous studies focused on a very limited number of stressors that were selected based on assumptions. To effectively address reef degradation by targeted management, studies require a holistic approach that includes measuring both global and local stressors, such as climate change and coastal societies. The close link between society and coral reefs in the South Pacific, where island communities rely heavily on services derived from these ecosystems, makes this area an urgent research priority. Thus, the present study addressed which global and/or local stressors are shaping coral reef status across the South Pacific, and consequently what are the most effective strategies to manage reef status in the South Pacific. This was carried out by analysing a comprehensive multidisciplinary data-set covering 63 sites across the region (from Micronesia to French Polynesia). Data was collected in 2002 to 2008 under the framework of the PROCFish/C/CoFish programme, using identical survey methodologies for all sites. The data-set includes benthic community composition, fish biomass, physical parameters (i.e. latitude, longitude) and local social drivers (i.e. distance to market, fishing methods). Thermal exposure was also quantified for the 12 years prior to the survey dates. Based on benthic community composition, principle components analysis (PCA) differentiated sites with undesirable reefs characterised by dead coral, macroalgae and cyanobacteria, from desirable reefs displaying high live coral and crustose coralline algae. Linear models were used to identify dominant drivers of reef status (extracted from PCA) across the region, with an aim to provide important information for effective future management.

Quantifying bottom water oxygen concentrations via dinocyst assemblages

D. Gray¹

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Quantifying organic matter (OM) stability and preservation in the sedimentary record is an key requirement for assessing the interpretation of marine-based proxies and estimating the accuracy of climate reconstructions. High bottom water oxygen concentrations, and prolonged O₂ exposure have been implicated in enhanced degradation of broad spectrums of organic matter.

Organic walled dinoflagellate cysts, derived from marine algae have shown a species-specific response to oxygen exposure post-deposition; thus preferential concentration and/or depletion of specific dinocyst species classes has the potential to yield valuable information about aerobic degradation effects and overall degradation of organic matter.

In-situ exposure experiments carried over a 5yr period suggest exponential-like dinocyst decay, using this data coupled with controlled laboratory incubation experiments (d⁻¹ to yr⁻¹) we hope to estimate species specific degradation rates for dozens of dinoflagellates. A complementary down-core study based in the eastern Mediterranean will test the ability of dinocyst assemblages to identify both varying aerobic exposure conditions at the seafloor and estimate total overall OM degradation.

Contouritic depositional systems related to topographic heights at the Galician margin (NW Spain)

J. Haberkern^{1,2}, T. Schwenk^{2,1}, T. Hanebuth^{3,1}, V. Spieß²

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²*University of Bremen, Department of Geosciences, Germany*

³*School of Coastal and Marine Systems Sciences, Coastal Carolina University, U.S.A.*

At the Galician continental margin the interaction of bottom currents with topographic obstacles leads to the formation of multiple small scaled contouritic depositional systems.

The topography of the slope is controlled by an underlying horst and graben system, which is the result of the opening of the Central Atlantic Ocean and repeated reactivation of the fault systems. Close to elevated blocks, outcropping basement ridges and seamounts, drift bodies built up, in some cases moats occur and sediment waves form at the lee side of larger obstacles.

To gain insight into morphology, geometry and build-up of the drift bodies a dense, high-resolution multichannel seismic survey was conducted during RV METEOR Cruise M84/4 GAMIOMAR III in 2011, additionally PARASOUND sediment echosounder data were collected during this and the follow-up Cruise M110 GALIMOS in 2014. Also Swathsounder data is available from both cruises.

This study focuses on the Quaternary deposits. The beginning of the Pleistocene strata is clearly marked by strong Amplitude reflections in the seismic record and the whole Quaternary unit is not affected by the faults intersecting the older strata. Thus changes in drift geometry may be interpreted solely as effects of changes in the current regime. Additionally the occurrence of sediment waves and their migration at the lee side of obstacles is investigated.

Late Pleistocene history of Amazonian vegetation recorded by $\delta^{13}\text{C}$ of plant waxes

C. Häggi¹, C.M. Chiessi², S. Mulitza¹, E. Schefuß¹

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The Pleistocene history of Amazonian vegetation has been a controversially debated subject during the past few decades. Early work suggested a savannah expansion during glacial periods, leading to a fragmentation of the Amazon rain forest into isolated forest refugia. However, later studies hypothesized that forest vegetation prevailed throughout the Late Pleistocene. In order to shed more light on this issue, we investigated a high temporal-resolution sediment core from the continental slope off French Guiana to obtain an Amazon basin-integrated vegetation history for the last 50,000 years. In order to differentiate between forest and savannah biomes, we analysed the stable carbon isotope composition of plant-wax derived long-chain n-alkanes. Savannah vegetation typically has a large proportion of plant species using the C₄ carbon fixation metabolism which leads to ¹³C enrichment compared to the C₃ metabolism used by forest

species. Our results reveal the constant presence of C₃ vegetation during the past 50,000 years. Small scale enrichments of $\delta^{13}\text{C}$ were limited to Heinrich events. These results support the notion that the Amazon basin was predominantly forest covered during the late Pleistocene. We suggest that savannah expansions did not occur on glacial-interglacial time-scales but are rather associated with Heinrich events.

Grain-scale properties and sediment physics in heavy-mineral enrichment processes

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On beaches and in shallow marine environments, enrichment-zones of (magnetic) heavy-minerals can be observed worldwide. In previous studies, many involved processes like currents induced by tides and waves and correlating sediment transport could be described.

The current study aims at investigating the influence of grain-scale properties (like mineralogy and physical properties as well as grain sizes and shapes) of sediment and heavy-minerals on their distribution.

A first study area is the sub-marine dune field of the Fehmarn Belt in the Baltic Sea. Here, the bathymetry of the submarine ripples and their porosity-, susceptibility-, magnetite and sediment distribution was investigated by taking seafloor samples and with the help of the benthic profiler "NERIDIS III" as well as sidescan-sonar. As a next step, divers will be deployed to get exact samples along the ripple geometries and thus further improve the dataset of the region. This will be carried out in an Alkor cruise in late June.

Further, flume tank experiments will help to get further hold on the influence of the heavy-mineral and sediment-grain properties.

Finally, numerical modelling shall be utilised to define the involved processes.

Western Pacific Warm Pool hydrology and its impact on the Indonesian Throughflow

M. Hollstein¹, M. Mohtadi¹, G. Martinez Mendez¹, S. Steinke¹, D. Hebbeln¹

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The Western Pacific Warm Pool is the largest area of deep convection on earth. Thus, it is a main source area of heat and water vapour to the global atmosphere with potentially far reaching climate impacts. The Indonesian seas provide pathways for the transport of near-surface waters from the Pacific to the Indian Ocean via the Indonesian Throughflow. As the Indonesian Throughflow is the only tropical interoceanic conduit it regulates the salinity and heat budgets of the Pacific and Indian oceans and is thought to play an important role within the return branch of the global overturning circulation. Despite its importance for the global atmospheric and ocean circulation systems, past Western Pacific Warm Pool climate and ocean dynamics remain poorly understood. Especially records from east of Indonesia and Papua New Guinea are sparse. In my PhD project I will analyze records from sediment cores retrieved off Papua New Guinea to better understand how near surface waters from the southern Pacific influenced the ITF in the past and how they interacted with Western Pacific Warm Pool hydroclimate. A particular focus will be on the last two glacial-interglacial transitions. In order to reconstruct variations in near-surface temperature and the isotope composition of seawater I will primarily use Mg/Ca ratios and stable isotope compositions in shells of shallow dwelling planktic foraminifera.

Isotope investigation of the Amazon and Plata basin river systems

N. Höppner¹

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While researching the global water circulation and ocean mass budget one important aspect is the freshwater input from continents. Thus a detailed data base about current and past elemental and isotope composition of world rivers and respective their supply to the ocean is needed. Furthermore, rivers show immediate and long term responses to climate changes, making them an extremely important research field. Together the Amazon and Paraná River supply about 20 % of the global freshwater discharge to the ocean and their drainage area spans 52% of South America. In my PhD project I will analyze river samples (dissolved and suspended load) as well as marine sediment cores of these two basins. Using the combination of radiogenic (Sr, Nd, Pb) and non-traditional stable (Li, B) isotopes I will gain insight into the provenance of the discharged sediment and the chemical weathering properties of the basin area. Variations in river dynamics due to climate and vegetation changes will be detected by analyzing marine cores in their estuary areas. By examining the river samples the present-day elemental and isotope composition and input to the ocean will be characterized.

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

M. Jäger¹, L. Lelli¹, M. Vountas¹, J.P. Burrows¹

¹*Institute of Environmental Physics, University of Bremen, Bremen, Germany*

Desert dust plays a prominent role in climate as it influences the radiation budget in the atmosphere and, if being transported to the ocean, affects the ecosystem, e.g. by acting as fertilizer.

Measurements of dust deposition are usually performed using collectors on land and on buoys as well as sediment traps deployed across the Atlantic Ocean. However, regional to continental coverage can be only achieved 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 from the Sahara. The guiding idea is that, if transport orientation is correctly estimated, a decrease in AOT across the Atlantic can be linked to the deposition of aerosols onto the ocean surface.

First test show 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. Moreover, intercomparisons with in-situ sedimentation measurements at various sites show good correlations.

Furthermore, first impressions of a recent (January 2015), large dust outbreak will be presented.

Dynamics of small scale bedforms in tidal environments

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The abundance and migration of bedforms effects numerous processes in the benthic environment. From the perspective of hydrodynamics, bedforms are roughness elements that create turbulence in their wake region and thus extract energy from the mean flow. From the morphodynamic perspective, bedform migration is an effective mechanism for sediment transport. Furthermore, the presence and migration of bedforms influences the availability and distribution of oxygen in the upper part of the seafloor affecting biological and chemical processes.

While bedforms have been studied thoroughly in rivers and laboratory flumes, there is a lack of understanding their dynamics in tidal environments with alternating flow directions. The goal of this research is therefore to investigate the dynamics of bedforms in tidal environments in the German Bight. Field measurements are carried out through the deployment of lander devices equipped with sensors to capture hydrodynamic and morphodynamic properties. Sedimentological characteristics are derived from the analysis of grab samples.

In a first approach to describe the dynamics of small scale bedforms we compare predicted initiation of bedload transport from the relation of measured and critical flow velocity to bedform migration velocities obtained by cross-correlation of successive bathymetry scans. In agreement with literature, the results show that bedform migration in flow direction can be detected whenever the critical flow velocity is exceeded.

Volcanism of a different sort - Submarine mud volcanos in the Calabrian Arc

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Submarine mud volcanos are structures consisting of sediment, which has been extruded onto the seafloor from the subsurface. In nature, such a process is favoured by compressive forces for example where two continental plates collide. Together with the eruption of mud and rocks active mud volcanism is usually accompanied by the emission of fluids (gases and/or liquids). Methane (CH₄) or higher light-hydrocarbons have been found to be key components of the involved fluids, characteristic for so-called “cold seeps” found at mud volcanos. This seepage-mechanism promotes biogeochemical processes in surface sediments and if the methane is transported to the atmosphere, is responsible for the natural release of a potent greenhouse gas. So far, however, the contribution of deep-marine cold seeps to the global carbon cycle is not well constrained or quantified.

In the Calabrian Arc (Ionian Sea) where the African plate subducts below Europe, mud volcanos have been discovered on the accretionary prism. Active fluid seepage has been observed at least at one of the structures. The herein presented research project aims to investigate the past and present activity of mud volcanos and cold seeps along the accretionary prism. During an expedition of R/V Meteor (M112) high-resolution, geophysical methods shed light on complex, mud volcano morphologies and localised cold seep sites. Sediment cores, seafloor samples, pore fluid and water column measurements will provide the fundamental datasets in order to address research questions such as: a) How can the different morphologies of the surveyed mud volcanos be characterised?; b) What kinds of fluids are involved in the observed cold-seep activity?; c) Does mud volcano activity occur episodically or is it a process of prolonged duration?

Uncovering the pre-Sturtian distribution of life

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During the Cryogenian era (850 -635 Ma), Earth witnessed significant biological and geological changes; the supercontinent of Rodinia began rifting, oceans became fully oxygenated, several “Snowball Earth” glaciations occurred and the first complex lifeforms in the form of metazoa emerged. For our research we try to understand the timing and mechanisms behind the evolution of eukaryotic life prior to the first Neoproterozoic global glaciation. In order to reconstruct the biological and environmental conditions in the early Cryogenian, we analyzed the lipid biomarker distribution, trace metals as well as stable isotope values from 58 samples, deposited in a shallow depositional basin just prior to the Sturtian glaciation (~740 Ma). The sampled sequence witnessed slight thermal maturity and displays increasing reducing conditions paralleled with a steady marine water transgression based on results from the redox sensitive trace metals and molecular markers. Possibly more interestingly, is the finding of a strong -15‰ positive $\delta^{13}\text{C}$ anomaly in the kerogen which is not followed by co-occurring carbonates, suggesting that this anomaly is not driven by upper water column DIC but possibly by carbon limitation in the benthic zone. This observation is paralleled by a systematic shifting biomarker signature and microfossil assemblages, indicating a significant change in the ecosystem. Our data shows one of the oldest records in geological time of a decoupled carbon cycle and presents an alternative way we look at the behavior and distribution of life prior to the Sturtian glaciation.

Two new species of erect growing Bryozoa and the application of non-destructive imaging methods

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Two new species of cheilostome bryozoans, *Cellaria bafouri* n.sp. and *Smittina imragueni* n.sp. are described from cold-water coral habitats off Mauritania. Both species can be separated from already known species of their respective genera using minute, but distinct morphological characters. *Smittina imragueni* n.sp. highlights unresolved nomenclatural and systematic problems with an allegedly well-known and common species, viz. *S. cervicornis* (Pallas, 1766) from the Mediterranean. To support the diagnosis with additional data, both species have been scanned using micro-computer tomography. External and internal structures of both species are visualised and quantified. Automatic quantification of sub-individual morphological characters is applied for the first time on bryozoans. Further possibilities and the merits of micro-computer tomography in zoology and palaeontology will be discussed, as well as its potential influence on taxonomic nomenclature.

Deglacial sea surface temperature development in the Northwest Pacific reconstructed from TEX86

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Deglacial sea surface temperature (SST) development in the subarctic North Pacific and its marginal seas attests to teleconnections between North Atlantic and North Pacific climate change. However, in the western Bering Sea and the marginal Northwest Pacific SST development during early deglaciation is poorly understood as many existing records based on alkenone-paleothermometry end after 15kaBP. Here, we present complete Glacial-to-Holocene SST records for the northwestern Pacific and the western Bering Sea using TEXL86. Based on comparison of existing core-top data, the TEXL86 is interpreted to reflect summer SST. From the Bølling/Allerød to the present the records resemble short-term fluctuations known from Greenland ice cores suggesting an atmospheric coupling with deglacial variations in the Atlantic meridional overturning circulation. We find that the Western Bering Sea is already synchronized with the North Atlantic during early deglaciation while the Northwest Pacific synchronizes later at the onset of the Bølling/Allerød. Prior to 15kaBP gradually rising SST in the Northwest Pacific point to independency from the atmospheric linkage. Since this pattern is also known from the Gulf of Alaska surface conditions in the Northwest Pacific likely are strongly influenced by increased advection of waters from the Alaskan Stream which may overprint the atmospheric effect.

CO₂ outgassing from peat-draining rivers and its response to anthropogenic change

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Tropical peatlands play an important role in the global carbon cycle due to their immense carbon storage capacity. However, pristine peat swamp forests are vanishing due to deforestation and peatland degradation, especially in Southeast Asia. It has already been shown that soil CO₂ emissions increase once peatlands are deforested and drained, and that consequently, this efficient carbon sink is slowly turning into a source. These warning signals might also be observed in the adjacent aquatic system. Rivers flowing through tropical peatlands seem to reflect the vulnerability of those ecosystems by increased export of formerly stored organic carbon. As a consequence, CO₂ emissions from tropical peat-draining rivers are thought to increase as well; however, this has been mere speculation so far. We present for the first time total organic carbon (TOC) and CO₂ data from a tropical blackwater river draining an intact peat dome in Sarawak, Malaysia. Our measurements in the Maludam national park reveal that the lateral carbon flux dominates over CO₂ outgassing in an undisturbed system. Our study serves as a reference for future studies on changing carbon dynamics in peat-draining rivers due to anthropogenic disturbance.

Seismostratigraphy of the Kveithola sediment drift, northwestern Barents Sea

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The Kveithola sediment drift has a complex morphology, constituted by a main (outer) drift body about 200 km² wide and a minor (inner) one about 100 km² wide. In addition, there are drift lenses in the outer part of the drift (about 20 km² wide), more or less connected patches of drift in the inner part of the Kveithola Trough, and other perched patches in local depressions on the northern flank of the trough. The drift is comprised of lensoidal units up to about 30 ms thick and thinning towards the sides of the drift. These units rest on top of a sub-parallel, more laterally continuous unit. It hence has a broadly mounded shape. However, the morphology of the drift is severely controlled by the morphology of the underlying units. In fact, the highs within the drift correspond to elevated areas of the underlying glacial units. The separation between outer and inner drift bodies is also connected to the underlying morphology. In fact, a buried Grounding Zone Wedge, transversal to the axis of Kveithola Trough, is located between outer and inner drift bodies, covered by a greatly reduced drift thickness (less than 5 ms). Due to this control operated by the underlying glacial units, the morphology of the drift is complex, with several local highs and with the maximum thickness not necessarily corresponding to a bathymetric high.

Lipid biomarker proxies in sinking particles from the equatorial to the polar Atlantic

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Although lipid biomarker proxies have been widely used to reconstruct past Sea Surface Temperature (SST) and supported important insights into the climate system since they have been developed, uncertainty still remains.

Concerning the uncertainty, the following questions have been emerged:

- 1) Do biomarker proxies reflect the seasonality of the source organisms?
- 2) Which processes govern their export to the deeper depth?
- 3) At which depth are biomarkers produced?
- 4) What is the main reason of the discrepancy between different proxies at special ecological settings?

To investigate those inquiries, I will focus on the sinking particle traps in the Atlantic Ocean, which were approximately moored for 6 months, 12 months and 12 months at a certain depth, in Lüderitz upwelling region off Namibia, West Brazilian oligotrophic basin and Southern Polar Front area, respectively. Additionally, to estimate the applicability of TEX₈₆ value and a sub-surface maximum glycerol dialkyl glycerol tetraether (GDGTs) on suspended particles in the Arctic, it is planned to join the research cruise (PS92) within the first year of my project and collect samples from the surface and various depths including in and under the sea-ice.

The results of this project will support to answer the questions mentioned above in more detail in various ecological settings.

Coral holobiont responses to elevated dissolved organic carbon concentrations

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Local anthropogenic stressors may negatively affect coral and reef resilience. In this context, the effects of elevated inorganic nutrient (e.g., ammonium, nitrate, phosphate) concentrations on reef organisms have been intensively studied, but there is little information on anthropogenically-derived dissolved organic matter (DOM). These studies indicate that DOM may be more deleterious to corals than inorganic nutrients. The present study therefore addresses the effects of dissolved organic carbon (DOC) on the common reef-building Red Sea coral *Pocillopora verrucosa* in a holistic approach including all departments of the coral holobiont (i.e. the coral animal, endosymbiotic algae, associated bacterial community). This was achieved by carrying out a series of manipulative experiments using a combination of physiological, biogeochemical, and molecular tools. Such an interdisciplinary approach is urgently needed for a better understanding of coral holobiont responses to DOC, and may contribute to the improvement of water quality and reef management. The present talk discusses the key findings and implications for coral reef resilience.

Evidence for a Red Sea sponge loop?

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Paradoxically, coral reefs maintain high productivity in extremely oligotrophic waters. Dissolved organic matter (DOM) represents the largest energy source produced on coral reefs but is largely unavailable to most heterotrophic reef organisms. Recently, coral reef sponges were found to play a key role in transferring most of the reef's energy and nutrients to higher trophic levels through the rapid uptake and transformation of DOM into particulate organic material (POM) via the so-called sponge loop. Organic matter released by primary producers, such as corals and algae, typically dominates the DOM pool on coral reefs. However, direct uptake of natural DOM sources by sponges has not been investigated. This study conducted laboratory stable isotope pulse-chase experiments using chamber incubations and aquarium flow-through setups to follow the fate of ¹³C- and ¹⁵N-labelled coral mucus and algal-derived DOM through Red Sea reef sponges. Our results provide the first direct evidence for the uptake of naturally-sourced coral- and algal-derived DOM by reef sponges demonstrating a direct link between benthic primary producers and sponges that retains energy and nutrients in oligotrophic coral reef ecosystems.

Diatom Assemblages and Lipid Biomarkers: Towards a More Robust Reconstruction of Diatom Paleoproductivity

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Diatoms are the dominant phytoplankton class in coastal upwelling systems, accounting for a large proportion of global primary production. This research aims to investigate the organic imprint of upwelling-related diatom species, which may allow the reconstruction of past primary productivity in areas where diatoms are not preserved in the sediments.

To better understand the preservation and chemical signature of diatoms in the sedimentary record, we are studying diatom abundance, assemblages and lipid biomarkers in water column samples, sediment-traps, surface sediments and diatom cultures recovered at the Iberian Margin. This study goal is to identify the major groups of lipid biomarkers related with upwelling diatom species in this area.

Diatom abundances and assemblages observed in the water column and sediment-traps evidence seasonal primary productivity. Sediment-traps and surface sediment samples are dominated by *Leptocylindrus* spp. and *Chaetoceros* spp. resting spores.

Preliminary results of the biomarkers study show that sterols, known to be one of the major groups of biomarkers related to diatoms, occur in different composition and concentration in the analyzed diatom cultures, water column and sediment-trap samples. Other known diatom related lipid biomarkers, namely highly branched isoprenoids and long - chain diols, are also being investigated.

The Campi Flegrei caldera - a "supervolcano" in the heart of Europe

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Large collapse calderas are associated with exceptionally explosive volcanic eruptions, which are capable of triggering a global catastrophe second only to that from a giant meteorite impact. Therefore, active calderas have attracted significant attention in both scientific communities and governmental institutions worldwide.

One prime example of a large collapse caldera can be found in southern Italy, more precisely in the northern Bay of Naples within the Campi Flegrei Volcanic Area. The Campi Flegrei caldera covers an area of approximately 200 km² defined by a quasi-circular depression, half onland, half offshore. It is still under debate whether the caldera formation was related to only one ignimbritic eruption namely the Neapolitan Yellow Tuff (NYT) eruption at 15 ka or if it is a nested-caldera system related to the NYT and the Campanian Ignimbrite eruption at 39 ka.

During the last 40 years, the Campi Flegrei caldera has experienced episodes of unrest involving significant ground deformation and seismicity, which have nevertheless not yet led to an eruption. Besides these short-term episodes of unrest, long-term ground deformation with rates of several tens of meters within a few thousand years can be observed in the central part of the caldera. Understanding the mechanisms for unrest and eruptions is of paramount importance as a future eruption of the Campi Flegrei caldera would expose more than 500,000 people to the risk of pyroclastic flows.

This study is based on a dense grid (semi-3D) of high-resolution multi-channel seismic profiles acquired in the offshore sector of the Campi Flegrei caldera. Based on the seismic dataset, a conceptual reconstruction of the caldera deformation and depositional processes was developed.

Highly dynamic benthic communities in upwelling exposed Costa Rican coral reefs

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Seasonal upwelling at the northern Pacific coast of Costa Rica offers the opportunity to investigate in situ effects of pronounced changes in key water parameters (i.e. temperature and nutrient concentrations) on coral reef communities. This study monitored the relative cover of key benthic organisms in a local reef, accompanied by temperature and nutrient measurements, from April 2013 to April 2014 in a weekly resolution. Findings revealed a major shift from turf algae to coral dominance within the observed year. Cover of the scleractinian coral *Pocillopora* spp. increased continuously from 22 to 51 % in 12 months. Turf algae covered around 60 % from April to June 2013 and decreased to 35 % within two weeks in June 2013. The green macroalgae *Caulerpa sertularioides* covered substantial parts of the reef substrate in April 2013, but disappeared almost entirely within one month after their synchronized gamete release in April/May 2013. Upwelling decreased mean water temperatures by 2.3 °C and increased mean phosphate and nitrate concentrations by 70 % and 270 % respectively between February and April 2014. This did not affect the relative cover of benthic reef organisms, indicating that benthic communities were highly adapted to the pronounced seasonal changes in measured water parameters. The findings hint to a dynamic benthic community, with an increase in coral cover faster than previously reported in the scientific literature.

Proteomics as novel tool for biodiversity research on benthic Foraminifera

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Ecosystems heavily rely on functional biodiversity within the system to build resilience to environmental variability. Foraminifera are a highly diverse group, constituting largely to sediments on coral reefs and playing important roles in biogeochemical cycles. Their fossil record provides major indicators for palaeo-ecological reconstructions. Larger benthic foraminifera harbour photosynthetic symbionts and, like corals, are particularly sensitive to environmental changes. Traditionally, foraminiferal species are identified by the morphology of their calcareous shell, which is a selective adaptation to environmental forces. This phenotypic plasticity is a consequence of the various levels with which individuals respond to environmental conditions, including morphological, physiological, behavioural or phenological traits. These are direct outcomes of structural differences in temporal and spatial protein expression. Amphistigenidae is one of the most recognised families of symbiont-bearing foraminifera, widely used in ecological studies. They react sensitively towards stress by test modification and symbiont loss, but related processes and interactions with their photo-symbionts are widely unknown. Genetic analyses revealed numerous cryptic foraminifera species, following different evolutionary trajectories and distinctly responding to environmental forcing. Therefore, the proteomic responses of different populations of Amphistigenidae to chronic and repetitive environmental stress exposure will be characterized and linked to cellular biomarkers. Revealing diversity in Foraminifera on an intra-species molecular level is essential to understand their adaptive potential, evolutionary mechanisms and resilience towards environmental changes.

The characteristics of particulate organic carbon in the lower Amazon Basin

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Riverbed sediments from the Amazon mainstream and its main tributaries were used to study the characteristics of particulate organic carbon in the lower Amazon basin. The samples were analyzed for particulate organic carbon content (POC), $\delta^{13}\text{C}_{\text{OC}}$, lignin phenol compositions and the concentrations of aluminium and silicon (Al/Si) were used as a proxy for grain size. The POC content in the main tributaries ranged from 0.13 to 3.99 wt-% and increased with Al/Si ratio in each tributary. $\delta^{13}\text{C}_{\text{OC}}$ varied from -26.1‰ to -29.9‰ VPDB in riverbed sediments. Lignin content (represented by Λ_8 , sum of eight lignin phenols in OC, expressed as mg/100mg OC) ranged from 0.73 to 6.91 and is positively related with Al/Si ratio in the main tributaries except for the Xingu River, in which Λ_8 decreased with Al/Si. Ratios of syringyl to vanillyl (S/V) and cinnamyl to vanillyl (C/V) varied from 0.70 to 1.51 and 0.08 to 0.47, respectively, suggesting that the dominant source of lignin is non-woody angiosperm tissue. The ratios of vanillic acid to vanillin (Ad/Al)v (0.26-0.71) and syringic acid to syringaldehyde (Ad/Al)s (0.15-0.57) indicated relatively fresh, minimally degraded lignin.

Late Quaternary calcareous nannofossils from the western tropical Indian Ocean

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Relative to other parts of the western tropical Indian Ocean, the study area off the coast of Tanzania has a characteristically unique environment. Studies on the modern day oceanographic conditions on this side of the Indian Ocean suggested that the area has stratified waters year-round, steady thermocline, and relatively low surface water productivity. In general, the surface waters of the western Indian Ocean are governed by seasonally reversing monsoon winds leading to upwelling and downwelling in the ocean, which in turn affect the nutrient availability and surface water productivity. Sediment core GeoB 12613-1 encompassing the past 25,000 years was analyzed for calcareous nannofossil assemblage composition and abundance to reconstruct the past productivity of the study area. Results show that calcareous nannofossil taxa off the coast of Tanzania are influenced in various ways by the productivity variations in the study area through time. The assemblages in the study area are mostly dominated by low productivity indicator species *Florisphaera profunda* comprising up to 70% of the total assemblages. It is followed by high productivity indicator species *Emiliana huxleyi* with relative abundances between 10 to 22% and by *Gephyrocapsa oceanica* and *G. ericsonii* with up to 12% relative abundances. Species that favor oligotrophic waters such as *Umbellosphaera irregularis*, *U. tenuis*, and *Discosphaera tubifera* were also present. Other significant contributors to the assemblages are *Calsiosolenia brasiliensis*, *C. murrayi*, *Ceratolithus cristatus*, *Oolithothus antillarum*, *O. fragilis*, *U. foliosa*, and *U. hulburtiana* comprising up to 5% of the assemblages. The *syracosphaerids* and *helicosphaerids* also contributed to the total assemblages.

Seasonal variations in foraminiferal fluxes and $\delta^{18}\text{O}$ in the southwestern Atlantic

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Planktonic foraminifera assemblages and isotopic composition of their shells preserved in marine sediments provide information on past changes of the thermal structure of the ocean surface layers. Knowledge about the seasonal variations of these proxies under modern conditions is essential to interpret their fossil record. Because seasonality patterns in the flux and habitat of foraminifera species vary across the ocean, an assessment of seasonality on foraminifera proxies requires detailed regional studies. Thus, the aim of this study is to examine seasonal variations in isotopic composition of planktonic foraminifera and fluxes in order to calibrate proxies for the southwestern margin of the Atlantic. For this purpose, we used samples from sediment traps installed at 50 and 100 meters water depths, which continuously collected the vertical flux of particulate material between November 2010 and April 2012. The results show large variations in the isotopic composition ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) and fluxes of key species (*G. ruber*, *G. sacculifer*, *G. menardii* and *N. dutertrei*) related to seasonal changes in the upper water column stratification. The $\delta^{18}\text{O}$ values for *G. ruber* (white and pink) showed a wide variation (from -1.91 to -0.43 ‰), following the seasonal variation of the SST measured by the mooring. Moreover, $\Delta\delta^{18}\text{O}_{\text{ruber-dutertrei}}$ seems to be related to the surface-to-thermocline temperature gradient in the water column. The access to seasonal variations can improve our understanding about the potential bias for each species in the sediment record.

Governance of Marine Protected Areas in Costa Rica: stability and change of institutions

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Costa Rica has been working to consolidate its Marine Protected Areas (MPAs) in order to enhance protection of its marine resources. Challenges to MPAs in Costa Rica are manifold: from enforcing regulations to achieving MPA acceptance by nearby communities. Since several of these barriers are associated with formal institutions (e.g. legislation) and informal institutions (e.g. traditions) influencing MPA governance, my PhD project seeks to explore: (1) mechanisms driving stability of institutions in MPA governance in Costa Rica; (2) mechanisms driving change of these institutions; (3) alternative institutional arrangements where the current ones seem to be poorly working. I have chosen a qualitative case study research design to approach my topic. The case study is composed by two units of analysis: the local level (four MPAs) where challenges can be seen; and the national level (the national capital) where MPA policies are designed. I am currently analysing the data (interviews, documents and observations) and systematising the results. I am using Process Tracing, a qualitative data analysis method used to trace the influential mechanisms for a particular outcome. In this case the outcome is the current state of MPAs in Costa Rica. In this presentation I plan to share my preliminary results.

Bacterial Community Activity in Intertidal Marine Sediments by a Dual Stable Isotope Labeling

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Intertidal areas are characterized by high primary production with the sediment harboring a diverse and active microbial community that respire sedimentary organic carbon (SOC) in oxic and anoxic depth horizons (Jørgensen, 1982). A recent study suggested that dark fixation of inorganic carbon by chemoautotrophic bacteria is an important process that contributes significantly to microbial carbon cycling in coastal areas (Boschker et al., 2014). In order to further validate the relevance of this process, we studied inorganic carbon assimilation via a recently developed isotope-probing assay that enables the differentiation of autotrophic and heterotrophic modes of carbon assimilation (cf. Wegener et al., 2012) in a 22-cm-deep sediment core collected in the Janssand tidal (Wadden Sea, Germany). Specifically, we used a dual stable isotope labeling assay that tracked the incorporation of ¹³C-dissolved inorganic carbon (DIC) and deuterium from deuterated water (D₂O) into fatty acids and combined this with the quantification of the uptake of ¹³C-DIC into SOC via incubation experiments in the dark at 12 and 20 °C for 21 days. Our results showed inorganic fixation by heterotrophic sulfate-reducing Deltaproteobacteria dominated in intertidal sediment rather than chemoautotrophic microbes.

Pollen distribution in the mudbelt surface sediments offshore western of southern Africa

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The distribution of pollen in marine surface sediments offshore western of southern Africa was investigated to help interpretation of onshore Holocene vegetation changes. A transect of marine surface pollen samples from the south of the Orange River mouth (29.12°S) to St Helena Bay (32.50°S) along the Namaqualand mudbelt show marked pollen sources and vegetation changes on the adjacent continent. The pollen concentration increases southwards in relation to higher vegetation density of fynbos vegetation. Low pollen concentration may also be associated with high-energy environments due to the dilution effects of the Orange River. The pollen distribution suggests that the Orange River is contributing a major pollen component to the northern mudbelt with a decreased contribution southwards, while the pollen distribution in the central mudbelt is more attributed to inputs of pollen via berg winds and local ephemeral Namaqualand rivers. The typical fynbos elements dominated in the southern mudbelt indicate a pollen source mainly from the fynbos vegetation types. These conclusions are supported by the fossil pollen records of two marine sediment cores from the northern and central mudbelt respectively. This study demonstrates that pollen records from marine sediment cores in the mudbelt may be reliably utilized as tools to reconstruct palaeovegetation.

Scrutinizing changes in precipitation over tropical South America during Heinrich Stadial 1

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Here we carried out a detailed investigation on precipitation variations over tropical South America during the Heinrich Stadial 1 (HS1, 18–15 cal ka BP), the most prominent abrupt millennial-scale climate event of the last deglaciation. Based on major element end-member unmixing model and radiogenic isotopic data from a marine sediment core raised off French Guiana, we show a significant increase of the Andean-sourced terrigenous material to the equatorial Atlantic during HS1. In agreement with this pattern, the compilation of available paleoclimate proxies from tropical South America presents increased precipitation over the Andes during HS1. To further elucidate the physical mechanism behind this scenario, we used a freshwater-hosing experiment performed with CCSM3.0. The model run indicates marked changes in the seasonality of precipitation over South America during HS1 relative to the Last Glacial Maximum (23-19 cal ka BP). We suggest that the weakened South America monsoon circulation (SAMC) during HS1 led to enhanced precipitation over northeastern Brazil (occurred in austral summer). In contrast, the enhanced precipitation over the Andes during HS1 (occurred in austral winter) probably resulted from an intensified convection at this high altitude region due in part to atmosphere-ocean oscillations over the tropical Pacific.

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