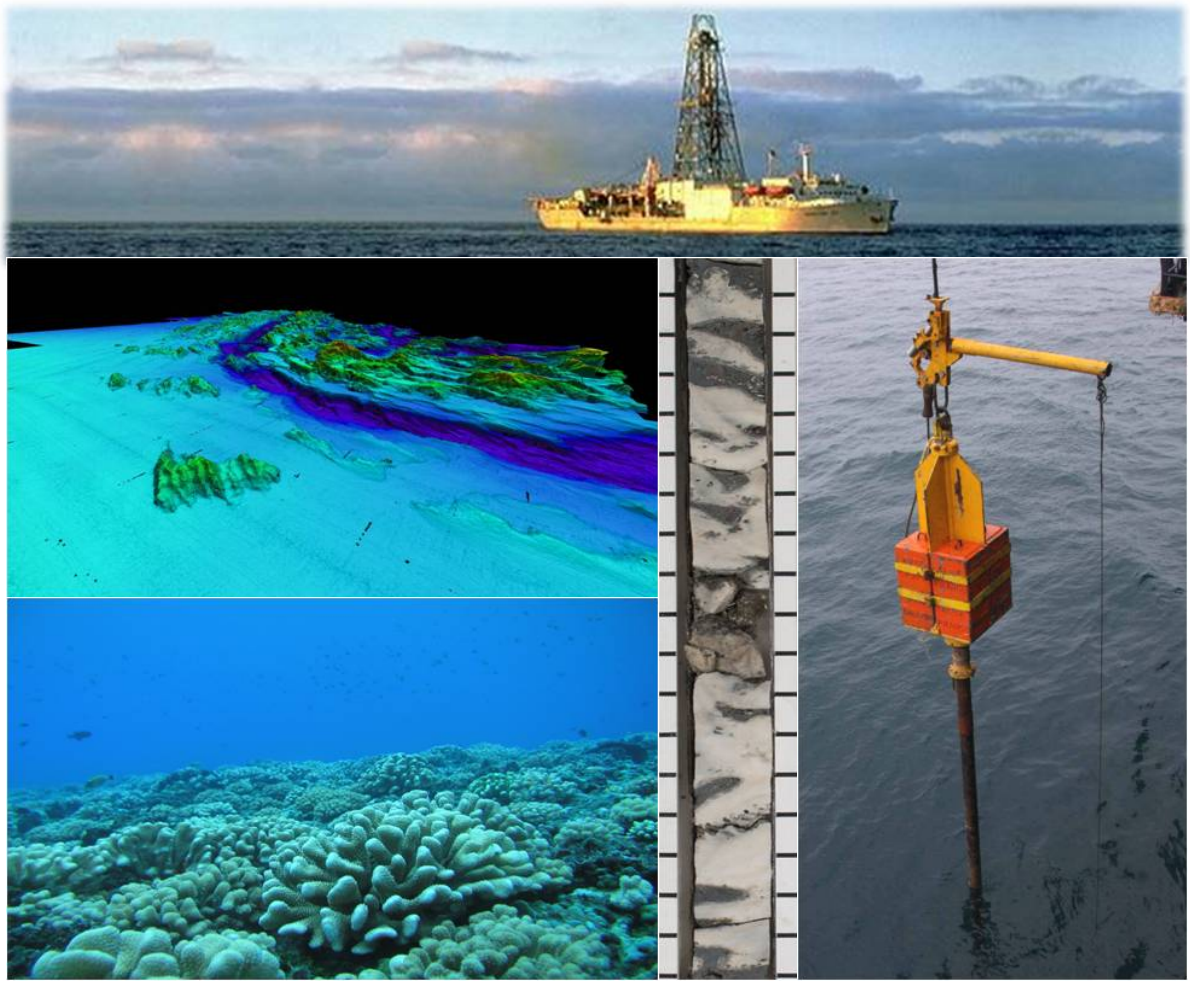
EUROCORES Programme
European Collaborative Research

EuroMARC
European Collaboration for Implementation of Marine Research on Cores

SECOND EUROMARC CONFERENCE

14-16 September 2009

Presqu'île de Giens, France



EUROPEAN SCIENCE FOUNDATION
SETTING SCIENCE AGENDAS FOR EUROPE

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13-16 September 2009

Club Belambra, Presqu'Île de Giens, France

PROGRAMME

last update: 4 September 2009

online at http://www.esf.org/euromarc

Sunday 13 September 2009

18.00	Registration at the hotel and at the ESF desk
19.00	Welcome drink
20.00	Dinner

Monday 14 September 2009

08.45 **Conference Opening**
Shane Murphy (EUROCORES Programme Coordinator, ESF)

Session 1: CHECREEF
Convenor: Andy Wheeler

09.00 **Thomas Felis** (Universiatät Bremen, Bremen, Germany)
Pronounced interannual ENSO variability in tropical Pacific temperatures at the end of the last glacial

09.30 **Nicolas Durand** (CEREGE, Aix-en-Provence, France)
New chronological constraints on the radiocarbon calibration: 14C and U-series dating of corals drilled offshore Tahiti (IODP Expedition 310)

09.50 **Alexander Thomas** (Oxford University, United Kingdom)
The timing of termination II: Results from IODP Expedition 310 "Tahiti Sea Level"

10.10 **Claire Seard** (CEREGE, Aix-en-Provence, France)
Microbialite development patterns of last deglacial reefs of Tahiti (French Polynesia)

10.30 Coffee break

Session 2: CARBONATE
Convenor: Thomas Felis

11.00 **Andy Wheeler** (University College Cork, Ireland)
Cold-water coral carbonate mounds as palaeoenvironmental recorders: an analysis of the lithic record

11.20 **Nina Joseph** (Friedrich-Alexander University Erlangen-Nuremberg, Germany)
Palaeo-environmental variability in Holocene cold-water coral reefs in Stjernsund, Northern Norway

11.40 **Henk de Haas** (Royal Netherlands Institute for Sea Research, The Netherlands)
West Rockall Trough carbonate mounds; what are they made of and how did they get there?

12.00 **Anneleen Foubert** (Catholic University of Leuven, Belgium)
The early diagenetic behaviour of cold-water carbonate mound systems in deep environments

12.30 Lunch

Session 3: H2DEEP
Convenor: Mara Weinelt

14.00 **Fernando Barriga** (University of Lisboa, Portugal)
Mineralogy and Geochemistry of Loki's Castle Arctic Vents: significance to the Deep Biosphere

14.30 **Kirsten Möller** (University of Bergen, Norway)
Transition metal isotope fractionation in hydrothermal iron-sulphide deposits

14.50 **Tamara Baumberger** (ETH Zurich, Switerland)
Geochemistry of hydrothermal fluids and rift valley sediments of the Loki's Castle vent field at the ultra-slow spreading southern Knipovich Ridge

15.10 **Steffan Jorgensen** (Univsersity of Bergen, Norway)
Microbial Diversity in Deep-Sea Sediments: Influence of Volcanism and Hydrothermal Activity

15.30 Coffee Break

Session 4: Poster presentation

16.00 **Presentation of posters**
1 or 2 slides by each poster presenter

16.30 **Official Poster Session** (with authors in attendance)

19.30 Dinner

21.00 **Poster session / Free Time**

Tuesday 15 September 2009

Session 5: AMOCINT
Convenor: Trond Dokken

09.00 **Silvia Nave** (Instituto Nacional de Engenharia Tecnologia e Inovação, Portugal)
High-resolution productivity changes during MIS 5 at mid-latitudes and its relation to Meridional Overturning Circulation

09.30 **Mara Weinelt** (University of Kiel, Germany)
Variability of the Azores Current over the Holocene, last glacial termination and at the end of the last interglacial

10.00 **Helga Flesche Kleiven** (University of Bergen, Norway)
Rapid centennial scale reductions in North Atlantic deep water during the peak of the lastiInterglacial period recorded in sediments from the Eirik Drift

10.30 Coffee break

Session 6: RETRO
Convenor: Eystein Jansen

11.00 **Trond Dokken** (University of Bergen, Norway)
Progress and further plans in RETRO

11.30 **Stefan Mulitza** (University of Bremen, Norway)
Late Quaternary evolution of the African rain belt: Relation to ocean circulation and Saharan dust emissions

12.00 **David Hodell** (University of Cambridge, United Kingdom)
Surface and deep water hydrography on Gardar Drift (Iceland basin) during the last interglacial period

12.30 Lunch

Session 7: Parallel Sessions

14.00 **Atlantic Overturn / Circulation /Atmospheric Influence**
Chairs: G. DeLange; T. Dokken

Accessing palaeo archives in carbonated systems

Chairs: A. Wheeler; H. Westphal

15.30 Coffee break

16.00 **CRP Meetings**

17.30 Free Time

19.30 Dinner

21.00 **Scientific Committee Meeting / Poster session**

Wednesday 16 September 2009

Session 8: MOCCHA
Convenor: Dick Kroon

09.00 **Stefano Bernasconi** (ET H Zurich, Switerland)
Mediterranean climate and hydrographic variability in the last millennium from high-resolution oxygen and carbon isotope records from the Gulf of Taranto

09.20 **Gerard Versteegh** (University of Bremen, Gremany)
Lipid geochemistry and high resolution environmental reconstruction

09.40 **Anna-Lena Grauel** (ETH Zurich, Switerland)
Temperature and Salinity reconstruction based on planktic foraminifers from a long core section from the Gulf of Taranto, Mediterranean Sea – Status report of the MOCCHA project

09.55 **Marie-Louise Goudeau** (Universiteit Utrecht, The Netherlands)
Geochemical composition of surface samples from the SW Adriatic Sea and the Gulf of Taranto (Southern Italy) and a comparison with sub-recent sediments.

10.10 **Arne Leider** (University of Bremen, Germany)
New insights: Biomolecular proxies and recent environmental conditions along the Southern Italian shelf

10.25 **Liang Chen** (University of Bremen, Germany)
How dinoflagellate cysts from the Po-river discharge plume provide information about annual variations in temperature and precipitation in the Italian region during the last two centuries

10.40 Coffee break

Session 9: GLOW
Convenor: Gert De Lange

11.00	**Dick Kroon** (Vrije Universiteit, The Netherlands) *First results of the GLOW cruise offshore Tanzania*
11.30	**Tracey Aze** (Cardiff University, United Kingdom) *A biostratigraphic report from the GLOW site survey cruise of the S.W. Indian Ocean*
12.00	**Jeroen van der Lubbe** (Vrije Universiteit, The Netherlands) *African climate change as evidenced in sediments from Lake Turkana*
12.30	Lunch

Session 6: General Discussion

14.00	*Sedimentary paleoclimate projects* **Chairs:** *D. Kroon, T. Dokken, G. De Lange, E. Jansen*
15.30	Coffee break
16.00	**General discussion**
17.30	Free time
20.00	Conference Dinner

Thursday 17 September 2009

07.30	Breakfast and departure

All posters will be on display during the whole duration of the conference

EuroMARC is financed by research agencies from 9 European countries: Belgium (FWO), France (CNRS), Germany (DFG), Ireland (IRCSET), The Netherlands (NWO), Norway (NFR), Portugal (FCT), Switzerland (SNF), United Kingdom (NERC), and the European Science Foundation (ESF) under the EUROCORES

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LIST OF ABSTRACTS

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Project

06-EuroMARC-FP-009 / Tropical temperature history during Palaeogene global warming events (GLOW)

Presentation: Oral

Session: GLOW

A biostratigraphic report from the GLOW site survey cruise of the S.W. Indian Ocean.

Tracy Aze1, Paul N. Pearson1, Bridget Wade2, Paul Bown3, Dick Kroon4,5

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GLOW (Tropical temperature history during Paleogene GLObal Warming) is a research project funded by European Science Foundation (ESF) EuroCORES/EuroMARC programme. A site survey cruise was conducted in the S.W. Indian Ocean with seismic data and cores collected from the Davie ridge and offshore east Africa using RV Pelagia.

A total of 32 seismic lines were shot, and 17 sites were cored using box and piston coring methods. A large number of Holocene and Pleistocene samples were recovered; these contain beautifully preserved tropical foraminifer assemblages which will be used for a variety of isotopic, taphonomic and taxonomic studies.

A key objective of the GLOW survey was to take sediment cores where stratigraphic layers crop out at the sea floor in order to provide age control on seismic reflectors and test correlations to boreholes outside the area, with specific emphasis on the correlation between the seismic interpretation from GLOW and Deep Sea Drilling Program (DSDP) Site 242 (further south on the Davie Ridge) and the onshore Tanzania Drilling Program (TDP).

Correlation between GLOW data and DSDP 242 confirms the age of prominent reflectors in the Neogene sedimentary package. The close match to Site 242 suggests that Paleogene material, incorporating significant global climatic events such as the Palaeocene-Eocene Thermal Maximum and the Eocene-Oligocene glaciation, is potentially drillable with an Integrated Ocean Drilling Program (IODP) expedition. Recovery of these expanded clay rich Paleogene sediments containing exceptionally preserved and abundant microfossils will facilitate the application of a range of palaeoclimate proxies used for reconstructions of sea surface temperatures and tropical climates during this significant period in Earth's climatic history.

The GLOW seismic data and age constraints from the box and piston cores will be used in the submission of IODP Proposal 711, Tanzania to Offshore Paleogene Survey (TOPS): Tropical climate modes during greenhouse to icehouse conditions.

	The GLOW Project Team: Dick Kroon1,2, Paul Pearson3, Bridget Wade6, Niamh O'Sullivan5, Tracy Aze3, Heather Birch3 , Andy Purvis4, Thomas Ezard4, Clay Bowden6, Chris Nicholas5, Yiming Wang7, Ralph Schneider7, Henk Brinkhuis8, Tjeerd van Weering9 and Henk de Haas9 1)University of Edinburgh (UK); 2) VU University, Amsterdam (The Netherlands); 3) Cardiff University (UK); 4) Imperial College London (UK);5) Trinity College Dublin, Ireland); 6) Texas A & M University (USA); 7) Christian Albrecht University Kiel (Germany); 8) Utrecht University (The Netherlands); 9) Royal Netherlands Institute for Sea Research, Texel (The Netherlands).

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Project

06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentation: Oral

Session: H2DEEP

Mineralogy and Geochemistry of Loki's Castle Arctic Vents: significance to the Deep Biosphere

Barriga, Fonseca, Dias, Pinto
Creminer FCUL LA/ISR, University of Lisbon and Univ Evora

We are investigating the possibilities of identifying a hydrothermal component in sedimnents, and their mineralogical and chemical compositions relevant to the microbial population of the sediments. The mineralogy of chimneys and other hydrothermal vents structures are being studied

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Project
06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentation: Oral
Session: H2DEEP

Geochemistry of hydrothermal fluids and rift valley sediments of the Loki's Castle vent field at the ultra-slow spreading southern Knipovich Ridge

Tamara Baumberger (1), Gretchen L. Frueh-Green (1), Rolf B. Pedersen (2), Ingunn H. Thorseth (2), Marvin D. Lilley (3), Stefano M. Bernasconi (1)
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The rift valley of the ultra-slow spreading southern Knipovich Ridge in the Norwegian-Greenland Sea (73°N) is partly buried by a thick sediment cover. These glacial and post-glacial sediments (12-20 ky), derived from the nearby Bear Island fan, likely act as a thermal and hydrogeological boundary to heat and fluid flow and influence hydrothermal fluid compositions. Geochemical studies of the rift valley sediments and the hydrothermal vent fluids at Loki's Castle, a black smoker vent field discovered during the H2Deep 2008 Expedition, provide insights into the origin of the hydrothermal fluids and their interaction with the sediments. Here we present an overview of preliminary data on the carbon and sulphur geochemistry of the sedimentary and hydrothermal components at Loki's Castle and compare these with other sedimented and unsedimented mid-ocean ridge hydrothermal systems. The vent fluids have a pH of ~5 and are characterized by elevated concentrations of hydrogen and methane. Ammonia concentrations are also high compared to unsedimented ridge environments and point to a sedimentary input. Vent fluid S-isotope data reflect mixing of a MORB source with sulphide derived from reduced seawater sulphate. d13C values of dissolved inorganic carbon are depleted relative to mantle carbon values, consistent with an organic carbon input. Our preliminary data suggest that buried rift valley sediments may significantly contribute to the Loki's Castle hydrothermal fluids. Thus, Loki's Castle likely reflects a unique three-component-hydrothermal system: Fluid – Basalt – Sediments.

Short gravity cores of the rift valley sediments have relatively constant organic carbon contents (TOC) of ~0.5 wt%, but are locally as high as 1.5 wt%, and yield d13C values typical of marine organic matter. In two cores north of Loki's Castle, extracted sediment pore fluids show an increase in alkalinity and DIC concentrations and a decrease in sulphate concentration associated with isotopic heavy sulphate-sulphur with increasing burial depth. The d13C values of DIC show a clear depletion with increasing alkalinity and DIC concentrations. These compositions reflect enhanced diagenesis and degradation of organic matter in this area.

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Project
06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral

Session: MOCCHA

Mediterranean climate and hydrographic variability in the last millennium from high-resolution oxygen and carbon isotope records from the Gulf of Taranto.

S.M. Bernasconi*1, A.L. Grauel1, I. Müller1 K. Zonneveld2, G. Versteegh2 and G. De Lange3

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Previous studies of sediment cores from the Gulf of Taranto have shown that this location has a great potential for climate reconstructions at high resolution, because of the high sedimentation rates and the reproducibility of geochemical signals in cores collected in different parts of the Gallipoli shelf (e.g. Castagnoli et al. 1990). Available oxygen isotope records of the planktonic foraminifera G. ruber for the last 2000 years and of alkenone temperatures for the last 1300 years (Versteeg et al. 2007) shows significant variations that are well correlated with other global and local climatic signals. To verify the robustness of these climate signals we analyzed a new short core reaching back to 1300 AD for the isotopic composition of G. ruber (white and pink variety) and U. Mediterranea. Based on these new records we will discuss the correlation with other climate archives and their relation to changes in Northern Hemisphere temperatures, in hydrological regime in the alpine region and in the circulation of surface waters in the eastern Mediterranean. These new data allow to distinguish a significant anthropogenic influence in the signals of the last 100 years, but also provides a strong support that the ongoing studies on long cores have the potential to provide robust reconstructions climate change at (sub)decadal resolution fro the entire Holocene.

Castagnoli GC et al. 1990, GRL, 17, 1937-1940.

Versteeg et al. 2007, G3, DOI. 10.1029/2006GC001543

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Project
06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Poster
Session: Not Applicable

Temperatures variations in the upper water column over the last 1000 years in the Charlie Gibbs Fracture zone.

Thomas Bouinot, Elsa Cortijo, Catherine Kissel, Elisabeth Michel, Aline Govin, Laurent Labeyrie
LSCE/IPSL, Laboratoire des Sciences du Climat et de l'Environnement (CEA-CNRS-UVSQ)

Recent oceanographic measurements show that the Atlantic Meridional Overturning Circulation (AMOC) fluctuated in a decadal period of time (Hansen et al, nature, 2001). The cause of these fluctuations is still poorly understood and available observations are too limited in time (last decades) to properly investigate all the mechanisms responsible for these fluctuations.

On the other hand, the AMOC is an important component for oceanic heat transport from low to high latitudes and most of the ocean heat is mainly contained in the first few hundred meters of the water column. Variability of the oceanic heat content can be related to variability of the AMOC through model simulations.

In order to extend to the past the available informations on AMOC and heat content fluctuations, we reconstruct here the variability of the sea temperature in water column (the main thermocline) during the Holocene and particularly in the last 1000 years. We study marine sediment core MD08-3182 CQ (52°41.99'N 35°56.15'W, 3757m) collected on board of RV Marion Dufresne as part as the IMAGES program. This core is located in the main pathway of the Gulf Stream, in the Charlie Gibbs Fracture Zone. The upper water column temperature is reconstructed by geochemical analysis (stable isotopes, trace elements) on planktonic and deep-dwelling foraminifera. We will present preliminary results showing such temperature variations over the last 1000 years.

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Project

06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral

Session: MOCCHA

How dinoflagellate cysts from the Po-river discharge plume provide information about annual variations in temperature and precipitation in the Italian region during the last two centuries

Liang Chen, Karin A.F. Zonneveld
Fachbereich-5, Geowissenschaften, Universität Bremen

The apparent rise in global temperature during the second half of the last century continues to fuel world-wide discussions about the causes and effects of global climate change. Although it is obvious that human activity influences the natural system, large uncertainties remain about to what extent human activity is responsible for the current climate change. This is partly due to our poor understanding of the exact magnitude and effects of natural climate forcing mechanisms. One way to enlarge this understanding is to compare climatic and environmental change prior to the human-induced increase in greenhouse gasses with those of the last 100 years. For this, long, continuous, well dated, high temporal resolution records have to be studied covering both pre-industrial and industrial climate change. To date, such records are extremely rare but recently unique sediment cores have been recovered from both the Golfo di Taranto (Eastern Mediterranean) that fulfil these requirements.

Within this paper we will present the first results of high detailed study on this material by presenting a reconstruction of environmental change of the last 200 years on annual resolution. Based on the variability in the organic dinoflagellate cyst associations of multicore GeoB 10709-5 (39° 45.39' N, 17° 53.57' E, water depth 172.3m), we reconstruct short term climatic steered cyclic changes in Po-river discharge and discharge of the local eastern Italian rivers. Apart from this, the variation in cyst associations reflects short term changes in upper water temperatures and bottom water oxygen concentrations. We will start a discussion about the possible mechanisms behind the observed short term eastern Mediterranean climate perturbations.

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Project
06-EuroMARC-FP-005 / Response of tropical Atlantic surface and intermediate waters to changes in the Atlantic meridional overturning circulation (RETRO)

Presentation: Oral

Session: Not Applicable

Glacial to Holocene weathering patterns across tropical Africa: implications for the dynamics of the tropical rainbelt

James Collins, Stefan Mulitza, Matthias Zabel, Rik Tjallingii, David Heslop, Trond Dokken, Enqing Huang, Andreas Mackensen, Jun Tian, Michelle Zarriess, Gerold Wefer

Marum and Department of Geosciences, University of Bremen, Bremen, Germany Institute for Geosciences, University of Kiel, Kiel, Germany Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany Bjerknes Centre for Climate Research, Bergen, Norway Laboratory of Marine Geology, Tongji University, Shanghai 200092, PR China

Large expanses of subtropical Africa are prone to rainfall fluctuations, as exemplified by the 1968-1988 Sahel drought (1). It is thus important to understand the mechanisms likely to influence African rainfall in the future. Most of the rain in tropical and subtropical Africa is delivered by the rainbelt, a band of rain which oscillates seasonally between ~20°N and ~20°S. The distribution of rainfall is determined by the latitude, the width and the intensity of the rainbelt.

Alternating wet and dry conditions in Africa during the Late Pleistocene and Holocene are often attributed to displacement of the average latitudinal position of the rainbelt. However, this mechanism is not consistent with new climate records (2, 3), which suggest that drought in Africa occurred at the same time in Northern and Southern Hemispheres.

Soil type in Africa is primarily dominated by weathering intensity and hence rainfall intensity (4). This is because mobile elements such as K, Na and Ca are dissolved and removed during weathering whilst immobile elements such as Fe, Al are left behind, forming clays (5). Here, we use (Fe+Al)/K of bulk hemipelagic sediments as an index of weathering intensity.

Samples were taken from 8 sediment cores spanning a N-S transect from 21°N to 17°S off the West coast of Africa in order to chart the dynamics of the rainbelt. We analyse 4 timeslices: Last Glacial Maximum, Heinrich Stadial 1, mid-Holocene and Recent. Results suggest that latitudinal displacement of the rainbelt only takes place during the Holocene and that the cause of drought in Africa during Heinrich Stadial 1 and the Last Glacial Maximum is mostly associated with changes in the width and intensity of the rainbelt.

	In addition, we also plan to use stable carbon isotopes of plant waxes from the same N-S transect to indicate changes in vegetation type across Africa. 1. S. E. Nicholson, Global and Planetary Change 26, 137 (2000). 2. J. E. Tierney et al., Science 322, 252 (October 10, 2008, 2008). 3. E. Schefuss, S. Schouten, R. R. Schneider, Nature 437, 1003 (2005). 4. FAO/IIASA/ISRIC/ISSCAS/JRC, FAO, Rome, Italy and IIASA, Laxenburg, Austria, (2009). 5. J. J. Middelburg, C. H. van der Weijden, J. R. W. Woittiez, Chemical Geology 68, 253 (1988).

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Project

06-EuroMARC-FP-002 / Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic (CARBONATE)

Presentation: Oral

Session: CARBONATE

West Rockall Trough carbonate mounds; what are they made off and how did they get there?

Henk de Haas*, Furu Mienis*, Norbert Frank^, Thomas O. Richter*, Reinhold Steinacher*, Henko de Stigter*, Cees van der Land*, Martin White[%], Gerard Duineveld[@], Marieke van de Vorstenbosch*, Tjeerd C.E. van Weering*,[#]

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Giant (up to 380 m high, several km in diameter, often in clusters) cold-water coral covered carbonate mounds are present at the W Rockall Trough margin (NE Atlantic Ocean). An extensive dataset consisting of box- and piston cores, benthic lander observations, CTD measurements, sea bed photographs and video recordings, seismic profiles, penetrating echo sounder lines and multibeam bathymetry was used to investigate the formation of these mounds.

The local hydrographic setting, being tidal currents and internal waves, play an important role in the supply of food to the cold-water corals. The coral framework acts as a sediment trap. In this way the sedimentation rate is locally increased which results in the formation of the mounds. However, the shelter effect of the coral branches does not fully prevent the resuspension of particles, organic as well as inorganic. Resuspension of fresh organic matter even plays an important role in the food supply to the corals. In this way the food is made available several times, giving the corals more than one change to collect it.

Up to 90%, or more, of the sediments consist of calcium carbonate. In the order of 70% of the mound sediments is locally produced material (coral debris and other biogenic carbonate). The remainder is of mainly pelagic origin (pelagic foraminifera, pteropods, very small terrigenous fraction, etc.). In contrast, the non-mound sediments consist of pelagic foraminifera and siliciclastic sands. Often with ice rafted debris of various size classes (sand to boulders).

Although the sedimentation on the mounds seems to be fairly continuous during the Holocene, on a longer time scale (glacial-interglacial cycles) hiatuses of up to 200,000 years are observed. These probably reflect periods of non-deposition or erosion, related to glacial-interglacial variability.

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Project
06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral

Session: CRP Meeting

Introduction to **M**ultidisciplinary study **O**f **C**ontinental/ocean **C**limate dynamics using **H**igh-resolution records from the eastern mediterrane**A**n (MOCCHA)

De Lange G.J.(1), Versteegh G.(2), Zonneveld K.A.F.(2), and Bernasconi S.M. (3)

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The MOCCHA project aims to study high-resolution paleoclimate with high-frequency variations, in continuous marine records with sufficient time resolution. In addition, MOCCHA will compare such settings for a nearcoastal high-sedimentation rate site and a deep-marine anoxic, laminated site. Such records are rare but vital for our understanding of causes and consequences of climate and environmental change at decadal to millennial time scales. Our initial studies at the two contrasting sites seem to provide a continuous marine paleo-climate record for the near-coastal site that permits such high-resolution and well dated climate reconstructions for at least the last few kyrs. Cores for the MOCCHA project have been collected during the pre-Moccha ESPRESSO cruise with RV Universitatis and CAPUCCINO cruise with RV Poseidon, followed by the DOPPIO cruise with RV Pelagia. The cores recovered and studied thusfar appear to contain largely laminated sediments (submillimetric) down to 10 kyr.
We will introduce the sites with existing and recently published evidence and supplement these with preliminary results for both sites obtained during these cruises. All of these are aimed to illustrate their suitability for high-resolution studies of paleoclimate , i.e. for future IODP drilling.

This work is supported by the EUROMARGINS Programme of the European Science Foundation; NWO.817.01.002 MOCCHA project).

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Project

06-EuroMARC-FP-005 / Response of tropical Atlantic surface and intermediate waters to changes in the Atlantic meridional overturning circulation (RETRO)

Presentation: Oral

Session: RETRO

Progress and further plans in RETRO

Tisserand, A. and Dokken, T
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Atlantic Meridional Overturning Circulation (AMOC) transports warm and salty surface waters from Tropics to high-latitudes, where deep-water forms and returns southwards ventilating deep- and intermediate waters. Reconstructing changes within the tropical thermocline and intermediate and deep-waters circulation can potentially solve the mechanisms linking high and low-latitudes climate changes and could better constrain our understanding in how the tropics may balance the thermohaline transport to high latitudes.

Modeling study of climate scenario has shown unexpected anomaly variations in warm temperature changes at tropical thermocline about 3ºC during periods of reduced AMOC [Manabe and Stouffer, 1997] (Figure 1). As a part of this strategy, we aim to reconstruct tropical thermocline changes during the past. Consequently, we need best possible calibration methods to reproduce water mass properties and to detect the amplitude of the typical modern tropical thermocline at the Brazilian Atlantic margin.

Benthic foraminifera composed by carbonate shells preserve environmental properties of seawaters [Rosenthal et al., 1997]. The method used to map the thermocline gradient in the western tropical Atlantic is to use the concept of Magnesium/Calcium (Mg/Ca) on bottom water living foraminifera as a representation of temperature at site. In order to track the thermocline gradient dynamics in the western tropical Atlantic, the ratio of Mg and Ca recorded in benthic foraminifera shells is used in this study as proxy of temperature in the deep ocean. Knowing the function of modern representation of thermocline defined by Mg/Ca, we can use this concept to map thermocline deepening/shallowing in the past.

The present study is based on seven species of benthic foraminifera with different microhabitat being analyzed from the core-top sediments, retrieved during the R/V “G.O. SARS” - RETRO cruise, along a transect from 600 to 1000 meters depth corresponding to a bottom temperature range from 6 to 4ºC and represent the lower part of present day thermocline level. Mg/Ca are obtained from samples cleaned using oxidative steps and measured on a ICP-OES. For the calibration we used a set of CTD (Conductivity Temperature Depth sensors) casts and oxygen isotopic temperature to provide an estimate of thermocline depth penetration in modern climate.

Recent studies have revealed that the carbonate chemistry of ambient water could exert an important control on the incorporation of Mg during shell growth, even if temperature seems to be the most important parameter controlling the incorporation of Mg [Elderfield

	et al., 2006; Healey et al., 2008; Yu and Elderfield, 2007]. Depending on the foraminiferal species, we examined the sensitivity of the different species in how they response to temperature at site and the carbonate ion saturation effect on Mg/Ca ratios.

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Project
06-EuroMARC-FP-003 / The last deglacial sea-level and climatic changes. Coral reef records in the south Pacific: Tahiti (French Polynesia) - IODP Expedition #310 –, Australian Great Barrier Reef – IODP Proposal #519. (CHECREEF)

Presentation: Oral

Session: CHECREEF

New chronological constraints on the radiocarbon calibration: 14C and U-series dating of corals drilled offshore Tahiti (IODP Expedition 310)

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The correction of radiocarbon ages from the fluctuations of the atmospheric 14C production through time is essential for the 14C dating method. These fluctuations may be estimated by comparing raw 14C measurements with true calendar ages derived from independent dating methods such as the accurate and precise chronology given by the U-Th method. Beyond 12 ka BP, fossil corals are the most suitable and reliable archive that has been used to establish the radiocarbon calibration curve.

The cross dating of fossil shallow-water tropical corals drilled offshore Tahiti (IODP Expedition #310) was performed by 14C and U-Th methods in order to improve and to extend the current 14C calibration curve, especially beyond 13,800 years BP which is the oldest U-Th age obtained on drill cores extracted onshore in the Tahiti barrier reef [1]. Data from the marine record such as those obtained on corals are converted to the atmospheric equivalent with a site-specific marine reservoir correction.

Before 14C and U-Th analyses, rigorous screening criteria have been applied in order to select pristine aragonitic coral skeletons and avoid those displaying any post-mortem diagenesis that alters original ages. In particular, we made a significant effort to improve detection and quantification of very small amount of secondary calcite in the aragonitic coral lattice using X-ray diffraction measurements [2]. In addition, we apply a strict screening criterion based on $\delta 234U$. However, the new Tahiti dataset allow to refine the previous tolerance range previously adopted by Hughen et al. [3].

The 14C results obtained on Tahiti corals presented here are compared to 14C chronologies from other corals, those of Barbados and those from other Pacific islands (Moruroa, Vanuatu, Marquesas, Christmas), and also to the Cariaco basin varve chronology [4]. Reconstructions of atmospheric $\Delta 14C$ for the deglacial period has also been done and results are discussed in front of Lake Suigetsu sediment [5, 6] and Bahamian speleothem records [7].

[1] Bard et al. 1996, Nature, 382, 241.

	[2] Sepulcre et al. 2009, Global and Planetary Change 66, 1. [3] Hughen et al. 2004, Radiocarbon 46, 1059. [4] Hughen et al. 2004, Radiocarbon 46, 1161. [5] Kitagawa and van der Plicht 1998, Science 279, 1187. [6] Kitagawa and van der Plicht 2000, Radiocarbon 42, 370. [7] Beck et al. 2001, Science 292, 2453.

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Project
06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentation: Poster
Session: not applicable

Carbonate formation in ultramafic-hosted hydrothermal environments and its implications for subseafloor mixing processes

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The ultramafic-hosted Logatchev Hydrothermal Field (LHF) on the Mid-Atlantic Ridge and the Arctic Gakkel Ridge (GR) feature carbonate precipitates in voids and fractures of different types of host rocks. Chemical (Sr/Ca, Mg/Ca, REE) and isotope compositions (d18O, d13C, 87Sr/86Sr) were used to examine the conditions of their formation. Our data reveal that different processes have led to the precipitation of carbonates in the various settings. Seawater-like 87Sr/86Sr ratios for aragonite hosted in serpentinite from the LHF are similar to those of aragonite from the GR and indicate aragonite precipitation from seawater at ambient conditions. Aragonite veins in sulfide breccias from LHF also have seawater-like Sr isotope compositions, but their REE patterns show a clear positive europium (Eu) anomaly indicative of a small (<1%) hydrothermal contribution. In contrast, dolomite from the LHF has precipitated at much higher temperatures (~100°C), and its 87Sr/86Sr ratios are only slightly lower than those of aragonite. Even higher temperatures are calculated for the precipitation of calcite in serpentinite-talc fault shists from north of the LHF. These calcites show unradiogenic 87Sr/86Sr ratios indicative of precipitation from evolved hydrothermal fluids. A mixing model (based on Sr mass balance and enthalpy conservation) indicates strongly variable conditions of fluid mixing and heat transfers involved in carbonate precipitation. Dolomite precipitated from a mixture of 97% seawater and 3% hydrothermal fluid that should have had a temperature of ~14°C assuming that no heat was transferred. The higher apparent precipitation temperatures based on oxygen isotopes may be indicative of conductive heating, probably of seawater prior to mixing. In contrast, the calcite in the fault shist has precipitated from a mixture of 67% hydrothermal fluid and 33% seawater, which should have had an isenthalpic temperature of ~250°C. The much lower temperatures calculated from oxygen isotopes are likely due to conductive cooling of hydrothermal fluid discharging along faults. REE patterns corroborate the results of the mixing model, since the hydrothermal calcite, which precipitated from waters with the greatest hydrothermal contribution, has REE patters that closely resemble those of vent fluids from the LHF. This demonstrates, for the

	first time, that precipitation from pure seawater, conductive heating of seawater, and conductive cooling of hydrothermal fluids in the subseafloor all can lead to carbonate precipitation within one single ultramafic-hosted hydrothermal system.

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Project

06-EuroMARC-FP-003 / The last deglacial sea-level and climatic changes. Coral reef records in the south Pacific: Tahiti (French Polynesia) - IODP Expedition #310 –, Australian Great Barrier Reef – IODP Proposal #519. (CHECREEF)

Presentation: Oral

Session: CHECREEF

Pronounced interannual ENSO variability in tropical Pacific temperatures at the end of the last glacial

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The response of interannual climate variability in the tropical Pacific Ocean to future greenhouse warming plays a crucial role in climate model simulations. However, the dominant mode of Pacific atmosphere-ocean variability on interannual timescales, the El Niño-Southern Oscillation (ENSO), is poorly understood with respect to its behaviour under boundary conditions different from today. For last glacial conditions, model simulations and rare proxy records of interannual climate variability in the Pacific are contradictory. Here we present a monthly resolved reconstruction of tropical South Pacific climate from 15,000 years ago at the end of the last glacial. This period was characterised by substantial cooling in the North Atlantic Ocean and a reduction in the strength of the Atlantic Meridional Overturning Circulation (AMOC) in response to massive iceberg discharge associated with Heinrich event 1 (H1), conditions even more extreme than during the last glacial maximum (LGM). Our Sr/Ca palaeotemperature record constructed from a fossil coral recovered by Integrated Ocean Drilling Program (IODP) Expedition 310 to Tahiti indicates pronounced interannual ENSO variability, even though the site is only weakly influenced by ENSO today. The results suggest that interannual ENSO variability in the tropical South Pacific was strong during H1, consistent with climate model simulations suggesting that a weakening of the AMOC can lead to an intensification of ENSO variability. The coral Sr/Ca palaeothermometer indicates that mean sea surface temperatures in the tropical South Pacific were lower by not more than 3.5 °C relative to today at 15,000 years ago (by ~2-3 °C when seawater Sr/Ca changes are considered), with no change in seasonality. Our results suggest that strong interannual ENSO variability is characteristic for periods of reduced AMOC under glacial boundary conditions.

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Project

06-EuroMARC-FP-002 / Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic (CARBONATE)

Presentation: Oral

Session: CARBONATE

The early diagenetic behaviour of cold-water carbonate mound systems in deep environments

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Sub-recent cold-water carbonate mounds localized in deeper slope settings on the continental margins can not be any longer neglected in the study of carbonate systems. They clearly play a major role in the dynamics of mixed siliciclastic-carbonate and/or carbonate-dominated continental slopes. Recent studies emphasize the importance of early diagenesis overprinting the primary environmental record (e.g. aragonite dissolution) (Foubert & Henriet, 2009) in such systems. However, the extent of early diagenetic and biogeochemical processes shaping the petrophysical nature of mounds is until now not yet fully understood. Understanding the functioning of a carbonate mound as biogeochemical reactor triggering early diagenetic processes is necessary for the reliable prediction of potential late diagenetic processes.

Early differential diagenesis overprints the primary environmental signals, with extensive coral dissolution and the genesis of small-scaled semi-lithified layers in the Ca-rich intervals in Challenger Mound, drilled during IODP Expedition 307 aboard the R/V Joides Resolution (Foubert & Henriet, 2009). The low cementation rates compared to the extensive dissolution patterns can be explained by an open-system diagenetic model. Moreover, Pirlet et al. (subm.) emphasizes the occurrence of gypsum and dolomite in another mound system (Mound Perseverance) in Porcupine Seabight, which might be also related with fluid oxidation events in a semi-open system. Along the Moroccan margins, fluid seepage and fluxes in pore water transport affect the development of mound structures, enhancing extensive cold-water coral dissolution and precipitation of diagenetic minerals such as dolomite, calcite, pyrite, etc. (Foubert et al., 2008). However, no obvious relation between cold-water coral growth and seepage is observed. The early diagenetic processes as observed in Challenger mound and in mounds along the Moroccan margins are compared with other drilled mound structures, such as in Purcupine Seabight, Porcupine Bank and Rockall Bank (van der land et al., subm.). Recent carbonate mounds provide indeed an excellent opportunity to study early diagenetic processes in carbonate systems

	without the complications of burial and/or later meteoric diagenesis. Refining the geochemical signatures of the sediments helps to quantify the effects of early diagenetic processes, which change the geophysical and petrophysical characteristics of a carbonate mound and have an impact on the preservation of primary environmental signals. References Foubert, A., & Henriet, J.P. (2009) Nature and Significance of the Recent Carbonate Mound Record: The Mound Challenger Code. Lecture Notes in Earth Sciences, Vol. 126. Springer, 350 pp. ISBN: 978-3-642-00289-2. Foubert, A., Depreiter, D., Beck, T., Maignien, L., Pannemans, B., Frank, N., Blamart, D. & Henriet, J.P. (2008) Carbonate mounds in a mud volcano province off northwest Morocco: key to processes and controls. Marine Geology, 248, 74-96. Pirlet, H., Wehrmann, L., Brunner, B., Frank, N., Dewanckele, J., Van Rooij, D., Foubert, A., Swennen, R., Naudts, L., Boone, M., Cnudde, V. and Henriet, J.P. (submitted) Diagenetic formation of gypsum and dolomite in a cold-water coral mound in the Porcupine Seabight, off Ireland. Sedimentology Van der land, C., Mienis, F., De Haas, H., Frank, N., Swennen, R. and Van Weering, T.C.E. (submitted) Diagenetic processes in carbonate mound sediments at the southwest Rockall Trough margin. Sedimentology.

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Project
06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral

Session: MOCCHA

Geochemical composition of surface samples from the SW Adriatic Sea and the Gulf of Taranto (Southern Italy) and a comparison with sub-recent sediments.

Goudeau, M-L.S.; Ní Fhlaithearta,S.; Robert,B.,De Lange;G.J, Leider,A; Chen,L.; Zonneveld.K.A.F.;Versteegh,G.J.M; Schmiedl, G.

The Mediterranean is a key area for (paleo-) climate studies. It lies between low and mid-latitudes and is influenced by both the monsoonal and NAO climate systems. At the Gulf of Taranto, Southern Italy, sites with relatively high sedimentation rates can be found, giving possibilities to study short time-scale climate variability in the area. To clearly understand this variability it is necessary to improve our knowledge on correlations between environmental variability in the area and the geochemical composition of sediments. The potential sources for the inorganic fraction of the sediment is the Po river suspension and suspension coming from smaller Italian rivers embouching into the Adriatic and Taranto Gulf. For this study, 47 surface samples distributed from the SW Adriatic sea into the Taranto Gulf region have been analysed for major and trace elemental composition using ICP-OES, for bulk organic C/N, d13C and d15N. Distinct patterns occur, indicating strong correlations between redox elements (a.o. Fe, Mn) and oxygen penetration levels as indicated by Manganese porewater profiles. Organic C/N, d13C and d15N seem to be influenced largely by waterdepth in particular in the Taranto Basin. Their distribution is basically in agreement with sediment colour (Schmiedl, 2006), benthic foraminiferal productivity indicators, dinoflagellate cysts and temperature values based on TEX 86 (Leider, 2009). Furthermore a clear distinction can be made between the east and west side of the Gulf of Taranto. These correlations are then used to explain variations in a multi-core (NU04-MC) from the Taranto region. For some elements, the surface sediment variability is at least as large as for the depth-related changes at one site. Preliminary results show that possible climate-related sub-recent sediment variability in the Gulf of Taranto (Multi-core NU04-MC) is clearly detectable using a combination of geochemical proxies. In addition, a major shift is observed in the topmost part of the sediment, probably representing the last 100 to 150 years. The latter most likely is not only climate but also pollution related.

Eastern Mediterranean high resolution paleoclimate investigations using finely laminated sediment : preliminary data

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Sediments from the Gulf of Taranto area, southern Italy, offer the

	possibility to very high resolution paleoreconstructions of the eastern Mediterranean climate variability (MOCCHA project). Riverine waters, with the Po river as its main contributor, are streaming south-eastward in the Adriatic along the eastern Italian coastline,before entering the bay of Taranto and discharging their suspended material as sediments on the shelves. Multicore GeoB 107-39-03 was taken in 2006, in the central part of the straits of Otranto, south Adriatic, on a potential monitoring site for input variability of continental waters to the Gulf of Taranto. The sediment exhibits on its total length sub-milimetric scale laminae potentially connected to high-frequency climate/hydrology variability. Conventional geochemical analyses were carried out on discrete samples (XRF, ICP-OES, organic C/N, 13C), and a novel technique was used to investigate the sediment chemistry at the laminae scale: the sediment has been resin-impregnated to enable laser ablation coupled to ICP-MS analyses (LA-ICP-MS). This powerful method recently developed at the University of Utrecht (Jilbert et al., 2008) permits extremely high resolution geochemical profiling of the laminated sediment, to unravel the forcing mechanisms generating the laminae.

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Project

06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral

Session: MOCCHA

Temperature and Salinity reconstruction based on planktic foraminifers from a long core section from the Gulf of Taranto, Mediterranean Sea – Status report of the MOCCHA project

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The MOCCHA Project (Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean) aims at reconstructing climate change from high sedimentation rate sediments in the Gulf of Taranto. Here we present the first results of a long core taken during the DOPPIO cruise in 2009 in the Gulf of Taranto in the northwestern Ionian Sea. The detailed sedimentological description, high-resolution XRF scan and a preliminary age model based on an AMS 14C dating of the long core confirm the relatively constant and homogenous sedimentation in the research area which is comparable to former studies on shallow water cores in the Gulf of Taranto. Based on the preliminary age model we chose a first section (800BC to 800AD) of the long core and sub-sampled it using a resolution of 2.5mm. In a first step we measured the bulk carbonates of this section to get an impression of the environmental and climatic conditions during the time interval between 800BC and 800AD in the Gulf of Taranto.

For the oxygen and carbon analysis of planktic foraminifers we carried out a calibration with an extensive set of sediment surface samples taken during the CAPPUCCINO cruise in 2006 along the southern Italian coast. With the help of this calibration we are able to evaluate the reconstruction of past temperature and hydrography conditions in the Gulf of Taranto from sediment cores. For the calibration, we measured the oxygen isotope composition of benthic and planktic foraminifers and compared them to seasonal satellite-based sea surface temperature maps and water column profiles, as well as to a set of water samples from the Gulf of Taranto in order to be able to estimate the effect of salinity on the $\delta 18O$ of foraminifers. The results indicate that the planktic foraminifers, while being highly affected by different salinity distributions within the water masses (which are in turn due to the circulation patterns and pathways of major water masses), record a signal for summer temperature conditions. As a next step we will analyze the oxygen and carbon isotope composition of Globigerinoides ruber (white) from the long core section to reconstruct the temperature and the salinity in the Gulf of Taranto for the time interval between 800BC and 800AD.

Core top calibration of temperature proxies along the Southern Adriatic coast

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Here we present the results of an extensive set of sediment surface samples, taken during the CAPPUCCINO cruise in 2006, along the southern Italian coast. The goal of this study is to calibrate multiple temperature proxies and evaluate their potential for reconstructing past temperature and hydrography conditions of the southern Adriatic Sea from sediment cores. We measured alkenones and the oxygen isotope composition of benthic and planktic foraminifers and compare them with seasonal satellite-based sea surface temperature maps and water column profiles, as well as with a set of water samples from the Gulf of Taranto, to estimate the effect of salinity on the δ18O of foraminifera. - The alkenones closely reflect spring temperature conditions with a gradient to colder conditions near the coast, whereas planktic foraminifers give a signal for summer temperature conditions.

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Project

06-EuroMARC-FP-003 / The last deglacial sea-level and climatic changes. Coral reef records in the south Pacific: Tahiti (French Polynesia) - IODP Expedition #310 –, Australian Great Barrier Reef – IODP Proposal #519. (CHECREEF)

Presentation: Poster

Session: Not applicable

Formation of post-glacial Tahitian coral reef-microbialites (IODP 310)

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The genesis of voluminous microbial carbonate crusts, so-called microbialites in the coral reefs off Tahiti (up to 80 vol. % of the cores) is still under discussion. The co-occurrence of oligotrophic corals with microbialites, which are believed to preferentially form in nutrient-rich environments, has previously led to the assumption that the microbialites are considerably younger than the encrusted coral framework. Microbialites have been suggested to have formed in deeper storeys of the reef edifice or to represent a disturbance of the reef ecosystem.

Here, we study IODP 310 cores comprising the deglacial (last sea-level rise) reef-succession, represented by coral framework encrusted by coralline algae and microbialites. The cores have been drilled in drowned Pleistocene to Holocene barrier reefs seaward of the modern fringing reefs off the volcanic island of Tahiti. Lipid biomarker analysis and the study of δ13C values of the bulk organic matter and specific lipid biomarkers (iso- and anteiso C15:0 and C17:0 fatty acids) indicate that mainly sulphate-reducing bacteria were responsible for microbialite formation. Sulphate reducers are able to induce carbonate precipitation by increasing alkalinity. Trace elemental studies (LA-ICP-MS) and the fact that voluminous deglacial reef-microbialites are restricted to volcanic islands suggest that moderately or possibly episodically elevated nutrient-rich conditions caused by elevated sediment influx from the basaltic island of Tahiti promoted the growth of phototrophic primary producers, which provided the organic matter for sulphate reduction. Microbioerosion patterns of endolithic chlorophytes in microbialites and layers of microbialite intercalated with red algal thalli reveal a photic setting during the whole period of microbialite development. Based on these observations, only a short time interval elapsed between coral growth and subsequent microbial encrustation during times of rapid sea-level rise. Accordingly, radiocarbon dating yielded almost identical ages for corals and microbialites, which agrees with continuous microbialite formation in the photic zone immediately below the reef-top. Hence, the Tahitian microbialites are suggested to be syngenetic components of the reef environment.

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Project

06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Invited Lecture

Session: RETRO

Surface and Deep Water Hydrography on Gardar Drift (Iceland Basin) during the Last Interglacial Period

DA Hodell
University of Cambridge

Changes in surface and deep-water hydrography were inferred from variations in stable isotopes and sortable silt mean grain size, respectively, on the southern Gardar Drift in the subpolar North Atlantic. The bathymetric δ13C gradient during the penultimate glaciation was similar to the last glaciation with high- δ13C Glacial North Atlantic Intermediate water above ~2000 m, and low- δ13C water derived from the Southern Ocean below. During Termination II, low-δ13C water was present throughout the water column with minimum values at intermediate depths (~1500-2000 m) and below 3000 m. This pattern continued well into the early part of the Last Interglacial (LIG) period. Sortable silt mean size at 3275 m suggests that deep-water circulation on Gardar Drift was relatively weak during the earliest part of the LIG (128 to 124.5 ka) when planktonic δ18O was at a minimum, reflecting warming and/or reduced salinity. We suggest that low- δ13C water and slow current speed on Gardar Drift during the early part of the LIG was related to increased melt water fluxes to the Nordic Seas during peak boreal summer insolation, which decreased the flux and/or density of overflow to the North Atlantic. The resumption of the typical interglacial pattern of strong, well-ventilated Iceland Scotland Overflow Water was delayed until ~124 ka. These changes may have affected Atlantic Meridional Overturning Circulation.

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Project

06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentation: Poster

Session: Not applicable

Catalytic Hydrogen Evolution from Ni-Cysteine Complex and its Implication in Origin of Life

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It is believed that the most probable circumstance for the origin of life was in the hydrosphere of the early Earth, when the oceans were dominated by sulfides. Transition metals Fe and Ni are proposed to have played key roles in this process. In this work, the Ni-cysteine cluster is studied in sea water by square wave voltammetry. In addition to the formation of Ni monocomplex of cysteine, evidence of the formation of multi-nuclear species of nickel and cysteine is observed. A catalytic hydrogen wave is produced in the presence of Ni(II) and cysteine at -1.53 V. The reaction mechanism of the hydrogen evolution from nickel cysteine cluster appears to mimic the catalytic mechanism of the NiFe hydrogenases, which catalyses the reverse reaction of hydrogen oxidation in most lives including hyperthermophiles, arguingly representing the earliest form of life on Earth. The finding extends previous knowledge on similar reactions from only occur in physiological conditions to pH = 8 in natural sea water system. It suggests that Ni-thiol substance could have played important roles in the emergence of life in the sea water and supports the chemoautotrophic theory of the origin of life that nickel, together with iron, as a central component.

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Project
06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Poster
Session: Not Applicable

The Relationship between North Atlantic Deep Water (NADW), climate, and the Greenland Ice Sheet during the Penultimate Interglacial (MIS 5e)

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ABSTRACT NOT RECIEVED

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Project

06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentation: Oral

Session: H2DEEP

Microbial Diversity in Deep-Sea Sediments: Influence of Volcanism and Hydrothermal Activity

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The influence of volcanism and hydrothermal activity on microbial diversity in deep sea sediments is largely unknown. However, it could be speculated that the input of chemical compounds from such activity will have a huge influence on the microbial community composition. Volcanic and hydrothermal activity is mainly located at or near the mid-ocean ridges where low sedimentation rate in combination with ocean-floor spreading prevents accumulation of significant amounts of sediments. However, the arctic Knipovich ridge with its ultra-slow spreading and vicinity to continental margins and the Bear island fan, and thus a relatively thick sediment cover within the rift valley, is a unique sampling site. Several gravity cores (3-4 metres deep) retrieved from the area surrounding the Loki's castle hydrothermal vent field during the H2DEEP cruise 2008 have been analysed by a XRF scanner for geochemical composition. In addition, total inorganic and organic carbon contents (TIC and TOC) of the sediment and the pore water chemistry (e.g. ammonium, sulphide, sulphate, major elements) from distinct layers in each core has been analysed. In order to relate these data to microbial function and diversity, cell numbers (archaea and bacteria) have been estimated by real time qPCR. Further, the diversity in each layer is being analysed using massive parallel sequencing of the 16S rDNA region. Preliminary results indicate a dynamic system with relatively high organic carbon content where iron, manganese, ammonium and sulphur compounds is likely to play important roles in microbial metabolism. Cell numbers seem to decline with depths but with great variation between layers separated only by a few centimetres. There is likewise great variation between the ratio of archaea and bacteria cell numbers, but with no obvious controlling factor.

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Project

06-EuroMARC-FP-002 / Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic (CARBONATE)

Presentation: Oral

Session: CARBONATE

Palaeo-environmental variability in Holocene cold-water coral reefs in Stjernsund, northern Norway

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Cold-water coral reef mounds are widely distributed in the Atlantic Ocean and adjacent seas. In the Norwegian Sea the reef forming scleractinian coral Lophelia pertusa occurs on the shelf and in fjords with a deep-water connection to the open shelf. The coral mounds in Stjernsund (70°N) thrive close to the known northern biogeographic boundary of Lophelia, which is situated around Sorøya and Stjernøya, in the West Finnmark District. The 30-km-long and 3.5-km-wide Stjernsund, formed as an east-west oriented glacial trough, comprises a deep-water connection to the open shelf to the west as well as via the Altafjord to the east. The prominent coral mounds are situated on a Late-Glacial terminal moraine forming a sill at 260 to 235 m water depth. The adjacent through (~500 m depth) to the east is dominated by muddy postglacial sediments. The sill-crest comprises a current-swept environment, influenced by tides and ambient water temperatures between 5 and 6°C. The currents provide a steady nutrient flux and inhibit sedimentation.

During RV Poseidon cruise POS-325 in summer 2005, a series of gravity cores have been taken in an east-west transect across the sill, to investigate the geological and climatic history of these coral mounds. This transect comprises pro-glacial debris-flow deposits and glaciomarine-rhythmites CHECK overgrown by corals on the western flank of the sill, and postglacial coral mound deposits across the sill crest as well as on the eastern flank. Several of these Holocene on-mound cores show the contact with the underlying till of the terminal moraine. Additionally a core has been taken in the postglacial trough deposits to the west. These cores are investigated in a multi-proxy approach covering carbonate budgeting, biodiversity, sedimentological, geochronological and palaeoceanographical analyses, as well as measurements of physical core properties, like XRF-scans, gamma ray, magnetic susceptibility. This project is rooted at the GeoZentrum of the University of Erlangen (GZN) and is complemented by studies of a team of international scientists from several European countries (ESF-CARBONATE).

One of the key-aspects within this project comprises the investigation of the foraminiferal assemblages, biodiversity and stable isotopes, to reconstruct paleoceanographic and environmental changes. The focus has been set on the on-mound core POS-325-472, recovered at 262 m water depth on the moraine crest, as well as on the off-mound core POS-325-482, recovered at 479 m water depth in the fjord-basin. Both cores have been dated at high-resolution with AMS-14C or U/Th and provide two contemporaneous archives spanning the entire

	Holocene. Stable oxygen and carbon isotopes of benthic foraminiferal tests as well as faunal assemblages are used to trace climatic and environmental changes across the last ~10 ka. Oxygen isotope compositions (δ18O) of benthic foraminifera indicate deep-water renewal, while their stable carbon isotope compositions (δ13C) are used as a proxy for organic matter flux and for oxygen availability within the sediments. Changes in the faunal assemblages will further trace variations in current velocity, climate, nourishment and seafloor-oxygenation, but will also be used to characterize differences between on- and off-mound communities.

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Project

06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Poster

Session: Not Applicable

Holocene Variations in the Strength of the North Atlantic Deep Water, at the Charlie-Gibbs fracture zone (first results from the AMOCINT cruise)

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During the MD168-AMOCINT-IMAGES cruise which took place on board the R. V. Marion Dufresne (French Polar Institute) in 2008, a casq core has been taken at 52°45'N in the Charlie-Gibbs Fracture Zone (CGFZ). The CGFZ is bathed by the Iceland-Scotland overflow water (ISOW) after this water mass flows southwestward along the Gardar drift and it is at the place where it turns westward, heading back northward along the western side of the Reykjanes ridge. This core (MD08-3182) is therefore ideally located to monitor changes in the deep NE Atlantic circulation related to changes in the strength of ISOW.

The radiocarbon ages obtained on a previous core taken from the same basin are transferred to core MD08-3182 using the similar magnetic susceptibility. The average sedimentation rate through the Holocene is about 1m/kyr and therefore allows to define centennial-scale oceanographic variations. Unfortunately, a turbidite is present in the sequence between 2.6 and 4.9 m.b.s.f and masks part of the record.

Full magnetic analyses has been performed on this core. The main magnetic carrier is magnetite in the pseudosingle domain range. As for the other cores along the path of the ISOW, the magnetic material most likely originates from the northern basaltic province and it is transported to the site by bottom currents.

Long term and short-term fluctuations are observed both in the magnetic concentration and in the magnetic grain size. These fluctuations will be discussed together with those observed in the sortable silt fraction measured in the same sequence. The most prominent short term feature is approximately dated at 8.6 kyr B.P. and it is characterized by a very significant decrease in magnetic concentration and magnetic grain size and by a fining in the sortable silt fraction. Additional radiocarbon datings are needed but this would illustrate a significant decrease in the bottom current strength, maybe related to the 8.2-8.4 kyr events.

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Project
06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Oral
Session: AMOCINT

Rapid Centennial Scale Reductions in North Atlantic Deep Water During the Peak of the Last Interglacial Period Recorded in Sediments From the Eirik Drift

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One key uncertainty in future climate projections involves changes in the ocean meridional overturning circulation (MOC) and its response to possible increases in freshwater fluxes in a warmer future. The peak of the previous interglacial period (MIS 5e) has a number of elements in common with our projected future—much of the North Atlantic was warmer, the Greenland ice sheet was smaller, and sea level was higher than at present. Thus, a detailed characterization of North Atlantic Deep Water (NADW) properties and circulation during this period is instrumental for constraining the potential sensitivity of NADW to possible future warming and freshening of the North Atlantic. Here we present new high-resolution records of near surface and bottom water properties spanning MIS 5e from a core site on the Eirik Drift south of Greenland (Core MD03-2664 cored during the IMAGES P.I.C.A.S.S.O cruise of the R/V Marion Dufresne of the French Polar Institute). The site lies at 3440m, just below the main axis of the sediment laden Western Boundary Undercurrent (WBUC) and is optimally situated for recording changes in newly formed NADW—the deep, southward flowing branch of the MOC. We use δ13C and δ18O of benthonic foraminifera (C. wuellerstorfi) to reconstruct deep water chemical and physical properties, while near surface water properties are reconstructed using planktonic δ18O records (N. pachyderma sinistral). Due to the extreme accumulation rates at this location our records provide a sub-centennially resolved (~20 yr sample spacing) depiction of deep water and surface climate evolution spanning peak MIS 5e. Our preliminary results show gradually increasing benthonic δ13C values through MIS 5e, not reaching modern NADW values until the second half of the interglacial. Superimposed on this long term trend are distinct large-amplitude (>1 permil) reductions in benthic δ13C. These δ13C decreases are affected rapidly and last no more than a few of centuries before recovering rapidly to background values. The first two, and the most distinct, of these low carbon isotope excursions occur early in MIS 5e and are initiated during the two lowest intervals in our planktonic oxygen isotopic records. Taken together our results suggest that the influence of NADW was briefly but strongly curtailed at our site during the interval of MIS 5e when surface waters south of Greenland were their warmest/freshest.

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Project

06-EuroMARC-FP-003 / The last deglacial sea-level and climatic changes. Coral reef records in the south Pacific: Tahiti (French Polynesia) - IODP Expedition #310 –, Australian Great Barrier Reef – IODP Proposal #519. (CHECREEF)

Presentation: Poster

Session: Not Applicable

Freshwater geochemistry and its impact on reef growth and reef alteration

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In two sampling campaigns, a series of surface water and mixing zone waters from the mouths of Tahitian rivers have been collected in November 2007 and in August 2009. Analyses of the samples include major elements, nutrients and stable isotopes measurements.

The overall mineralization of the freshwater samples is very low (between 10-460 µS), which is due to the high precipitation amount (up to 8500 mma-1) and the low residence times in the freshwater system. All freshwater samples are undersaturated in respect to aragonite/calcite and therefore could potentially dissolve the reef carbonates offshore Tahiti.

Calculating a simple water balance according the climatic data of Tahiti and surface water runoff, we can estimate the potential amount of submarine groundwater discharge (SGD). SGD is likely on Tahiti because of the high hydraulic gradient, which is induced by the steep relief. Using the geochemical model PHREEQC, the modeling results give us the maximum quantity of Ca-carbonates, which could be dissolved under equilibrium conditions. In the August 2009 campaign we will focus on sampling the SGD.

Among the existing samples, water from the mixing zone is especially interesting. We can track the pathways and the mixing amount using stable isotope data and conservative tracers like sodium and chlorine. These findings illustrate, whether the dissolved compounds behave conservative according to mixing or if there are geochemical processes with the solid phase.

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Project

06-EuroMARC-FP-009 / Tropical temperature history during Palaeogene global warming events (GLOW)

Presentation: Oral

Session: GLOW

First results of the GLOW cruise offshore Tanzania

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Global warming (GLOW) is rapidly becoming a societal problem. Prediction of climate feedbacks, temperature, and the circulation state of the ocean is very difficult. Geological records give a significant framework to improve predictions in response to greenhouse warming. Past global greenhouse warming events can be regarded as analogues for the current warming event, and these past warming events can thus be used to improve prediction on the future state of the oceans. The Paleogene part of the geological record represents a climatically dynamic period in Earth history including rapid global warming events. Geological evidence for these warming events is sparse in the tropical realm, although Tanzania onshore geological sequences contain well preserved records of these Paleogene warming events. Offshore Tanzanian geological sequences, however, have not been explored as yet for drilling. The GLOW project collected basic information on seismic sequences to understand the basic geological structures and basin infill offshore Tanzania. Sediment cores were retrieved from the sea bed in areas where older reflectors crop out, to obtain ages of the sediments. We successfully explored the Davie Ridge and in-shore areas for seismic sequences by sailing a comprehensive network of seismic lines. We identified potential drilling sites for future drilling using the seismic network. We conclude that the GLOW deliveries provide sufficient seismic and basic stratigraphic information to support a full proposal for drilling in the area within the International Ocean Drilling Program.

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Project

06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral

Session: MOCCHA

New insights: Biomolecular proxies and recent environmental conditions along the Southern Italian shelf

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The Southern Italian shelf has great potential for high-resolution paleoclimate reconstructions due to undisturbed sedimentation rates of 0.06 cm per year enabling a temporal resolution of 4 years (e.g., Versteegh et al., 2007 and references therein). In order to further exploit these archives of paleoenvironmental information, we need to establish an understanding of the mechanisms controlling the preservation of climatic signals in this complex sedimentary system nowadays. Here we present results of an organic geochemical study of a grid of surface sediment samples along the SW Adriatic coast and the Gulf of Taranto in the framework of the EuroMARC program project MOCCHA. These samples integrate recent conditions such as sea surface temperature (SST), algal ecology, changes in land vegetation, surface productivity and the regional hydrology.

Lipid biomarkers in the study area originate from marine and terrestrial sources with only little lateral variability with respect to their relative distribution. The contribution of terrestrial OM is reflected by prominent long-chain n-alkanes and n-alcohols. The carbon preference index (CPI) of n-alkanes implies at least two distinct sources, which will be substantiated by compound specific isotope analyses of carbon and hydrogen and examination of the BIT Index.

The marine fraction of OM is best represented by short-chain n-alkanes (C17, C19, C21), a mixture of C26 to C29 sterols, alkenones, phytol and dinosterol. Alkenone-derived SSTs are in consensus with satellite derived temperatures, and reflect largely the colder season when maximum production and export of haptophyte biomass is fueled by maximum intensity of the Western Coastal Adriatic Current (WACC) that delivers nutrient-rich and cold near-coastal surface waters. In contrast, temperatures following the recently developed organic geochemical proxy TEX86 revealed, that production of Crenarchaea occurs during summer at open ocean sites. Consequently, seasonality seems to play a crucial role in transferring the temperature signal into the sediment and should not be neglected for other biomarkers.

The multi-biomarker data are evaluated in concert with external datasets such as historic records of SST seasonality, satellite data of chlorophyll distribution and salinity to further reveal processes and mechanisms affecting export, transport and accumulation of OM. The resulting understanding of mechanisms involved in the formation of

	the sedimentary biomarker signals at the Southern Italian shelf provides a solid basis for unraveling the paleoenvironmental history of the region at sub-decadal resolution.

Core-top calibration of biomolecular proxies to recent environmental conditions along the Southern Italian shelf

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Continental shelf areas play an important and dynamic role for the accumulation and distribution of autochthonous and allochthonous organic matter (OM) (Prahl et al., 1994, Goñi et al., 2000). Furthermore, due to generally high sedimentation rates these areas may harbor promising sites for paleoenvironmental studies at high temporal resolution.

The Southern Italian shelf has great potential for such high-resolution paleoclimate reconstructions due to undisturbed sedimentation rates of 0.06 cm per year enabling a temporal resolution of 4 years (e.g., Versteegh et al., 2007 and references therein]. In order to further exploit these archives of paleoenvironmental information, we need to establish an understanding of the mechanisms controlling the preservation of climatic signals in this complex sedimentary system nowadays. Here we present results of an organic geochemical study of a grid of surface sediment samples along the SW Adriatic coast and the Gulf of Taranto in the framework of the EuroMARC program project MOCCHA. These samples integrate recent conditions such as sea surface temperature (SST), algal ecology, changes in land vegetation, surface productivity and the regional hydrology.

Lipid biomarkers in the study area originate from marine and terrestrial sources with only little lateral variability with respect to their relative distribution. The contribution of terrestrial OM is reflected by prominent long-chain n-alkanes and n-alcohols. The carbon preference index (CPI) of n-alkanes implies at least two distinct sources, which will be substantiated by compound specific isotope analyses of carbon and hydrogen in combination with examination of lignins and the BIT Index.

The marine fraction of OM is best represented by short-chain n-alkanes (C17, C19, C21), a mixture of C26 to C29 sterols, alkenones, phytol and dinosterol. Alkenone-derived SSTs are in consensus with satellite derived temperatures, and reflect largely the colder season when maximum production and export of haptophyte biomass is fueled by maximum intensity of the Western Coastal Adriatic Current (WACC) that delivers nutrient-rich and cold near-coastal surface waters. Consequently, seasonality seems to play a crucial role in transferring the temperature signal into the sediment and should not be neglected for other biomarkers.

In this study, multi-biomarker data will be examined in concert with external datasets such as historic records of SST seasonality, satellite data of chlorophyll distribution, salinity, and foraminiferal derived temperatures to further reveal processes and mechanisms affecting export, transport and accumulation of OM. The resulting

	understanding of mechanisms involved in formation of sedimentary biomarker signals at the Southern Italian shelf will inform our studies of paleoenvironmental variability at ultra-high resolution.

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Project

06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentations: Oral

Session: H2DEEP

Transition metal isotope fractionation in hydrothermal iron-sulphide deposits

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Transition metal isotope compositions in natural samples may be used to unravel prevalent reaction conditions (e.g. temperature, pH, oxidizing versus reducing environment) or even to distinguish between inorganic and biogenic reactions, through which these samples formed. Deep-sea hydrothermal vent fields provide an opportunity to investigate both inorganic and microbially-mediated precipitations, because of the high abundance and diversity of microorganisms living in these systems. Previous investigations of Fe isotope ratios in hydrothermal sulphides show significant variations in the isotopic composition of different sulphide minerals. Although much is known about fractionation processes of Fe isotopes in hydrothermal vent systems, data on fractionation processes of Cu and Zn isotopes are so far scarce.

Hydrothermal iron-sulphide deposits as well as microbially induced iron oxide-hydroxide deposits of the Mohns and the Knipovich Ridges, North-Atlantic Ocean, shall be investigated. From the results it is anticipated to better understand reaction pathways of fluids in hydrothermal vent systems, and the reactions and processes that take place during percolation and rise of hydrothermal fluids within the oceanic crust. Furthermore, a better understanding of different sulphide precipitation reactions on and within chimney walls is aimed at. Systematic differences in the Fe, Cu, and Zn isotope composition of deposited iron-sulphides and iron oxide-hydroxides will hopefully also allow to distinguish between inorganically and microbially induced metal precipitation.

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Project

06-EuroMARC-FP-005 / Response of tropical Atlantic surface and intermediate waters to changes in the Atlantic meridional overturning circulation (RETRO)

Presentation: Oral

Session: RETRO

Late Quaternary evolution of the African rain belt: Relation to ocean circulation and Saharan dust emissions

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Rainfall over tropical Africa depends on the intensity, width and latitudinal position of the tropical rainbelt that oscillates seasonally between about 20°N and 20°S. For example, precipitation in West Africa was at least 50% greater in the 1950s and early 1960s than in the subsequent dry decades. The transition to the dry period was associated with a threefold increase in Saharan dust production and widespread famine. Instrumental records suggest that dry/wet periods are triggered by changes in the large-scale distribution of sea surface temperature which is, among other factors, influenced by the heat transport due to the Atlantic meridional overturning circulation. However, due to the shortness of the observational record, the influence of the large scale ocean circulation on tropical rainfall is still elusive. Based on proxy records of several marine sediment cores from the West African continental margin, I will review links between ocean circulation, African precipitation, and Saharan dust generation.

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Project
06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Oral
Session: AMOCINT

High-resolution productivity changes during MIS 5 at mid-latitudes and its relation to Meridional Overturning Circulation

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About one-fifth of the photosynthesis on Earth is carried out in the oceans by diatoms, phytoplankton found worldwide where enough nutrients and light are available. Diatoms play a crucial role in the global carbon cycle since a significant portion of long-term atmospheric CO2 change is driven by variations in biological productivity. Variations in the interactions between marine ecosystems, ocean circulation, external forcing and atmospheric greenhouse gases concentrations are likely to produce natural climate oscillations, but these variations are not yet fully represented in detailed models of the glacial-interglacial transitions. Understanding the sub-orbital scale variability of past productivity over interglacial cycles will help to quantify the parameters needed to run comprehensive climate models, and subsequently help to better predict climate change for the near future.

A high-resolution study of productivity, bottom water flow speed, surface and deep-water mass, bottom water ventilation, and terrestrial input changes during the Marine Isotope Stage (MIS) 5, and partially the MIS 4 and 6, at an open ocean site approximately 300 km west off Portugal [Calypso piston core MD01-2446: 39°03'N, 12°37'W, 3547 m water depth] was conducted within the AMOCINT project.

Even though siliceous productivity (dominated by diatoms), based on opal analyses, is expectedly low for this location (less than 1%) it shows a robust and consistent pattern with increased values during cold phases of MIS 5, and during the glacial stages 4 and 6. The opal record is fully supported by the organic carbon content. Given that this core is located far from the continent, productivity records at this location should mainly reflect local open ocean conditions, and therefore variations in light and nutrient availability. The benthic d13C record suggests less NADW coincident with periods of higher productivity. The probable enhancement of AABW during these periods may also account for a higher preservation of siliceous biogenic particles at the ocean floor sediment/water interface. The deep-water strength, inferred from grain-size analysis, is not coherent between the cold water phases of MIS 5, and the MIS 4 and 6.

The direct correlation between cold stadial phases of MIS 5, with productivity suggests light and higher nutrient availability, during these periods. Given that this site has a privileged geographical location, as potentially it may also preserve the signal of punctual coastal processes from upwelling filament plumes at the Estremadura Plateau, the coastal upwelling processes could also account for higher

	productivity observed for glacial periods. However, Lebreiro et al., 1997, reported in a near location of the Tore seamount, the dominance of pre-upwelling and post-upwelling related foraminifera species during MIS 6 implying less intense or persistent upwelling during MIS 6 than MIS 4. On the contrary, opal data reveals a clear increase in productivity also during MIS 6, reinforcing the idea that productivity variations at this location are likely related to open ocean conditions and therefore, related to Northern hemisphere summer insolation, wind driven surface ocean mixing, and Meridional Oceanic Circulation. References: Lebreiro, et al., Paleoceanography, 12, 718-727, 1997.

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Project

06-EuroMARC-FP-011 / Ultraslow spreading and hydrogen based deep biosphere (H2DEEP)

Presentation: Oral

Session: Not Applicable

Low-temperature alteration of ultramafic rocks and microbial life

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The microbial diversity associated with the weathering of ophiolite-hosted, serpentinized ultramafic rocks on the island Leka, Mid-Norway, has been studied by microscopy, molecular analyses and culturing of the percolating groundwater and fracture-filling minerals. The results show that this highly alkaline environment supports a rich endolitic microbial life.

Groundwater collected from a 50 m deep borehole had higher pH, higher TOC, and lower cell number and colony forming units compared to groundwater from surface seepages.

Molecular analyses and cultures obtained from the surface seeps showed bacteria affiliating with Bacteriodetes, and alpha-, beta-, and gamma-Proteobacteria. In groundwater from the borehole only sequences that affiliated with beta- and gamma-Proteobacteria were detected. Molecular analyses of relatively thick (>3 mm) fracture fillings from 15–20 cm below the rock surface revealed a rich microbial community, where sequences from microorganisms related to Acidobacteria, Actinobacteria, Bacteriodetes, Cyanobacteria, Deinococcus, Planctomycetes, alpha-, beta-, gamma-Proteobacteria, Crenarchaeotae, Ascomycota including lichens, and Chlorophyta were detected. Isolates from these fractures were closest related to members of Actinobacteria, Firmicutes, alpha and beta-Proteobacteria and Ascomycota. In thin (<2 mm) fracture fillings from 20–160 cm below the rock surface, only sequences which related to prokaryotic organisms were detected. The closest relatives were uncultured clones belonging to Crenarchaeota, Acidobacteria, Actinobacteria, Firmicutes, Nitrospirae, and alpha-, beta- and gamma-Proteobacteria. Enrichments from these fractures are not performed. The community composition indicates that the energy yielding metabolic processes in the wide, surface-near fractures are both photosynthesis and low-temperature water-rock interactions. In the thinner and deeper fractures our detection of bacterial sequences affiliating to hydrogen-, iron- and manganese-oxidizing bacteria indicates that molecular hydrogen and reduced manganese and ferrous iron produced by low-temperature water-rock reactions are oxidized by these bacteria in energy yielding chemosynthetic processes. In addition many sequences have high similarity to C1- and hydrocarbon –degrading bacteria

Elevated levels of H2 and CH4 have been detected in the water from the 50 m borehole. The results show that the endolithic community is not reflected in the groundwater.

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Project

06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Poster

Session: Not Applicable

Holocene changes in coccolith assemblages and its hydrographic implications south of the Azores Islands

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The presented study is conducted in the framework of the AMOCINT project and aims to reconstruct the variability of primary production in the Azores Current during Interglacials and relations to Atlantic Meridional Overturning Circulation (AMOC). Assessing paleoproductivity is essential for understanding natural climate variability because of its impact on atmospheric CO2 concentrations via the oceanic carbon pump.

Here we focused on productivity of coccolithophorids, one of the three major primary producers in modern oceans and possibly the major constituent of sedimented particles at the investigated site south of the Azores Islands (37,999°N; 31,1283°W). The core location is situated underneath the Azores Current and the associated Azores Front. Together they form the northern margin of the low productive North Atlantic Subtropical Gyre (NASG) and mark a transition zone to the more productive higher latitudes. Hence changes in the productivity recorded at the coring site should reflect the latitudinal expansion of the two different productive zones or changes in the nutrient source.

To reconstruct primary production we investigated the relative abundance of individual coccolithophorid taxa and their concentration in the sediment. Furthermore we analyzed alkenone concentrations as a proxy for coccolithophore paleoproductivity. The alkenone saturation ratio (Uk'37) is used to monitor sea surface temperatures (SST). High resolution XRF corescanner data are used to determine the biogenic fluxes in the area, which show a strong decrease of biogenic silica production during the late Holocene, whereas carbonate productivity seems to be less affected.

Our census data show major shifts in the coccolith flora pointing to drastic changes in the surface ocean primary productivity and ecology during the Holocene. Because of our preliminary age model the age and duration of events are not well constrained. Nevertheless a major shift is present at approximately 80 cm core-depth (~ 8 ka BP) as revealed by the relative abundance of E. huxleyi, G. muellerae and F. profunda. This change is caused by a transition from cooler and nutrient-rich conditions to a warmer and more oligotrophic regime. These results are corroborated by isotopic measurements on planktic foraminifers. Furthermore the oligotrophic conditions during the latter part of the Holocene seem to be displayed in the accumulation rate of the coccoliths. Altogether this indicates an increasing influence of the NASG at the core location. A similar shift in the relative abundance of E. huxleyi and G. muellerae have been reported by several authors from the northern North Atlantic, which raises the

	question if this is a basin wide event. Beside this longer-term trend during the latter part of the Holocene we notice a shorter period of relatively cold conditions following a short general warming trend at the base of the Holocene, given the age model uncertainties.

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Project

06-EuroMARC-FP-003 / The last deglacial sea-level and climatic changes. Coral reef records in the south Pacific: Tahiti (French Polynesia) - IODP Expedition #310 –, Australian Great Barrier Reef – IODP Proposal #519. (CHECREEF)

Presentation: Oral

Session: CHECREEF

Microbialite development patterns of last deglacial reefs of Tahiti (French Polynesia)

Claire Seard(1), Gilbert Camoin(1), Yusuke Yokoyama(2,3), Nicolas Durand(1), Hiroyuki Matsuzaki(4), Pierre Deschamps(1) and Edouard Bard(1)

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The widespread occurrence of microbialites in the last deglacial reef frameworks (16-6 Ka BP) implies that the study of their development pattern is necessary for understanding the evolution both of post-glacial reef architecture and growth through time.

The present study, based on the sedimentological and chronological analysis (14C AMS dating) of drill cores carried out on the successive terraces occurring on the modern reef slopes from Tahiti (IODP Expedition #310 « Tahiti Sea Level »), provides a comprehensive data base to investigate the microbialite growth patterns (e.g. growth rates and habitats), to analyze their roles in the reef frameworks and to reconstruct the evolution of the reef framework architecture.

The last deglacial reefs from Tahiti are composed of two distinctive biological communities which were characterized by a similar scenario of development throughout the sequence, involving a diachronous development and a lack of direct competition. The coralgal communities composed of seven assemblages characterized by various growth forms (branching, robust branching, massive, tabular and encrusting) formed the initial frameworks, while microbialites developed in the primary cavities of those frameworks, a few meters below the living reef surface, where they heavily encrusted the coralgal assemblages. The offset between the growth of coral assemblages and the development of microbialite crusts ranges from 100 to 600 years.

The development of microbial crusts was controlled by the volume and the shape of the primary cavities of the initial reef frameworks determined by the morphology and the packing of coral colonies. The highest microbialite development occurred in frameworks dominated by branching, thin encrusting, tabular and robust branching coral colonies which built loose and open frameworks typified by a high

	porosity (> 50%). In contrast, their development is minimal in compact and low porosity (~30%) coral frameworks formed by massive and thick encrusting corals where primary cavities could not host a significant microbialite development. The reconstruction of the evolution of reef architecture and growth patterns through time is of prime importance to reconstruct accurately the reef response to sea-level variations and environmental changes.

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Project

06-EuroMARC-FP-003 / The last deglacial sea-level and climatic changes. Coral reef records in the south Pacific: Tahiti (French Polynesia) - IODP Expedition #310 –, Australian Great Barrier Reef – IODP Proposal #519. (CHECREEF)

Presentation: Oral

Session: CHECREEF

The Timing of Termination II: Results from IODP Expedition 310 "Tahiti Sea Level"

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U/Th dating of fossil corals recovered during IODP Expedition 310 "Tahiti Sea Level", are used to place constraints onto the timing of the penultimate deglaciation. We find that the onset of sea level rise must have occurred prior to traditional forcing hypotheses that tie deglaciations to northern hemisphere insolation with a constant phase relationship. We also observe evidence for millennial time-scale fluctuation of sea level during deglaciation.

We also present a novel sample preparation procedure for U/Th measurements in shallow water corals. This method has allowed the identification of MIS 9 corals from which the constraints on the subsidence rate of tahiti can be improved.

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Project
06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Oral
Session: MOCCHA

Lipid geochemistry and high resolution environmental reconstruction

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Lipids preserved in sediments are increasingly applied to reconstruct of past climate and environment by means generating high resolution time series of lipid concentrations, lipid ratios and/or lipid isotopic composition. Like any other set of proxies also lipid-based proxies not only the conditions during formation but also are modified by taphonomic processes transport and preservation. Possibilities, limitations and recent developments of the lipid-based approach will be discussed.

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Project

06-EuroMARC-FP-008 / Atlantic Meridional Overturning Circulation During Interglacials (AMOCINT)

Presentation: Oral

Session: AMOCINT

Variability of the Azores Current over the Holocene, last glacial termination and at the end of the last interglacial

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The AMOCINT project explores the interglacial variability of the state of Atlantic Meridional Overturning Circulation at selected sites along the North Atlantic warm water routes. In this frame we are exploring interglacial hydrographic variability of the Azores Current, a branch of the Gulf Stream forming the northeastern rim of the North Atlantic subtropical gyre. The Azores Current system is generally considered as fairly stable with respect to its latitudinal position, even under full glacial conditions. Sites MD 3180 and KF 16 from the MAR (38°N, 31°08´W) thus offer to test hypotheses of subtropical salt accumulation in the western Atlantic as a potential mechanism to re-establish AMOC after reductions induced by disturbances in the subpolar North Atlantic.

Planktonic stable isotope and Uk37´ records of cores MD 3180 and KF 16 (38°N, 31°08´W) reveal large-scale and rapid sea surface temperature (SST) fluctuations by as much as 5-6°C over the last deglacial period. Pronounced coolings are linked to a freshening in the range of 0.5 psu. Concurrence with times of well known reduced AMOC strength at the Oldest and at the Younger Dryas thus contrasts patterns in the source area of the Gulf Stream in the western subtropical North Atlantic showing coeval temperature and salinity increase. Our records suggest a southward shift of the Azores Current and a far south extending cool and fresh watermass in the eastern subtropical Atlantic.

For the remainder of the Holocene SST and SSS in the Azores Current remained indeed fairly stable with small-scale SST fluctuations of 1-2°C superimposing a long-term warming trend. Interestingly, no major change is found for the 8.3 k event which is clearly documented in the deepwater record of the site.

SST fluctuations in the area of the Azores Current at the end of MIS 5e into 5d may have been of similar magnitude as the deglacial ones as indicated by high planktonic d18O amplitudes of and strong variability of carbonate contents.

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Project
06-EuroMARC-FP-002 / Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic (CARBONATE)

Presentation: Oral

Session: CARBONATE

Cold-water coral carbonate mounds as palaeoenvironmental recorders: an analysis of the lithic record

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Cold-water coral carbonate mounds form common features at intermediate water depth on the European, African and American continental margins. They can be several hundred metres tall and more than a kilometre across. Features are both exposed at the seabed and buried within upper seismic sequences.

The ESF-CARBONATE project aims to recover complete mound sequences through a range of carbonate mounds in different settings and elucidate the timing and factors controlling carbonate mound genesis, generate a robust carbonate mound development model for different environmental setting and estimate the influence of climate change in carbonate mound development. In addition, CARBONATE will derive palaeoenvironmental signals from carbonate mound sequences and assess the role of cold-water coral carbonate mounds in the global carbon cycle.

The ESF-CARBONATE has recovered long and complete mound sequences through a range of carbonate mounds in different settings on a latitudinal gradient from Mauritania to northern Norway. We present preliminary results from contrasting cores from the Mauritanian and north Norwegian margins. Results show changes in lithic infill of coral frameworks in response to changes in palaeoenvironmental conditions.

A COLD-WATER CORAL CARBONATE MOUND PALAEOCLIMATE ARCHIVE: ANALYSIS OF THE LITHIC RECORD (IODP EXP. 307)

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During IODP Expedition 307 Challenger Mound, one of the large (~155 m high) cold-water coral mounds along the NE Atlantic continental margin (Porcupine Seabight), was successfully drilled. The complete recovery of this carbonate mound's sedimentary sequence provides us for the first time with material documenting the entire mound development process and is therefore crucial in our quest to unravel the mechanisms driving and maintaining the build-up of these bio-geological systems.

Changes in the hydrodynamic and sedimentary regime are suggested as amongst the main controls on cold-water coral mound evolution (e.g. Rüggeberg et al., 2007). Therefore, in this study high-resolution (siliciclastic) particle size analyses and their end-member modelling (Weltje, 1997), in conjunction with additional data (XRD, foraminiferal assemblages, grain surface textures), are chosen as primary tools for disentangling the different sedimentary contributors to the Challenger Mound system and their palaeo-environmental implications.

The results, so far, enable the differentiation and identification of 4 sets of sediment producing and transporting mechanisms. Based on the presence and intensity of these mechanisms distinct variations in the hydrodynamic environment can be observed throughout the entire mound sequence, which are inferred to be (predominantly) climatically steered. A clear and significant shift in sedimentation and/or preservation style can be noted around 22-23 mbsf, supporting and refining the two-phase mound development model proposed by Kano et al. (2007), who located a significant (~1 Ma) "mound crisis" around this depth. A higher resolution palaeo-record appears to be located below this "mound crisis", in the lower part of the mound (23- 155 mbsf), rather than above, revealing the potential of cold-water coral mounds as intermediate water depth, continental margin, Early-Mid Pleistocene palaeo-archives. Furthermore it seems that the specific role of cold-water corals in these sedimentary systems may be primarily in stabilisation and preservation of the matrix records.

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Project
06-EuroMARC-FP-004 / Multidisciplinary study of continental/ocean climate dynamics using high-resolution records from the eastern Mediterranean (MOCCHA)

Presentation: Poster

Session: Not Applicable

Dinoflagellate cysts from the Po-river discharge plume reflecting temperature and river discharge in the Italian region (MOCCHA Project)

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Continuous marine high-resolution climate records with sufficient time resolution are needed to detect high-frequency variations in paleo-climate. Such records are rare but vital for our understanding of causes and consequences of climate and environmental change at decadal to millennial time scales. The eastern Mediterranean Sea is particularly sensitive to climate change and within the EuroMark fundet project MOCCHA (Multidisciplinary study Of Continental/ocean Climate dynamics using High-resolution records from the eastern mediterraneAn) we intent to obtain detailed information about short term climate perturbations in climate at annual to decadal time resolution.

Recently unique sediment cores have been recovered from the Southern Italian Region that allow the reconstruction of climate in the region at this resolution. Pilot studies at these sites have revealed that these short term perturbations in climate involve either temperature or precipitation changes or a combination of both (Versteegh et al., 2007).

A way to determine the precipitation and temperature history of the Italian climate is to establish reconstructions of past variations in Po-river discharge and sea surface temperatures in the region. Fossil dinoflagellate cyst associations are very suitable tools to achieve this information as they reflect in detail changes in surface water salinity concentrations and upper water productivity as well as temperature. However, to do this precise information about the relationship between present day upper ocean environmental conditions and cyst association in modern surface sediment samples has to be established. To obtain this information we have studied the association of 48 sites in the middle and distal part of the discharge plume. The dinoflagellate cyst association reflects both upper and bottom water circulation. Four associations can be distinguished that are characteristic for the major oceanographic settings in the region. (1) River discharge association, (2) Warm water association (3) Oxygenated bottom water group (4) Golfo di Taranto group. The results from this study allow the reconstructions of past variations in Po-river discharge, Sea surface temperatures and bottom water circulation. As such they form the basis for future studies within the MOCCHA projects that are presented in this session as well as in session CL15.