

**Arctic Ocean Sciences Board:
National Reports**

Nuuk, Greenland 2010

GERMANY

Activity Name or Title:

LOTEVA-GS -Long term variability of the hydrographic structure, convection and transports in the Greenland Sea

Lead PIs, including e-mail addresses:

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Sponsoring Organization(s):

AWI, Bremerhaven, Germany

Date Initiated: 1999

Ending Date if known: -

Polarstern cruise ARK XXIV/1 in 2009

In the present state of the earth climate the northern North Atlantic is an important source for the deep water of the global ocean determining its circulation decisively. Dense water from the Nordic Seas and the Labrador Sea flows southward at depth and is substituted by a northward flow of warm water in the upper layers. The heat is released to the atmosphere and melts the polar sea ice, maintaining the present mild climate in Europe. Because of the global warming of the last 50 years and the predicted temperature increase in this century the current situation may change. The amplification of the hydrological cycle and the enhanced melting of the Greenlandic ice shield increase the fresh water input to the ocean. This may cause a reduction of the formation rate of deep water or even a total shut down with an impact on the evolution of the air temperature and on the sea surface height. A fresh water input event during the 90s has already led to a complete basin wide structural change in the Greenland Sea away from the classic deep water dome to a two layered structure which isolates the deeper layer effectively from atmospheric influences.

During Polarstern cruise ARK XXIV/1 both essential parts of LOTEVA-GS, i.e. mooring work (autonomously profiling CTD) in the central Greenland Basin and a zonal hydrographic transect with close station spacing along 75°N could be performed. Due to time constraints the transect was restricted to stations west of 5°E. Most important findings are:

- The isolation of the lower layer of the two story hydrographic structure is maintained in 2009.

- Winter convection reached to 1600 m and is combined with heat (and salt) loss of the ventilated layers, which which is - for the first time after a couple of years - in accordance with the classical idea of winter convection.

- It is impossible to construct a 'mean state' of the Greenland Sea in 2009 due to a laterally two parted structure which shows ventilated areas and areas dominated by Atlantic waters side by side.

Overall, the recent overwhelming influence of Atlantic Water inputs into the gyre is reduced in 2009, but it is at present unclear whether this will be a turning point of the development or only a pause of the trend.

A complete report is available electronically at the AWI Polarstern web sites.

Summary of planned work:

The project LOTEVA-GS will be continued in 2010 (Polarstern cruise ARK XXV/1), but will not be continued in the future.

Data: Mooring and station data will be available at PANGAEA (www.pangaea.de) after processing and calibration and can be obtained immediately from the PI.

Activity Name or Title: **Hotspot Ecosystem Research and Man's Impact on European Seas (HERMIONE) & Long term Observations of Mud volcano Eruptions (LOOME)**

Lead PIs, including e-mail addresses: Michael Klages (Michael.Klages@awi.de), Dirk DeBeer (dbeer@mpi-bremen.de)

Sponsoring Organization(s): AWI, Max Planck Institute for marine Microbiology, Bremen, EU funded projects HERMIONE and ESONET (demonstration mission LOOME)

Date Initiated: 1999

Ending Date if known: -

Summary of work accomplished:

The cruise leg ARK-XXIV/2 (Longyearbyen – Reykjavik) of *Polarstern* started on the 9th of July 2009 leaving the Adventfjord of Svalbard. The availability of a Remotely Operated Vehicle (ROV) was essential for the planned scientific work. The deep sea robot QUEST owned and operated by the Center for Marine Environmental Research (MARUM) at the University Bremen was onboard of *Polarstern* for the second time after 2007.

The work at sea started first at the AWI–HAUSGARTEN, a deep-sea observatory west of Svalbard at 79 degrees northern latitude and 4 degrees eastern longitude. Here, long-term studies and *in-situ* experiments have been carried out by the Alfred Wegener Institute since 1999. The observatory consists of 16 sampling stations covering a depth range of 1,000 to 5,500 meters. The ice conditions were moderate and had no impact on our station planning, except some influence at the central station and the most westerly stations at water depths between 5,000 and 5,500 m in the Molloy Deep. However, standard gears such as Multicorer, CTD, and water sampler (Rosette) could be used without problems.

During the second half of the cruise leg the implementation of a long-term observatory on the Norwegian margin was done. There, the Håkon Mosby Mud Volcano (HMMV) located at a water depth of 1,250 m on the SW Barents Sea slope is a priority target within the ESONET project. It is also a key site of the EU projects HERMIONE, MARBEF and the ESF EuroDeep programme CHEMECO. Liquefied mud, gas, and

geofluids rising from a seafloor depth of at least 3 kilometres, form a highly active mud volcano with a diameter of 1,5 kilometer characterized by permanent gas emission. PARASOUND profiles conducted during the cruise leg gave evidence for considerable gas emissions at various sites of the HMMV and temperature lance measurements across the inner part of the mud volcano helped us to locate the active centre of the HMMV. Here we measured temperatures at 1.5 m below seafloor of 30° Celsius, and an even higher temperature of 35° Celsius at 3 m sediment depth. Therefore, an important task of our work at HMMV was the installation of a long term observatory called LOOME (Long term Observations of Mud volcano Eruptions), because earlier investigations of MPI, AWI and IFREMER at HMMV have shown that fluid flow rates do not only control the distribution of chemosynthetic communities, but at the same time the stability of the hydrate system and gas emission. The first long-term measurement of sediment temperatures from September 2005 to June 2006 yielded evidence of several eruptive events, indicated by abrupt temperature increases of several degrees of Celsius within a few days. With the implementation of a long-term observatory it is envisaged to monitor the temporal variability at HMMV to follow the sequence of events before, during and after an eruption and to analyze their effects on gas hydrate stability, seafloor morphology and the distribution and colonization patterns of benthic communities.

Data: : Mooring and station data is available at www.pangaea.de, the complete cruise report can be downloaded at the Polarstern web site at www.awi.de.

Activity Name or Title: **East Greenland 2009**

Lead PIs, including e-mail addresses: (Wilfried.Jokat@awi.de)

Sponsoring Organization(s): AWI

Date Initiated: Jan 2009

Ending Date if known: Dec. 2012

Summary of work accomplished:

With RV Polarstern two long deep seismic transects off the Kong Oscar Fjord and in the centre of the Boreas Basin were acquired with 30 ocean-bottom seismometers. The purpose was to improve our understanding of the general deep velocity structure of the continental margin and the ultra-slow spreading crust in the Boreas Basin. In addition, GPS measurements were carried out by helicopters along the East Greenland coast up to 80°N to determine the current vertical movement of the Greenlandic coast. Along three long transects up to 50 heat-flow stations were performed in order to understand the thermal state of the basins, and the consequences for the observed sedimentary disturbances.

Summary of planned work:

We started in 2010 to analyse the geophysical data. Ph.D. students will be employed this year to conduct the data analysis. It will take another three years till the data are finally processed and interpreted.

Data:

Mainly ASCII and in seismic DISCO Format.

Activity Name or Title: **Fluxes through Fram Strait**

Lead PIs, including e-mail addresses: Eberhard Fahrbach, Eberhard.Fahrbach@awi.de

Sponsoring Organization(s): AWI, EU projects ACOBAR and DAMOCLES' (Developing Arctic Modeling and Observing Capabilities for Long-term Environmental Studies)

Date Initiated: August 1997

Ending Date if known: -

Summary of work accomplished: To quantify the inter-annual to decadal variation of volume, heat and salt fluxes through Fram Strait, an array of moorings is maintained since 1997 to measure currents, temperature and salinity. The year-round measurements were combined with hydrographic sections taken during the cruises. As in 2008, also in 2009 a glider mission was conducted in the framework of the. It contributes to the international Arctic-wide studies "ASOF", SAON and other acronyms.

The observations during summer 2009 showed again the decrease of the temperature of the northward flowing Atlantic Water after the record high in 2006.

Summary of planned work: The long-term flux programme in Fram Strait will be continued with a Polarstern cruise in summer 2010. 6 moorings, one of them containing an acoustic recorder for marine mammals in a cooperation with the NOAA Alaska Fisheries Science Center, and PIES (Pressure inverted echo sounders) will be exchanged and a hydrographic section and a glider mission will be carried out.

Data: Mostly processed, most data available at Pangaea.

Activity Name or Title:

Biology of marine benthic algae from Spitsbergen

Lead PIs, including e-mail addresses: Christian Wiencke AWI, Germany,
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Sponsoring Organization(s):

AWI, Bremerhaven, Germany

Date Initiated: 01.01.2007

Ending Date: 31.03.2012

Studies in 2009

Part of our expedition time was devoted to the investigation of the molecular mechanisms of adaption and acclimation to UV and temperature stress of the kelps *Saccharina latissima* and *Alaria esculenta* sporophytes and spores. We conducted short term exposure experiments with spores and sporophytes in different temperature culture rooms and in underwater devices exposed for 24 h at different depths in the water column of Kongsfjorden. Afterwards RNA was extracted and transported back to Bremerhaven for further gene expression analysis including microarray hybridisations. The results were exceptionally good and are presently further processed.

The second important experiment in summer 2009 focused on the lipid consumption process in *Alaria esculenta* spores and gametophytes. Therefore, we released *A. esculenta* zoospores and followed their germination and differentiation into gametophytes. Lipid samples were taken regularly to investigate the lipid composition and consumption over time and in each developmental stage. Furthermore, samples were taken for quantitative and qualitative phlorotannin analyses to determine variations during development of the gametophytes.

A third area of research was devoted to the depth zonation of benthic macroalgae in Kongsfjorden by use of the remotely operated vehicle (ROV) from IPEV. We recorded several profiles close to the Kongsbreen glacier, at Prins Heinrich Øya, Brandal, Hansneset and Kongsfjordneset, i. e. from the inner to the outer part of the fjord. There

was a relatively dense algal vegetation at all locations. Even at the location close to the glacier large seaweeds (predominantly *Saccharina latissima*) were found growing on dropstones. A major result of the study was that certain seaweed species are able to grow down to considerable depth. For example the red seaweed *Phycodrys rubens* was found grown in almost 70 m water depth at Hansneset. The plants were obviously several years old and grew together in a relatively high density.

Studies in 2010:

During the coming research season we will focus on interactive effects of enhanced UV radiation and temperatures on gene expression of kelp sporophytes (Project 1), on the role of seaweeds (Project 2) and of microphytobenthos (Project 3) as primary producers in the ecosystem Kongsfjorden.

Subproject 1: The proposed study aims at a detailed analysis of the molecular mechanisms of adaption and acclimation to UV-radiation and temperature stress. By this way, we want to back-up the physiological data obtained in previous years with molecular data. We are interested in identifying repair mechanisms and in analyzing the involved enzymes. We will determine potential differences in gene expression between optimal conditions and stress conditions within the species. Moreover, the presence of stress proteins of the type of MAP kinases (Mitogen-Activated Protein Kinases) will be studied. These kinases have been described both in macro and microalgae, and their expression is crucial for response to UV and temperature stress. These differences will be linked to habitat adaptation and acclimation and possible relations to the upper depth distribution limit of the key species. This will lead to a better understanding of the adaption of seaweeds to environmentally changing parameters.

Subproject 2: A new area of research on macroalgal ecology at Ny Álesund shall be initiated in order to better understand the role of seaweeds in the food web of Kongsfjorden. In order to elucidate the trophic relationships in nearshore waters in the Arctic the stable isotopes $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ will be measured in primary producers, suspension feeders and detritivores of Kongsfjorden. The effect of various parameters on

the isotopic signature of algae like seasons, different water masses and their periods of residence in the fjord, temperature, radiation conditions, sediment load and pH of the seawater will be registered simultaneously. Furthermore, various species of macroalgae will be experimentally degraded to particulate organic matter (POM) and maintained in the laboratory to observe changes in their isotopic signature during decomposition and “aging” of the thallus.

Subproject 3: Our knowledge on microphytobenthos (MPB) in cold-water systems is poor, despite its significant role in the exchange of oxygen and nutrients across the sediment-water interface, and in providing a primary source of organic matter for heterotrophs. Thus, investigations of MPB in polar coastal systems are relevant in the context of climate driven changes. Enhanced glacial inputs can reduce overall production, biomass and diversity of the benthic community. Differential effects of increasing temperature on the autotrophic and heterotrophic benthic compartments may lead to dramatic shifts in system structure and balance. We must enhance our understanding of polar MPB system structure and functioning substantially in order to be able to evaluate their actual significance as well as to develop scenarios and models of forthcoming change.

Laptev-Sea-System: Frontal Zones & Polynya Systems in the Laptev Sea

Lead PIs, including e-mail addresses: Leonid A. Timokhov (ltim@aari.ru) and Heidi Kassens (hkassens@ifm-geomar.de)

Sponsoring Organization(s): Federal Ministry of Education and Research Germany and Russian Ministry of Science and Education

Date Initiated: 01.01.2007

Ending Date: 31.03.2012

Summary of work accomplished: Over the past decade it became evident that the Arctic is undergoing significant and sweeping changes like increased air temperatures and enhanced wind mixing over most of the arctic shelf seas, reduced sea-ice cover and marked changes in amplitude and seasonality of river discharge. Most of these changes are already manifested on shelf environments. The Laptev Sea shelf (Siberian Arctic) and the Laptev Sea polynya were internationally defined as key regions in order to monitor and investigate variability and changes in system parameters in terms of changing boundary conditions as a result of climate change. Therefore the project focuses on oceanic frontal zones and polynya systems in the Laptev Sea by means of a multi-disciplinary approach including remote sensing, multi-year sea-floor observatories, ice camps and ship expeditions, and coupled sea-ice-ocean modelling. Russian-German research teams from Saint Petersburg, Moscow, Tiksi, Bremerhaven, Trier and Kiel are studying the flaw polynya in response to oceanic, sea-ice and atmospheric forcings as well as feedbacks of the Laptev Sea flaw polynya to the Arctic System (sea-ice & brine-enriched water formation).

Otto Schmidt Laboratory for Polar and Marine Research

Lead PIs, including e-mail addresses: Ivan E. Frolov (frolov@aari.ru), Irina Fedorova (ifedorova@otto.nw.ru), Karin Lochte (karin.lochte@awi.de) and Heidi Kassens (hkassens@ifm-geomar.de)

Sponsoring Organization(s): Federal Ministry of Education and Research Germany, Russian Ministry of Science and Education, Roshydromet/AARI, AWI and IFM-GEOMAR

Date Initiated: 1999

Ending date: ongoing

The Otto Schmidt Laboratory for Polar and Marine Research (OSL) is a milestone in Russian-German cooperation in the field of Arctic research. In 2000, the OSL was opened at the State Research Center of the Russian Federation the Arctic and Antarctic Research Institute (AARI) in Saint Petersburg. The OSL provides a basis for coordination and development of the research projects carried out within the framework of the Bilateral Agreement on Cooperation in Polar and Marine Research between the Russian Federation and Germany. Its main objective is to support young scientists through the OSL Fellowship Program "Changing Environments". The fellowship program pairs master students, graduated research assistants, and postdoctoral fellows with experienced mentors and challenges them to participate in ongoing research projects. To fulfill its tasks in research and education, the OSL is equipped with a state-of-the-art laboratory for polar and marine research, computer workstations incl. periphery and an international library. Meetings and workshops of up to 15 participants can be accommodated.

Master Program in Applied Polar and Marine Sciences (POMOR)

Lead PIs, including e-mail addresses: Nikolai V. Kaledin (kaledin@politreg.pu.ru), Eva-Maria Pfeiffer (E.M.Pfeiffer@ifb.uni-hamburg.de) and Heidi Kassens (hkassens@ifm-geomar.de)

Funding: Saint Petersburg State University, Federal Ministry of Education and Research Germany, DAAD, and IFM-GEOMAR.

Sponsoring Organizations: POMOR is a joint initiative of the Saint Petersburg State University, the Leibniz Institute for Marine Sciences (IFM-GEOMAR), the Alfred Wegener Institute for Polar and Marine Research (AWI), the Baltic Sea Research Institute Warnemuende (IOW) and Universities of Hamburg, Bremen, Kiel, Potsdam and Rostock.

Date Initiated: 2001

Ending date: ongoing

To encourage students to participate in Arctic research, the international Master Program in Applied Polar and Marine Sciences (POMOR) has been established in 2002. POMOR imparts knowledge of the polar and marine environmental systems from coastal to deep-sea regions. Moreover, applied aspects of oceanography, marine geosciences and marine biology are covered. Courses (in English) and practical training are held at the State University of Saint Petersburg in close cooperation with the Otto Schmidt Laboratory for Polar and Marine Sciences. After two years of study (modules: ocean basins, sediments and climate change, high seas and coastal waters oceanography, polar and marine ecosystems: structure, functioning and vulnerability, natural resources, coastal zones: processes and environmental management, periglacial ecosystems), the students are awarded a Master of Science in Applied Polar and Marine Sciences.

Activity Name or Title: **Laptev Sea System**

Lead PIs, including e-mail addresses: Jens Hölemann, Jens.Hoelemann@awi.de

Sponsoring Organization(s): AWI, Ministry of Research Germany

Date Initiated: August 1998

Ending Date if known: ongoing

Summary of work accomplished

A cruise with the Russian vessel “Victor Buynitski” has been conducted for the study of the “Laptev Sea system”, a German-Russian long-term program. Long-term moorings at the shelf edge and on the inner shelf have been exchanged and a hydrographic station grid has been sampled. It contributes to the international Arctic-wide studies SAON and others.

The analysis of observations from the Laptev Sea in 2007 indicate that in succession of the unusual warm summertime surface water temperatures also the bottom water temperatures on the mid-shelf of increased by more than 0.5°C compared to the long-term mean. The relatively warm bottom water occupied the mid-shelf from September 2007 until April 2008. The findings suggest that the preconditioning of the water column during summer largely controls the mixing processes during autumn storms that led to the observed increase in near-bottom water temperature. Thinner ice at the start of the melt season causes more summertime open water and thus warmer sea surface temperatures in the Laptev Sea. This was accompanied by a cyclonic atmospheric circulation that deflected the freshwater plume of the River Lena to the east thus increasing the salinity on the mid-shelf north of the Lena Delta. This resulted in a weakening of the density stratification and consequently to an increased mixing of the water column. The increase of water temperatures close to the seabed should also have an impact on the stability of submarine permafrost in the Laptev Sea. Due to the contact to relatively warm bottom water the submarine permafrost assimilates thermal energy from the seawater. Since arctic methane hydrates are permafrost controlled, they destabilise when submarine permafrost thaws leading to methane release into the ocean waters.

Summary of planned work: The long-term mooring and hydrography programme will be continued with a cruise with a Russian vessel in September 2010. Five moorings will be exchanged.

Data: Mostly processed, not yet available at Pangaea (www.pangaea.de).

Activity Name or Title: **Central Arctic Ocean**

Lead PIs, including e-mail addresses: Ursula Schauer, Ursula.schauer@awi.de

Sponsoring Organization(s): AWI

Date Initiated: 1991

Ending Date if known: -

Summary of work accomplished:

The analysis of the measurements taken during the IPY has been the focus of the work in 2009. Rabe et al., submitted to *deep-sea Research: Unprecedented summer-season sampling of the Arctic Ocean during the International Polar Year period (2006 – 2008)* makes possible a quasi-synoptic pan-Arctic estimate of liquid freshwater (LFW) inventories. In comparison to observations from 1992 – 1999, LFW content relative to a salinity of 35 in the layer from the surface to the 34 isohaline increased by more than 3000 km³ in the Arctic Ocean (water depth greater than 500 m). This is close to half the annual export of freshwater (liquid and solid) from the Arctic Ocean. Observations and a model simulation show regional variations in LFW were both due to changes in the depth of the lower halocline, often forced by regional wind-induced Ekman pumping, and a mean freshening of the water column above this depth, associated with an increased net sea ice melt and advection of increased amounts of river water from the Siberian shelves. Over the whole Arctic Ocean, changes in the observed mean salinity above the 34 isohaline dominated estimated changes in LFW content; the contribution to LFW change by bounding isohaline depth changes was an order of magnitude smaller, and non-linear effects due to both factors were negligible.

Summary of planned work: The analysis of the measurements taken during the IPY will be continued with the focus being the temperature changes.

Data: All data available in various data bases (for details see Rabe et al. 2010, submitted to *Deep-Sea Research*).

Activity Name or Title: **Fram Strait 2010**

Lead PIs, including e-mail addresses: Thomas Soltwedel, Thomas.Soltwedel@awi.de

Sponsoring Organization(s): AWI

Date Initiated: 1999

Ending Date if known: ongoing

The second leg of the 25th *Polarstern* expedition to the Arctic will start on 29th June 2010. The ship will depart from Longyearbyen (Svalbard) to conduct research all across Fram Strait (Fig. 1). The work will serve various projects and concentrate on the continental margin off Svalbard (deep-sea long-term observatory HAUSGARTEN), a short transect towards Kongfjorden (KONGHAU project), and a transect crossing the entire Fram Strait at about 79°N (ACOBAR project). The cruise will end on the 29th July in Reykjavik (Iceland).

The work planned for the HAUSGARTEN area will contribute to various EU projects (ESONET, HERMIONE, HYPOX) as well as to the new PACES (Polar Regions and Coasts in the changing Earth System) research programme of the AWI, which started at the beginning of 2009. Our planned work is embedded in research activities through studies on changing Arctic sea ice conditions and their impact on ecosystems and food webs. These changes will be addressed through a dedicated combination of long-term observations and modelling. The research contributes to the time-series studies at HAUSGARTEN, where we investigate the impacts of Climate Change on an Arctic marine deep-sea ecosystem through field studies, observations and models since 1999. Climate-induced changes of plankton communities in Fram Strait will be investigated by the new AWI research group PEBCAO (Phytoplankton Ecology and Biogeochemistry in the Changing Arctic Ocean).

Within the framework of the KONGHAU project (Impact of climate change on Arctic marine community structures and food webs), co-financed by the EU and the Norwegian oil company Statoil/Hydro, we will retrieve additional sediment samples on the continental shelf off Svalbard and inside Kongsfjorden. KONGHAU combines data collected over the past 10 years from time-series work at Kongsfjorden and HAUSGARTEN.

The oceanographic work embedded in the EU project ACOBAR (ACoustic technology for OBserving the interior of the Arctic Ocean) is dedicated to investigate the water mass and heat exchange between the Arctic and the northern North Atlantic with special emphasis on the inter-annual and decadal variability of the circulation in Fram Strait. Hydrographic measurements will be taken along 79°N, and water samples for tracer determinations will be collected. Oceanographic moorings with current, temperature and salinity meters deployed two years ago will be recovered and re-deployed with new instruments to extend the existing time-series.

During ARK-XXV/2, the observation and counting of sea birds and marine mammals from the previous leg will be continued.

Activity Name or Title: **Nares 2010**

Lead PIs, including e-mail addresses: Volkmar Damm (Volkmar.Damm@bgr.de);

Wilfried Jokat (Wilfried.Jokat@awi.de)

Sponsoring Organization(s): BGR, AWI

Date Initiated: Nov. 2009

Ending Date if known: Dec. 2013

Summary of work accomplished

The expedition is currently prepared with requests for research permits. The cruise will be conducted in August/September 2010. Both, geophysical and geological methods will be used to understand the tectonic evolution of the northern Baffin Bay and the Lancaster Sound. Multichannel seismic data, deep seismic sounding data with 30 ocean bottom seismometers, gravity, magnetic as well as bottom sampling will be conducted.

Summary of planned work:

Data acquisition and analysis

Data:

Not yet available

Activity Name or Title: **MERIAN Expedition MSM16/2 “LOOME”**

Lead PIs, including e-mail addresses: Antje Boetius antje.boetius@awi.de; Dirk de Beer dbeer@mpi-bremen.de

Sponsoring Organization(s): German Science Foundation, EU 6th FP ESONET Project

Date Initiated: April 2008

Ending Date if known: March 2011

Summary of work accomplished:

The Håkon Mosby Mud Volcano (Barents Sea) is one of the most active cold seep systems documented world wide, and has been intensively investigated during the last decade by a collaboration of Norwegian, French and German scientists. The research aims to describe physical phenomena, the chemistry and biology of the seep system, and the biodiversity and ecosystem function. Data on topography, dynamics, fluid and gas flow, hydrate distribution, temperature distributions, geochemical analyses, microbial rate measurements and microbial community descriptions, together with habitat descriptions using high resolution sampling based on video mapping have lead to a coherent view of the system. In 2008 with the Norwegian research vessel “Haakon Mosby” and with the German ice-breaker “Polarstern” in 2009 we have installed the first benthic observatory at a mud volcano as a demonstration mission (LOOME - Long-term Observatory On Mud-volcano Eruptions) of the ESONET project. The instruments deployed and samples taken will support a detailed investigations of the dynamics within the sub-seafloor and the sediment surface, to follow the sequence of eruption events. Measuring the effects of the eruption on the physics, geology, topography, biology of the seafloor will allow to evaluate natural environmental impacts and cause-and-effect relationships in the deep sea ecosystem.

Summary of planned work:

In October 2010 we will recover the LOOME observatory, and carry out a comparative sampling program to 2009, to investigate ecosystem change and relate it to the dynamics of mud volcanism.

Data: We will obtain the data from the long term observatory in October 2010. Subsequently, we will evaluate the data and all data will be submitted upon quality check to the World Data Center MARE/PANGAEA www.pangaea.de