

[Research]

Cluster of Excellence Ocean Floor

At MARUM – Center for Marine Environmental Sciences at the University of Bremen, a new Cluster of Excellence is being launched in 2019. With the proposal “The Ocean Floor – Earth’s Uncharted Interface”, the scientific goals of the group successfully reflected the Excellence Strategy of the German Federal and State Governments. The researchers will fully concentrate their efforts on this still uncharted interface of the Earth.

The ocean floor plays an important role, for example, in the global carbon cycle as well as the climate system in general. Geological, physical, chemical and biological processes interact with one another at and within the ocean floor.

Researchers furthermore need to improve our understanding of the specific processes related to the transport of organic material. The same is true for carbon and other elements – what happens when particles dissolve in seawater or are released from the seafloor into the water column?

For approximately the past four decades, it has been well known that the deep sea is not a desert, but rather an oasis of life, albeit a very sensitive one. When changes

occur in the ecosystem, it will presumably take decades to recover. Investigations at MARUM, therefore, will continue to focus on how the sensitive ecosystems of the deep sea react to a changing environment, including rising temperatures.

The seafloor is also a unique archive that records the environmental conditions of the past within its sediments.

An exceptional fleet of equipment operated by MARUM is deployed for research, including submersible robots, drilling rigs and autonomous underwater vehicles.

The new scientific challenges are being tackled not only by the development of new technologies, but also through new analytical methods and models. The efforts of scientists in the Cluster are enhanced by close interdisciplinary projects with other institutions in the region.

The Cluster of Excellence is based at the University of Bremen under the auspices of the MARUM Research Faculty. The new Cluster has its foundations in the previous Research Center of the German Research Council and the Cluster of Excellence “The Ocean in the Earth System”.

www.marum.de/The-Ocean-Floor.html

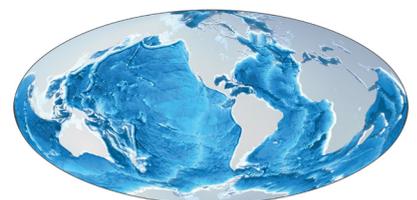
Dear Reader,

With the new Cluster of Excellence we face the opportunity of opening a new chapter in ocean-floor research (see adjacent article). Beyond the ambitious scientific goals of the Cluster, we are also pursuing a series of structural objectives. These include our plan to fill half of the scientist positions in the Cluster with women. The academic job market is constantly changing, which presents complex challenges for a university institution such as MARUM in the attraction and training of young talent for that market. For young scientists embarking on their new careers, we are continuing our well-established doctoral program. Through a new program we will provide support for post-docs in the important phase after their PhD work is completed. In addition to training, we will take advantage of the possibilities of the Cluster to further develop secure career paths in science, for example, through tenure-track positions. In the coming year, in our role as a university employer, we want to help create trend-setting models for improved balancing of families and careers.

I wish you a very enjoyable read,

Michael Schulz

Michael Schulz (Direktor)



Processes at the ocean floor are the center of focus in the new Cluster of Excellence.

ERC Starting Grant for research on sea-level changes

Marine researcher Alessio Rovere has received an ERC Starting Grant from the European Research Council. “WARMCOASTS – sea level and extreme waves in the last interglacial” is the title of his research pro-

ject. With a total of around 1.5 million Euros, Rovere’s work will be funded for a period of five years beginning in 2019. In the field of climate research, the last interglacial period, which occurred between

about 128,000 and 116,000 years ago, is often used for comparison to present conditions.

This was the last time in the Earth’s history that the climate was warmer than in pre-industrial times. Both sea level and temperatures were higher than today, and the ice sheets were smaller.

How will temperatures, sea level, and the size of ice sheets change in the future? Scientists believe that the answers lie in understanding the processes during the last interglacial.

“In this project we want to use a variety of multidisciplinary methods to study sea level, its fluctuations, and extreme waves during the last interglacial,” explains Alessio Rovere. He wants to apply the grant money toward recruiting outstanding young scientists to create a reliable global database for sea level during the last interglacial, and to study new field areas with advanced modelling and measurement technology.

“The results of this project,” Rovere is confident, “will contribute to a better understanding of coastal processes under somewhat warmer climate conditions.”

www.marum.de/en/Dr-alessio-rovere.html



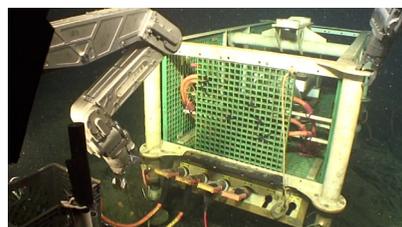
Alessio Rovere carrying out fieldwork with his colleagues. Photo: Elisa Casella

Successful tests

Ship time is limited and, above all, expensive. For this reason, chief scientists are very careful in assembling their expedition teams. A test has now been successfully carried out on the Research Vessel SONNE to evaluate a way in which the expertise of onshore researchers can be integrated into onboard research via telepresence. This concept was proposed by Volker Ratmeyer and Hauke Büttner (both of MARUM) along with Tom Kwasnitschka (GEOMAR). For this purpose, a satellite communications system was installed on the SONNE and tested in the South Pacific. While the remotely operated vehicle MARUM-QUEST works in the deep sea its every movement can be followed, not only by the scientists in the shipboard control container but also by their colleagues on land. It is also possible for the land-based scientists to communicate with the team on board in real time via audio signal. For the future, the concept envisages that researchers who cannot directly participate in the expedition can be fully integrated as team members. In addition to following the dives of remotely operated vehicles, the live transmission can also be used with autonomous underwater vehicles and seafloor observatories.

Deep-sea observatories

Yann Marcon and Ulli Spiesecke have installed two echo-sounder systems at an underwater observatory of the Ocean Observatories Initiative (OOI) at a water depth of 800 meters on the continental margin off Oregon in the northeast Pacific. These sonar systems were developed at MARUM. They will enable researchers, in real time and over a period of several years, to monitor and quantify the natural release of methane from the seafloor in one of the most active methane-seep areas known. Mounted on large titanium stands, the instruments were transported to the seafloor by a submersible robot and coupled to the connecting socket of the deep-sea cable of the OOI observatory.



Submersible robot JASON connects instruments to the cable-connection frame of the observatory. Photo: NSF, OOI, UW, ROV JASON

New joint research project

Since the summer of 2018, a joint research project coordinated through MARUM has been investigating how human and climate-change factors impact the ecosystems of South Africa. These include land-use changes as well as pollution by industry and agriculture. The consequences often include soil erosion, eutrophication of waters, and pollution input that have negative impacts on the local biodiversity. To use natural resources sustainably, a detailed and data-supported understanding is important. This is necessary, says project coordinator Matthias Zabel of MARUM, in order to assess the relationships between after-effects, climate changes, and regionally variable anthropogenic factors.

The German-South African joint research project TRACES (Tracing Human and Climate impacts in South Africa) is financed through 2021 by the Federal Ministry of Education and Research (BMBF). The partners comprise researchers at the Universities of Jena, Greifswald and Bremen, the South African universities in Durban/Pietermaritzburg and Johannesburg, and the South African Council for Geoscience.

www.marum.de/en/about-us/Sediment-Geochemistry/Traces.html



[MARUM visual]

Soft coral

A soft coral with a whip-like growth form, taken during a dive of the MARUM-QUEST in 1,929 meters water depth southwest of Samoa.

Photo: ROV MARUM-QUEST, Expedition SO263, RV SONNE

[Research]

New research building at MARUM

MARUM is acquiring a new research building – the construction of the “Center for Deep Sea Research” (ZfT – Zentrum für Tiefseeforschung) is scheduled to begin in 2020. In the future, expertise for a new research field will be pooled here. The areas of study will include, for example, the complexes “Climate information from the deep sea”, “Extreme habitats in the deep sea” and “Triggers of natural hazards”. “With the ZfT, the existing comprehensive and internationally oriented profile of marine sciences in the state of Bremen will be raised to a new level,” says MARUM Director Michael Schulz. The new building will be a

part of the MARUM Research Faculty. When the building is completed it will become home to a new cable-controlled submersible robot (remotely operated vehicle – ROV). For the past 20 years researchers at MARUM and from other institutes have been working with the MARUM-QUEST. ROVs have been used in deep-sea research by default for about 15 years, and during this time they have contributed significantly to completely new discoveries. With their help, researchers on marine expeditions are able to take samples with high precision and obtain high-resolution images. Additionally, ROVs are deployed for experiments

and in-situ measurements on the seafloor. The new, more capable ROV will dive to a depth of up to 5,000 meters. Completion of the new building is planned for the end of 2022, and it will comprise around 4,000 square meters for the equipment hall, core repository, laboratories and offices.



The Center for Deep-Sea Research (ZfT) will be located north of the MARUM building.

[IODP]

25-year anniversary of the Bremen Core Repository

Not only does the new building provide more room for technological equipment and laboratories, it will also allow for the expansion of the IODP Bremen Core Repository (BCR). For almost 25 years, cores have been stored here from the Atlantic and Arctic Oceans as well as the Mediterranean, Black and Baltic Seas that were drilled by the International Ocean Discovery Program (IODP) and its forerunner programs beginning in 1968. The collection comprises over a quarter million core sections, which, laid end-to-end, would total a length greater than 155 kilometers. It is the largest of the three IODP core repositories, and with the current expedition plans the number of

cores will continue to grow in the future. The core repository was established in 1994, originally in warehouse number 3 of what is now the Überseestadt harbor area, and at that time it was more or less a branch of the core repository at Texas A&M Univer-



155 kilometers of cores are archived in the IODP Bremen Core Repository.

sity (USA). This changed in 2003 with the creation of the European Consortium for Ocean Research Drilling (ECORD). This was preceded by the so-called Core Redistribution Project, in which each of the three core repositories in Germany, the USA and Japan was assigned a region of the world’s oceans from which the cores are archived either in Bremen, College Station or Kochi. But MARUM provides more than just a storage area for the cores. The repository, especially since its move to the university campus, also incorporates an infrastructure for researchers, with diverse laboratories and analytical opportunities. Scientists from around the world come to take samples for themselves, or they may have the BCR staff take and send them samples. The number of samples provided over the past quarter century totals over one million.

[IODP]

NanTroSEIZE: Targeting a plate boundary

What happens when one tectonic plate slides underneath another? This question is the focus of IODP Expedition 358. This is the ultimate phase of the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE), in which the researchers want to drill into the fault zone. The target of the cruise is the plate boundary at a depth of about 5,000 meters below the seafloor. Matt Ikari from MARUM takes part in the project. As a specialist for plate tectonics, he is one of the project's chief scientists. Expeditions to the Nankai trough have been carried out over the past eleven years to investigate

the causes of earthquakes, and to collect data on how water and rocks react with one another at a subduction zone to possibly trigger earthquakes. Fifteen expeditions have been carried out since 2007; 68 holes with a total length of 34 kilometers have been drilled into the seafloor; and observatories have been installed. It is the longest expedition in the history of the International Ocean Discovery Program (IODP). Instead of the usual eight weeks for IODP cruises, alternating teams will be working on the Japanese drilling ship CHIKYU from October 2018 to March 2019.

[Technologies]

Cooperation with Google

The information system PANGAEA, which is operated by MARUM and the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI), is cooperating with Google and other data centers in the development of a prototype. In order to make research data accessible around the world, the company has established the "Google Dataset Search". Users can search the internet for datasets, regardless of where they are stored and published. This is currently available for data in the environmental and social sciences.

<https://toolbox.google.com/datasetsearch>

[Research]

POLARSTERN Expedition

Hydrothermal vents and possibly cold seeps at the Sandwich microplate in the Southern Ocean are the targets of Expedition PS 119 of the research vessel POLARSTERN. The cruise begins in April. Its goals are to investigate fluid released from the seafloor and to study the accompanying biological communities. It will be the first deployment of a submersible vehicle from the research vessel POLARSTERN in the Antarctic region.

www.marum.de/en/Research/PS119.html

Dates and Events

Ocean Day

13 Feb 2019 University of Bremen

www.marum.de/en/Discover/Ocean-Day.html

Symposium "25 years with the IODP core repository"

12 Mar 2019 Haus der Wissenschaft, Bremen

Hanseatic City of Bremen Senate Reception in honor of the 75th birthday of Prof. Dr. Gerold Wefer

12 Mar 2019 City Hall, Bremen

[Personnel]

Two awards

In 2018, Prof. Dr. Antje Boetius was awarded both the Communicator Award of the Deutsche Forschungsgemeinschaft (DFG) and the German Environmental Award. The German Federal Environmental Foundation (Deutsche Bundesstiftung Umwelt – DBU) honors Antje Boetius for her achievements in deep sea and polar research, which have contributed significantly to our understanding of global climate and biodiversity. The Communicator Prize serves to strengthen the dialog between science and the public.



[Personnel]

Professorship in Norway

Dr. Irina Roghuzina has moved from MARUM to the Norwegian University of Science and Technology. There she has been Professor of Physical Geography since August. Her main focus now is on climate change-related natural hazards, impacts of warming climate on ecosystems, both in the ocean and on land. In addition, her goal is to develop an educational program for schools and the general public that combines the results of climate research with new technologies and media such as virtual reality.



[Personnel]

MARUM Research Award

The "MARUM Research Award for Marine Sciences 2018" is awarded to Dr. Kerstin Kretschmer and Dr. Clara Martínez-Pérez

for their dissertations. The prize is awarded annually for outstanding scientific theses in the field of marine sciences at the University of Bremen. Maren Elisabeth Richter and Lucy Schlicht were awarded for their master theses

[Personnel]

New Directorate

MARUM has a new Board of Directors. Prof. Michael Schulz is Director and Professors Monika Rhein and Achim Kopf have been Deputy Directors since 1 November. They will head the MARUM Research Faculty for the next six years.

In Memoriam

We mourn our departed colleague and a wonderful person, Dr. Heiko Sahling. He had to leave us on April 23, 2018 at the age of only 49 after a serious illness. Heiko worked for 15 years in the Department of Geosciences and at MARUM, where he helped to establish the working group "General Geology / Marine Geology". Heiko will remain in our memories as a friendly, thoughtful, reliable, dear and creative colleague. Scientifically, the deep sea with all its facets appealed to him. He participated in expeditions with great enthusiasm, as well as designing and leading them. His scientific work on board was always followed up by meticulous processing of the data and significant contributions that he incorporated into the broader scientific framework. He was always helpful and good-humored, and played an essential role in the working group.



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