

BIENNIAL REPORT 2022 23

Association

Leibniz Institute for Baltic Sea Research Warnemünde

MISSION & VISION

'Our mission is to understand the coastal seas with a holistic approach, and through scientific knowledge, innovative methods and the dialogue with society to contribute to solve regional and global societal challenges'

> FROM THE MISSION STATEMENT OF THE IOW



FOREWORD

DEAR READERS.

The period covered by this biennial report has seen three IOW directors: at the end of March 2022, longstanding Director Prof. Dr. Ulrich Bathmann took his well-deserved retirement after more than 10 years. I would like to take this opportunity to thank him for his dedicated leadership, under which the IOW developed its strong role in German marine research. Until I took office, Prof. Dr. Helge Arz served the institute as acting Director, for which I am also very grateful to him. I was then able to take up the position as IOW Director in March 2023 and consider it a great honour to lead this long-established institute with its expertise and responsibility to new perspectives.

But the personnel changes did not stop there: during the reporting period, Prof. Dr. Detlef Schulz-Bull, the long-serving Head of Marine Chemistry, who was also Deputy Director until September 2022, retired. And finally, in autumn 2023, we bid farewell to Dr. Barbara Hentzsch, the long-standing Head of Science Management, after around 30 years at the IOW.

The year 2022 was still strongly characterised by the coronavirus pandemic. Today, this deep cut, not only in private life but also in everyday life at the institute, sounds like something from a distant past. Nevertheless it still has an ongoing impact, because a lot of research in the laboratory and on the research vessel were cancelled or had to be postponed. As if these challenges were not enough, there was major water damage at IOW at the beginning of May 2023, which meant that offices and laboratories had to remain closed for many months, or still are.

In the face of all these events, the IOW has shown itself to be remarkably resilient and has once again proven its scientific credentials: at the beginning of 2023, the so-called Sondertatbestand 'Shallow Water Research' was launched as a new interdisciplinary research focus at the IOW. The word 'Sondertatbestand' (STB), i.e. a small-scale strategic expansion of an institute, was one of the first words from the Leibniz universe that I was able to learn. In the course of implementing the STB in 2023, a whole series of highly motivated young scientists and engineers were recruited for the development and application of innovative marine measurement technology and scientific research was expanded in all areas.

regards

Yours



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In August 2023, six months after I started as Director, the 'mid-term audit' of the Scientific Advisory Board took place at the IOW. The result is impressive - in its audit report, the Scientific Advisory Board attests to the IOW's very good overall development in terms of science and visibility as well as a spirit of optimism towards new goals. We have set our course and despite many changing conditions in politics and society, I look to the future with confidence.

I hope you enjoy reading this biennial report, which comes in a fresh new design, and send you my warmest

C. Dielinh.

OLIVER ZIELINSKI DIRECTOR

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RESEARCH HIGHLIGHTS



RF1: Small and Mesoso RF2: Basin-scale Ecosy RF3: Changing Ecosyste RF4: Coastal Seas and Cross-cutting Activity: Cross-cutting Activity:

A t the IOW, the four departments are working on an interdisciplinary 10-year research programme 'Understanding Coastal Seas' (2013 – 2023). The activities are bundled into research foci. They are dedicated to process studies at different spatial scales (research foci 1 and 2) and investigate changes over time and under the influence of human activities (research foci 3 and 4). In the two cross-cutting activities 'Innovative Instrumentation' and 'Model Development', the methodological tools of our research are being further developed.

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RESEARCH FOCUS1-'SMALL AND MESOSCALE PROCESSES'

If you want to understand the ocean as a whole, you have to start with individual processes on a very small scale. The aim of the scientific work in research focus 1 is to identify, understand and quantify all physical, chemical and biological processes from the water surface to the sediment.

'DEEP BIOSPHERE' CHARACTERISED BY DISSOLVED ORGANIC MATTER FROM THE EARTH'S SURFACE

eep below the superficial biosphere, where the cycle of life is mainly driven by photosynthesis, there is a 'deep biosphere' that extends several kilometres into the lithosphere. It contains about a quarter of the total global microbial biomass and is thus an important part of the Earth's carbon cycle. This living world comes into contact with a broad spectrum of dissolved organic matter (DOM) via deep groundwater reservoirs. This DOM theoretically represents a main food source for microorganisms. Little is yet known about the role of the associated bioavailability of these substances in nutrition in the deep continental biosphere, which is generally characterised by a lack of nutrients and energy - i.e. rather hostile conditions.

• Dissolved organic carbon (DOM) occurs in deep groundwater layers

This is not least due to the fact that access to this world is extremely difficult. In contrast, the Äspö Hard Rock Laboratory on the Swedish Baltic coast offers excellent research conditions. A 3.6-kilometre-long tunnel system, some of which extends under the Baltic Sea, provides access to groundwater. From different depths of this tunnel, a German-Swedish team with researchers from Linnaeus University, Kalmar, the Swedish University of Agricultural Sciences, Uppsala, the Äspö Hard Rock Laboratory, Oskarshamn, the company Terralogica AB, the Carl von Ossietzky University of Oldenburg and the Leibniz Institute for Baltic Sea Research Warnemünde took water samples. Depending on their position within the tunnel system, they recorded groundwater layers that were either influenced by precipitation and brackish water from what is now the Baltic Sea, or those that were contaminated with the salty water of a previous ocean. Their hypothesis: the microbial communities in the deep fissures of the continent are nourished from the earth's surface – by the DOM. To test this, the team compared the concentration and molecular composition of the DOM together with the stable and radiogenic carbon and water isotope values, the water chemistry and the structure of the microbial communities in fissure water samples of different depths, ages and origins.

'We were

able to show using different research methods that the DOM in all area samples from the recent Baltic Seainfluenced

'However, it is also noticeable that a core microbiome can always be found, even though the chemistry of the groundwater was completely different.' _____

DR. HELENA OSTERHOLZ

waters to the ancient saline fissure waters of the Fennoscandian Shield, which have been in existence for over 100,000 years stored underground – contains a strong terrigenous signature,' explains Marine Chemist Helena Osterholz the results. 'However, it is also noticeable that a core microbiome can always be found, even though the chemistry of the groundwater was completely different."

ODM as a food source for microorganism communities

The finding is attributed to the fact that the easily decomposable carbon compounds in the DOM are broken down on the way from the surface water to the groundwater, so that the refractory organic matter remains. This dominant supply of relatively difficult to utilise organic matter in turn triggered the selective formation of a stable community of microorganisms.

Helena Osterholz is certain: 'With regard to the significance of DOM in the nutrient supply of aquatic systems, we are only scratching the surface. Using the deep biosphere as an example, we were able to show that a multi-method approach brings new insights. This works best in interdisciplinary cooperations like this one, in which everyone contributes their own expertise from microbiology, geology and chemistry.

CONTACT PERSON

OHT



The samples for researching the 'deep biosphere' come from the Swedish Äspö Hard Rock Laboratory. © Lopez-Fernandez

Dr. Helena Osterholz

PUBLICATION

Osterholz, H., Turner, S., Alakangas, L. J., Tullborg, E.-L., Dittmar, T., Kalinowski, B. E. & Dopson, M. (2022): Terrigenous dissolved organic matter persists in the energy-limited deep groundwaters of the Fennoscandian Shield. Nat. Commun. 13. 4837. doi: 10.1038/s41467-022-32457-z



RESEARCH FOCUS 2 – 'BASIN-SCALE ECOSYSTEM DYNAMICS'

In the IOW's research focus 2, findings on individual processes are placed in a large basin-scale context. The aim is to investigate the current dynamics of the Baltic Sea system through observations and experiments and to simulate them as realistically as possible in the computer model.

HOW CLOSE IS THE TIPPING POINT? STUDIES ON THE ATLANTIC CURRENT SYSTEM

ith a recent publication in the scientific journal Nature Climate Change, researchers from Kiel and Warnemünde contribute to a further understanding of the changes in the Atlantic Meridional Overturning Circulation, which are known to the public as the 'Gulf Stream system'. It is just as important for the global climate as it is for climate events in Europe. The research centres on the question of whether human-made climate change is already slowing down the oceanic overturning circulation. According to the study, the natural climate change fluctuations are still dominant. Improved observation systems could help to recognise the human influence on the flow system at an early stage.

Is the Atlantic Meridional Overturning Circulation (AMOC) slowing down? Will this system of ocean currents, which is so important for our climate, possibly come to a standstill in the future? Are the observed fluctuations of natural origin or already a consequence of human-made climate change?



'Our study provides additional evidence that internal climate variability has played a significant role in climate change since 1900 [...].'

DR. M. HADI BORDBAR

Using evaluations of observation data, statistical analyses and model calculations, a team from **GEOMAR** Helmholtz Centre for Ocean Research Kiel and the IOW under the

leadership of the GEOMAR climate expert Mojib Latif has analysed changes in the current system over the past hundred years in more detail. According to the analyses, part of the North Atlantic is cooling - a striking contrast to the vast majority of ocean regions.

The analyses indicate that natural fluctuations have been primarily responsible for this cooling since the beginning of the 20th century. Nevertheless, the analyses indicate that the AMOC has begun to slow down in recent decades.



• Latif, M., Sun, J., Visbeck, M., Bordbar M.H. (2022): Natural variability dominates Atlantic 이슈요 Meridional Overturning since 1900. Nature Climate Change. doi: 10.1038/s41558-022-01342-4

Climate models consistently predict a significant slowdown in the Gulf Stream in the future if CO₂ emissions continue to rise, the ocean continues to warm and the Greenland ice sheet continues to melt. © Prien. IOW

Climate models consistently predict a significant slowdown of the current system in the future if our carbon dioxide emissions continue to rise, the ocean continues to warm and the melting of the Greenland ice sheet accelerates. 'Our study provides additional evidence that internal climate variability has played a significant role in climate change since 1900, and has identified the plausible future climate trends,' emphasises Hadi Bordbar, co-author of the publication and Physical Oceanographer at the IOW.

CONTACT PERSON

Dr. M. Hadi Bordbar

PUBLICATION



RESEARCH FOCUS 3 – 'CHANGING ECOSYSTEMS'

Research focus 3 combines scientific findings on small-scale and basin-scale processes with the factor of time. The scientists want to find out how the Baltic Sea and all the processes taking place in it have changed over decades, centuries and millennia and what the future might look like.

DISREPUTABLE WITNESSES: RECONSTRUCTING POPULATION GROWTH IN THE BALTIC REGION WITH FAECAL LIPIDS

t's worth saying right away: No, the Baltic Sea is not a sewer. Many sewage treatment plants along its coastline ensure that the wastewater is cleaned and what the rivers then carry into them is heavily diluted. Nevertheless, extremely low concentrations of molecules that were clearly components of faeces can be detected in the sediments at the bottom of the Baltic Sea. For geoscientists like Jérôme Kaiser, these 'direputable' molecules are as valuable as gold dust. As witnesses in the archives of the Baltic Sea, they provide information about population growth and the development of sewage pollution in the Baltic Sea over the last few centuries.

• A marine geologist researches historical pollution of the Baltic Sea

'We determine lipids in the sediments that are characteristic of human faeces, but also of excrement from farm animals,' explains Jérôme Kaiser, head of the biomarker laboratory of the Palaeoceanography and Sedimentology working group. In a large-scale study, he analysed the sediments of several important Baltic Sea tributaries as well as the surface sediments in different basins of the Baltic Sea for their faecal lipid content. 'The levels of faecal lipids in the sediments of rivers varies

greatly. Rivers with large cities or intensive livestock farming in their catchment area show the high-

est values.' Kaiser found these patterns

also in the surface sediments of the Baltic Sea: near the mouths of polluted rivers or in places

where regular cur-

'This method has the potential to serve as an indicator for overfertilisation.' -----

DR. JÉRÔME KAISER

rents channelled their water, the highest values were found. He is convinced: 'This method has the potential to serve as an indicator for over-fertilisation'.

Pollution in the Baltic Sea has increased

In addition to identifying spatial differences, the authors were also able to work out temporal differences: sample material of a sediment core from the northern Gotland Basin (Central Baltic Sea) was available. Age dating placed the deposits in the period from 1867 to 2015. During this time, the proportion of faeces increased continuously, whereby a mixture of human faeces was always present. The highest proportions of human faeces occurred in the 1950s, the late 1980s and the 2010s.

In order to determine whether there is a connection between the recorded lipid levels and population growth, the values were compared with demographic data from the Baltic Sea region. This revealed parallels with the population development in the south-eastern Baltic Sea region. The similarities with the develoment in the St. Petersburg area were particularly clear.



For Jérôme Kaiser, this opens up interesting opportunities to look back to even earlier times. 'We know that these molecules remain stable in the sediment forquite a long time. We can use them, for example, to obtain more information about population growth during the Medieval Warm Period.' And demographer Mathias Lerch adds: 'The faecal lipids add the aspect of population dynamics to the toolbox we have at our disposal for reconstructing past environmental conditions. This allows us to gain exciting insights into possible interactions between the population and the environment in the past.'

© Kaiser, IOW



CONTACT PERSON

Dr. Jérôme Kaiser

PUBLICATION



Sediment cores from the Baltic Sea are a valuable archive for the palaeoceanographers at the IOW, whose diverse constituents can provide information about the past of the Baltic Sea region.



Water cycles can be studied well in the Baltic Sea due to its relatively closed location. © Prien, IOW

THE BALTIC CLIMATE UNDER THE INFLUENCE OF THE ATLANTIC: NEW INSIGHTS INTO A **'DISTANT RELATIONSHIP'**

he footprint of man-made global warming is now detectable almost worldwide, including at regional level. In northern Europe, for example, the impact of climate change on the cryosphere – i.e. all areas covered in ice - is clearly documented. In contrast, the impact on the water cycle is less obvious. So what are the reasons for the sometimes drastic changes, for example in the amount of precipitation in the Baltic Sea region?

Fluctuations in the regional water cycle can be studied particularly well in the Baltic Sea due to its enclosed location, as changes here have a direct effect on salinity. And salinity data from the Baltic Sea has been available since the 19th century. They can therefore provide representative information about the development of precipitation and evaporation in the catchment area over a long period of time.

Interaction between salinity in the Baltic Sea and the North Atlantic Oscillation

On this basis, it was shown that the average salinity of the Baltic Sea is characterised by a fluctuation with a period of around 30 years. Markus Meier, head of the 'Dynamics of Regional Climate Systems' working group, and a team have now provided an explanation for this multidecadal variability in the salinity of the Baltic Sea water: the so-called Atlantic Multidecadal Variability (AMV) and its interaction with the North Atlantic Oscillation (NAO) influence the precipitation over the water catchment area and thus the river input into the Baltic Sea: the higher the precipitation, the greater the river water input. Both lead to a direct dilution of the Baltic Sea water. Mixing processes in the entrance area of the Baltic Sea ensure that the North Sea water flowing in here is also diluted – a positive feedback mechanism that additionally reinforces the multi-decadal variation in salinity.

• Improving the prediction of salinity changes

'With our results, trends caused by climate change can be differentiated from natural fluctuations. In future, we will be able to predict changes in salinity over the course of decades,' summarises Markus Meier. 'Such

predictions could serve sustainable fisheries management, for example, because most fish species

'With our results. trends caused by climate change can be differentiated from natural fluctuations.'

-----PROF. DR. MARKUS MEIER

are adapted to a specific salinity spectrum. Changes lead to stress and predictions of 'stressful' years would enable early countermeasures to be taken.'

• Long-term data on fluctuations in surface water temperature

However, the influence of the AMV is not limited to salinity. Florian Börgel, also a scientist in the 'Dynamics of Regional Climate Systems' working group, investigated how the AMV impacts the water temperature of the Baltic Sea. For the first time, he applied a statistical method to the Baltic Sea that was originally developed to recognise patterns of variability in the global ocean. This so-called low-frequency component analysis (LFCA) makes it possible to filter out fluctuation patterns on the scale of several decades from complex data sets.

'We subjected the sea surface temperature data of the Baltic Sea in the years 1900 - 2008 to the LFCA and compared the result with the result of such an analysis on observational data from the North Atlantic over the same period,' explains Florian Börgel. His conclusion: on a scale of years and decades, the multi-decadal



fluctuations in sea surface temperatures in the Atlantic correlate very well with those in the Baltic Sea. However, this picture deteriorates drastically when individual seasons are considered: Only the winter temperatures show that a considerable proportion of the fluctuations can be attributed to the AMV. It therefore also plays a special role for the ice cover in the Baltic Sea. In contrast, summer and spring temperatures are not influenced by the Atlantic.

CONTACT PERSONS

Dr. Florian Börgel; Prof. Dr. Markus Meier

PUBLICATIONS

• Meier, H.E.M., Barghorn, L., Börgel, F., Gröger, M., Naumov, L., Radtke, H. (2023): Multi-deca-dal climate variability dominated past trends in the water balance of the Baltic Sea watershed. npj Clim Atmos Sci 6, 58. doi: 10.1038/s41612-023-00380-9





Hardly any other sea is more affected by human activities than the Baltic Sea in the heart of Europe - it is a supplier of raw materials, a transport artery and a repository for pollutants all at the same time. In research focus 4, IOW researchers are focussing on the interactions between the Baltic Sea ecosystem and human activities.

SEWAGE SLUDGE AS A SOURCE **OF MICROPLASTICS**

RF4

icroplastics are plastic particles that are smaller than 5 mm. In the meantime, science is detecting them all over the world, even in such remote places as the Arctic and Antarctic. In comparison to this omnipresence, the level of knowledge about the sources of this pollution is low. But only if the sources are known can effective action be taken against the entry of microplastics into the environment. In recent years, research efforts have therefore been made all over the world to close the knowledge gaps.

Sewage sludge has been focussed on as a possible source. It often contains large quantities of microplastics and functions as a fertiliser in agriculture in some countries. IOW environmental researchers, together with the Johann Heinrich von Thünen Institute. Federal Research Institute for Rural Areas, Forestry and Agriculture in Braunschweig, and the Leibniz Institute of Polymer Research in Dresden, investigated a test field at the Speyer Agricultural Research and Testing Institute, which has been fertilised with sewage sludge regularly since the 1980s, what the microplastic contamination looked like in the plough area, in the underlying soil and in the neighbouring, untreated field.

'As expected, we found a relatively high number of microplastic particles on the test field. But we also

found them on the untreated field in the neighbourhood. The quantity corresponded to 44% of what we found in the surface area of the test field,' reports Alexander Tagg. This finding alone would not have been enough to prove the presence of a compound. 'However, the polymer spectrum of the microplastics shows an almost identical profile at both locations. In our opinion, this can only be explained with the transport from the test field.'

In addition, microplastics were detected in the soil of the test field treated with sewage sludge to a depth of 60-90 cm, which indicates that they can also penetrate deep enough to reach agricultural drainage systems. However, the quantities of microplastics at depth were only very low (1.6 % of the surface load) and the controlled long-term and intensive treatment of the analysed test field with sewage sludge was far above what is permitted in agriculture under the Sewage Sludge Directive.

'It's not the current quantities of microplastics that worry us, but the fact that these plastics are repeatedly released into the environment and persist there. They will not disappear and will continue to accumulate if we do not close the sources,' comments Matthias Labrenz, head of the MicroCatch_Balt project, 'It is not the current quantities of microplastics that worry us, but the fact that these plastics are repeatedly released into the environment and persist there.' _____

PROF. DR. MATTHIAS LABRENZ

microplastic sinks and sources from a typical catchment area to the open Baltic Sea). And he concludes: 'The spreading of municipal sewage sludge on agriculturalland can lead to further uncontrolled pollution.' However, sewage sludge is just one of many sources of microplastics. Further research is urgently needed to classify its significance in comparison with other known sources, such as tyre abrasion or the deposition of dust from the air.



which was

BMBF until

funded by the

2021 (Investi-

gation of the



In the sample from soil treated with sewage sludge, microplastic fibres as small as 0.5 millimetres can also be between plant fibres. © Tagg, IOW

CONTACT PERSONS

Dr. Alexander Tagg, Prof. Dr. Matthias Labrenz

PUBLICATION

■ Tagg, A. S., E. Brandes, F. Fischer, D. Fischer, J. Brandt and M. Labrenz (2022). Agricultural ap-●記録 plication of microplastic-rich sewage sludge leads to further uncontrolled contamination. Sci. Total Environ.: 150611. doi: 10.1016/j.scitotenv.2021.150611

CCA1

CROSS-CUTTING ACTIVITY 'INNOVATIVE INSTRUMENTATION'

In the cross-cutting activity 'Innovative Instrumentation', technologies are adapted to the requirements of science, improved or even developed from scratch. IOW researchers work hand in hand with partners from other institutes, universities and industry. Outstanding technological inventions developed in-house reach patent maturity and can thus be utilised by a wide range of customers worldwide.

A LOOK INSIDE CHANGING SEAS: IOW SUPPORTS SUCCESSFUL USE OF NEW **ARGO FLOAT SENSORS**

wo thirds of the Earth's surface is covered by water. While satellites have a good view of the surface of the ocean, they are not able to investigate the depths of the sea. However, this is now possible using automated drifting buoys known as Argo floats: once deployed, the floats sink to a depth of 1000 metres and drift with the current. Every 10 days, they dive further down to a depth of 2000 metres and then slowly rise to the surface. On the way up, they continuously measure - for example - the temperature and salt content of the water. After surfacing, the data collected is transmitted by satellite and published almost in real time. The Argo floats then sink again to continue drifting.

In this way, the first generation of Argo floats helped to improve global climate modelling and regional weather forecasts. As part of the DArgo2025 project, a German research consortium led by the Federal Maritime and Hydrographic Agency (BSH) was able to expand the field of vision of the Argo floats by equipping a total of 20 of these automated drifting buoys with new sensors for recording eutrophication, turbidity and acidification of the oceans in order to validate them for global use.

• Optical sensors provide information about the over-fertilisation of the Baltic Sea

An IOW team was involved in testing and validating innovative optical sensors for measuring the plant nutrient nitrate - an important indicator of over-fertilisation of water bodies. It also established a German contribution to the global Argo observations in the Baltic Sea for the first time. 'The special thing about the Argo floats

- in addition

'The special thing about the to the three-Argo floats [...] is the truly dimensionality continuous and year-round of the measuremeasurement activity [...]' ments – is the _____ truly continous DR. HENRY BITTIG and year-round

measurement

activity - in bad weather, storms and hail as well as in bright sunshine,' emphasises Marine Chemist Henry Bittig, who coordinated the IOW contribution to DArgo2025. 'No research vessel is able to collect measurement data with such a large temporal and spatial coverage and with such regularity.'

The integration of new measuring systems into the sophisticated technology of the Argo floats is a challenge in itself, which all institutions involved in the research network had to deal with intensively and which also required extensive evaluation of the newly equipped floats under the harsh outdoor conditions in the middle of the sea. 'In our system, there is also the fact that the Baltic Sea water has a high proportion of yellow matter and therefore very special optical conditions that only occur in large ocean depths. Of course, this also has an effect on optical methods such as ours for nitrate measurement and requires special attetion," continues Bittig.



In addition to Marine Physics, e.g. in relation to the stable stratification of the water body resulting from temperature and salinity, chemical-biological processes are of great importance in many of the IOW's research guestions. 'Together with oxygen and chlorophyll measurements, which have now also been carried out by the Argo floats, we were able to obtain a particularly rich and promising data set on the productivity and degradation of phytoplankton biomass in the central Baltic Sea, which is currently still being analysed,' says Henry Bittig.

As part of the DArgo2025 project, an Argo Float will be deployed in the Baltic Sea from on board the research vessel 'Elisabeth Mann Borgese'. © Naumann, IOW

The newly equipped drifting buoys are now being operated as part of the international 'Argo' observation programme, which currently comprises almost 4,000 such measuring platforms in the world's oceans. As part of the United Nations' Ocean Decade for Sustainable Development launched in 2021, the Argo floats are to be further developed so that they can also measure the deep sea down to a depth of 6.000 metres.

CONTACT PERSON

Dr. Henry Bittig

CONTACT POINT ARGO GERMANY:

• Argo programme at the Federal Maritime and Hydrographic Agency (BSH)



CCA2

CROSS-CUTTING ACTIVITY 'MODEL DEVELOPMENT'

The cross-cutting activity 'Model Development' is dedicated to the development of computer models. Every area of work at the IOW provides pieces of the puzzle for an overall scientific picture of the Baltic Sea, which can only be translated into a virtual image by the modelers if all areas work closely together and no piece is missing. IOW scientists can use the computer models to hypotheses, make predictions about the Baltic Sea's response to climate change, for example, or test the effectiveness of environmental protection measures before they are implemented.

MODEL SIMULATIONS FIND THE CAUSE OF **UNUSUALLY HIGH TEMPERATURES AT THE BOTTOM OF THE BORNHOLM BASIN**

he water temperature at the bottom of the Bornholm Basin in the central Baltic Sea has risen faster than at the surface in recent decades. Researchers of the IOW have now been able to explain this unusual development with a temporal change in the water exchange between the North and Baltic Seas. In addition to the rapid temperature increase in the surface water, which can be observed throughout the Baltic Sea and is due to global warming, it also causes the temperature in the deep water to rise. The research results have now been published in the renowned journal Geophysical Research Letters.

We are registering an increase in sea surface temperatures worldwide due to global warming – including in the Baltic Sea. While the surface water reacts relatively quickly to the higher temperature of the atmosphere, the deeper water only absorbs the heat with a delay. In some areas of the Baltic Sea, however, the deeper layers are warming faster than the surface water. How can this be? Leonie Barghorn, a Physical Oceanographer in the Dynamics of Regional Climate Systems working group, and her colleagues have investigated whether temporal changes in the inflow of North Sea water into the Baltic Sea could be the cause.

• Oxygen-rich North Sea salt water for the Baltic Sea

The brackish Baltic Sea draws its salt content from the North Sea. However, due to its higher salt content, the inflowing North Sea water is heavier than the brackish water of the Baltic Sea and therefore flows in at the bottom of the Baltic Sea. This is not a permanent process, as the Baltic Sea usually has a high filling level due to numerous inflows and large annual amounts of precipitation, which results in a strong outflow. Only under certain meteorological and / or oceanographic conditions do these conditions reverse, allowing North Sea water to enter the Baltic Sea.

For decades, autumn and winter storms were considered the main drivers of these conditions. In 2002, it was possible for the first time to identify and analyse a saltwater inflow that deviated from this pattern: in calm summer weather, an inflow of North Sea water into the Baltic Sea was driven solely by horizontal differences in salinity. Although these events are much smaller in scale, they occur more frequently. And of course, North Sea water that flows into the Baltic Sea in summer or early autumn is significantly warmer than that which enters via winter inflows.



Leonie Barghorn, Physical Oceanographer at the IOW, and her colleagues have investigated whether inflowing North Sea water contributes to the warming of the deep waters of the Baltic Sea in the Bornholm Sea © Amm. IOW

Modelling of saltwater inflows as a substitute for missing long-term data

There are still no sufficiently long observation series on the summer inflows, which means that determining trends on the basis of measurement data is subject to too much uncertainty. Leonie Barghorn has therefore used model simulations to investigate whether the frequency of saltwater inflows in summer and

early autumn has increased over the last 150 years and whether there is a causal link to the temperature increase in the deep water of the Bornholm Sea. 'We analysed a so-called 'hindcast' simulation that covers the period from

'We analysed a so-called 'hindcast' simulation that covers the period from 1850 to 2008.'

LEONIE BARGHORN

the two seasons of summer and early autumn with that of the entire year, we were able to clearly see that the summer and early autumn salt input increased and the winter input decreased during the model period under consideration.' While the Arkona Basin upstream of the

Bornholm Basin is regularly mixed due to its shallower depth, so that the incoming warm saltwater is distributed over the entire water column, the downstream Gotland Basin is not accessible for the small summer to early autumn saltwater inflows. This means that conditions that make this 'bottom heating' visible only prevail in the Bornholm Basin.

1850 to 2008.'

says Leonie

Barghorn, ex-

plaining her

methodology.

'By comparing

the data from

O Barghorn, L., Meier, H. E. M., & Radtke, H. (2023): Changes in seasonality of saltwater ●是社 inflows caused exceptional warming trends in the western Baltic Sea. Geophysical Research Letters 50. doi: 10.1029/2023GL103853

Markus Meier, head of the Dynamics of Regional Climate Systems working group, adds: 'We don't yet know exactly what caused the shift in salt input to the warm season. In any case, the consequences for the Bornholm Basin could be serious, as higher temperatures will also drive oxygen depletion and thus promote the spread of 'dead zones'.'

CONTACT PERSONS

Leonie Barghorn, Prof. Dr. Markus Meier

PUBLICATION

Innovative measurement techniques and modelling

High-energy marine environment a challenge for measurement systems



High productivity and biodiversity

© IOW

he application was previously submitted via the Ministry of Science, Culture, Federal and European Affairs of Mecklenburg-Western Pomerania. The project was submitted to the Joint Science Conference (GWK) and recommended for funding by the Leibniz Association's Senate Strategic Committee (SAS).

• Unexplored shallow water processes at the border between land and sea

The new research focus 'Shallow Water Processes' and Transitions to the Baltic Scale (STB) is dedicated to researching previously poorly understood processes in shallow coastal waters with the help of observations, field and laboratory experiments and modelling. The coastal seas of the world consist of different, but nevertheless closely interconnected ecosystems that are strongly influenced by human activities: estuaries, shallow coastal areas or tidal wetlands among others. For the Baltic Sea, the coastal zone is defined according to the extent of interaction between water and sediments (approx. 0-10 m depth), where mixing, waves and currents bring the sediments into light-flooded water layers. In other words, where the interaction of physics, biology, sedimentology and material flows is extremely close. The shallow coastal waters play an important role in the conversion of land-based material and form a unique environment. Although they are strongly influenced by climate change and human activities,

for long-term observations over several

NEW RESEARCH FOCUS

SHALLOW WATER PROCESSES

he IOW was successful with its application for a special 'small strategic institute expansion' for a new research focus on shallow water research. Since 2023, additional funds (just under 2 million EUR) have thus flowed into the IOW's core budget.

The logo summarises key processes in the coastal zones and highlights the challenges of the planned investigations.

the shallow coastal waters are not integrated in the understanding of the processes nor in the physical-biogeochemical modelling of the Baltic Sea and coastal seas. As there are no tides in the Baltic Sea, it is potentially more difficult to model comprehensive measurements. Nevertheless, this is exactly what is planned: Coastal measu-

ring stations are to be equipped and short-term that send data

'We assume that shallow water will play a very important role in understanding the entire Baltic Sea system.'

PROF. DR. MAREN VOSS

years. In addition, the stations are used to test physical and biological processes, species communities and sediment properties. 'We assume that shallow water will play a very important role in understanding the entire Baltic Sea system.'



The core team of the new research 'Shallow Water Processes': The newly appointed colleagues are framed in green (scientists), red (engineers) and blue (technicians).

Concentrated expertise

The scientists, including new colleagues, began their initial work in 2023. The following study areas have been selected: Nienhagen Reef, Boltenhagen Station and the Greifswald Bodden. The first long-term mooring is expected to be deployed at Nienhagen Reef in autumn 2024, which should also withstand storms, strong currents and sediment movements. Monthly trips with research divers took place to carry out initial measurements in order to characterise the conditions. A large experiment in the Greifswald Bodden on sediment resuspension and the recruitment of zooplankton was also carried out. All in all, the scientists have made a promising start, which already indicates how important and dynamic the coastal zones are and how large our knowledge gaps still are. New and more in-depth cooperations are planned in the Baltic Sea region and with universities.

CONTACT PERSONS

Prof. Dr. Maren Voss (Co-Lead) Dr. Peter Holtermann (Co-Lead)

LONG-TERM OBSERVATIONS





THE IOW LONG-TERM OBSERVATION **PROGRAMME – A TREASURE OF RESEARCH DATA**

The IOW has been running its own long-term observation programme for many decades and fulfils the German contribution to monitoring the marine environment of the Baltic Sea under the Helsinki Convention (HELCOM) on behalf of the Federal Maritime and Hydrographic Agency (BSH).

EXPEDITION EMB 293 – START OF THE EXTENSION OF THE UNIQUE LONG-TERM ENVIRONMENTAL DATA PROGRAMME TO THE ENTIRE BALTIC SEA

he physicists, engineers, chemists and biologists of the IOW environmental monitoring teams analyse the seasonal development of the ecosystem of the south-western and central Baltic Sea on the traditional three spring cruises in February, March and May. The summer and autumn situations are recorded on two further research cruises in August and November. This long-term data programme to record the environmental status of the Baltic Sea has been carried out consistently by the IOW since 1969.

In May 2022, the scientists at the IOW now set the starting point for a permanent annual expansion of this valuable programme. The ship expedition EMB 293

of the research vessel Elisabeth Mann Borgese led to the Gulf of Bothnia, i.e. to the most northeastern part of the Baltic Sea. Two permanent measuring stations had already been installed there a year earlier in the Bothnian Sea and the Bothnian Bay, their research data now provide a comprehensive insight into the oceanographic conditions and form the basis for the expansion of the permanent measuring programme. With the approval of the extended ship application for this project for the years 2024-2028 by the Research Vessel Review Panel (GPF) at the German Research Foundation (DFG), the course has been set for the acquisition of spatially high-resolution data of the most important oceanographic parameters such as salinity, temperature, oxygen concentration and turbidity of the water from Kiel Bay to the Bothnian Bay. The hydrographic section through the entire Baltic Sea measured during the voyage in May 2022 offers a unique insight into the structurally extremely diverse living conditions of the Baltic Sea, which is a marginal sea with pronounced vertical and horizontal environmental gradients.



Vertical distribution of dissolved oxygen in µmol/ kg-1 along the section from the Darss Sill in the south-west to the Bothnian Bay in the north-east (EMB 293 - May 2022). © IOW



Intensity of saltwater inflows – Salt import of barotropic saltwater inflows into the Baltic Sea in the period 2012 – 2023 © Mohrholz, IOW

THE SALTWATER INTRUSION OF DECEMBER 2023 - THE FIRST MAJOR WATER OUTBURST **EXCHANGE IN DEEP WATER SINCE 2017**

he ongoing series of years since 2017 with only weak inflow events from the North seawater into the Baltic Sea and the stagnation (oxygen depletion in the deep water) were finally interrupted in 2023. In December, a saltwater inflow occurred around the Christmas holidays from 20-29 December, which was classified as a 'Major Baltic Inflow' (MBI) of medium intensity and transported around 1.7 Gt of saline water (>16 g kg-1) into the deep water of the Arkona Basin. A total volume of 204 km³ crossed the shallow straits of Öresund and the Darss Sill in the western Baltic Sea.

The volume share of higher salinity (>16 g/kg), which sinks due to its higher density and feeds the deep water, totalled 86 km³. In comparison, during the major event in December 2014, the third strongest event in the long-term observation, there were 3.98 Gt of salt import with a total volume of 312 km³ and a highsalinity partial volume of 198 km³. The five seasonal ship expeditions of the IOW long-term data programme will continue to follow the advance of this water mass into the deep basins of the central Baltic Sea and the associated changes in the ecosystem over the course of 2024.

The barotropic (wind-driven) inflows of salt-rich water masses from the North Sea are the most important process for the ecological status of the deep waters of the Baltic Sea. The permanent density stratification of the Baltic Sea water consists of low-salinity surface water, which is constantly fed by freshwater from the numerous river systems flowing into the Baltic Sea, and the more saline deep water located below. This body of deep water is only sporadically fed by the connection to the oceans via the Kattegat and supplied with fresh oxygen as a result of seawater flowing in laterally. Both layers only mix very slightly, so that there is permanent stratification in the Baltic Sea and oxygen depletion in the deep water is a natural process.

CONTACT PERSONS

For the IOW long-term observation programme and **BSH-monitoring**:

Lead Coordination: Prof. Dr. Joanna Waniek, Coordination: Dr. Sandra Kube, Dr. Michael Naumann

For the expedition EMB 293 and salt water intrusion of December 2023:

Dr. Volker Mohrholz

Entry into the Golfo Almirante Montt, Chile of the esearch vessel SONNE as part of the MAPUCHE project © Schulz-Vogt, IOW

NEW PROJECTS

n 2022, 15 projects started at the IOW. In 2023, 19 new projects were acquired. Some of them are presented in the following chapter. A complete list of all 100 projects, that were worked on in both reporting years can be found in the appendix.

PIETZ Processes impacting estuarine turbidity zones in tidal estuaries

What is the interaction between the fast sediment dynamics in the water column and the slow dynamics of the sediments at the bottom and how does this impact the positions of the turbidity zones? What are the adaptation time scales of the sediment dynamics and the formation of turbidity zones under changing hydrodynamic conditions? What are the proportions of fluvial and marine sediment classes in estuarine turbidity zones? These questions will be answered by applying total exchange flow and other analytical methods. To this end, a numerical modelling laboratory is being set up to reproduce multi-decadal observation data of salt and sediment profiles along the Lower Elbe and the Schelde by calibrating the model configuration. Firstly, the sensitivity of the dynamics of the turbidity zones is systematically analysed. Subsequently, the examination of scenarios under idealised forcing conditions answers the above-mentioned research guestions for a multidimensional parameter space.







MAPUCHE

FUNDING

Impact of pelagic anoxia in the upwelling area off Concepción and in a pristine anoxic fjord, and the postglacial development of the Patagonian fjord region of Chile

Firstly, the project will investigate the effects of oxygen-depleted and anoxic conditions on the biogeochemical nitrogen, sulfur and phosphorus cycles. The focus is on the transformation and decomposition of organic material. The researchers are also interested in the influence of water column anoxia on habitats and food chains, and on biodiversity. Secondly, the post-glacial development of the Patagonian fjord region is being investigated. The influence of postglacial changes in the atmospheric and oceanic current regimes in the southeastern Pacific on the two fjord systems of the Canal Concepción/Canal Wide/

FUNDING



Relationship between salinity and estuarine turbidity maximum (ETM) in the Lower Elbe (simulated with the GETM model). Horizontal distribution of bottom salinity (a) and sediment concentration (b) at the bottom. Blue line: 5 m depth line, pink crosses: Elbe kilometres (80, 100, 120, 140, ascending to the west). Corresponding vertical distributions of salinity (c) and sediment concentration (d) along the navigation channel. Grey contours: Salinity. @ Li, IOW

PRINCIPAL INVESTIGATOR (PI) AT IOW

Prof. Dr. Hans Burchard



https://www.io-warnemuende.de/ project/265/pietz.html

Seno Eyre and the fjord Golfo Almirante Montt is being examined. In addition, the significance of the eustatic sea level rise, regional isostatic uplift and glacier dynamics on the fjord systems is to be determined.

Federal Ministry of Education and Research

PRINCIPAL INVESTIGATOR (PI) AT IOW Prof. Dr. Heide Schulz-Vogt



Orman https://www.io-warnemuende.de/ project/303/mapuche.html

PlumeBaSe

Tracing of ship plumes and impact to seawater

The increasing global transport of goods by water is constantly increasing the pressure on marine ecosystems. PlumeBaSe is concerned with the detailed analysis of the composition of organic aerosols that ships release during the combustion of fossil fuels. To date, the scientific understanding of the ageing processes of aerosols during atmospheric transport and in the water column, for example through UV radiation or reactive oxygen species, is incomplete. In order to close this gap between sources and sinks, the project will analyse the transport and composition of the combustion products in air and water, some of which are very long-lived, are sampled with high temporal and spatial resolution and analysed using modern mass spectrometry methods.

German Research Foundation

FUNDING

PRINCIPAL INVESTIGATOR (PI) AT IOW

Dr. Helena Osterholz

WEBSITE



• https://www.io-warnemuende.de/ project/296/plumebase.html

MicroMeth

Methane production by microphytobenthos and its contribution to the benthic methane flux from the coastal zone of the Baltic Sea

Coastal waters are of particular importance as a source of the greenhouse gas methane, because the methane concentration in coastal waters is much higher than in the open ocean. The source strength of the various methane emitters in anoxic and oxic environments is largely unknown. The focus of the investigations is on microphytobenthos. Its effect is studied in the laboratory in incubation experiments on cultures of benthic diatom species. On the other hand, natural communities are sampled off the Swedish Baltic Sea island of Askö and in the Bodden waters off Zingst. In order to be able

to classify the methane production rates determined in the experiments in terms of their significance, the methane fluxes between sediment, water and atmosphere are determined in the study areas.

FUNDING

German Research Foundation

PRINCIPAL INVESTIGATOR (PI) AT IOW

Dr. Oliver Schmale

WEBSITE



https://www.io-warnemuende.de/ project/298/micrometh.html



General methane distribution pattern with factors influencing production and transport of methane in the marine environment © Schmale. IOW

Guided aeronautic for aerosol sampling in ship emissions on deck of the FS Elisabeth Mann Borgese, expedition EMB315, April 2023 © Šmok. CUN

BaltChron

Placing the deep Baltic Sea sediment stratigraphy in a precise chronological framework: Improved paleoenvironmental studies

The project aims to improve the temporal classification of changes in the Baltic Sea ecosystem. This will improve the prediction of the effects of man-made climate change. The basis for this are sediments, which, with their physical, biological and chemical properties, reflect the changes in the ecosystem caused by varying environmental conditions in the past. Until now, the uncertainty of the assignment has been in the dimension of centuries. An evaluation of the recorded subdecadal environmental information therefore requires its placement in a precise chronological framework. Pilot 10Be data from a sediment core from the Baltic Sea around the mid-Holocene allowed synchronisation with the absolutely dated atmospheric 14C time series



© Czymzik, IOW



of the IntCal20 calibration curve. This synchronisation reduces the chronological uncertainties of a sediment core from centuries to $\pm 10-15$ years.

German Research Foundation

PRINCIPAL INVESTIGATOR (PI) AT IOW Dr. Markus Czymzik

WEBSITE

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• https://www.io-warnemuende.de/ project/297/baltchron.html

Changes in the strength of the Earth's and sun's magnetic fields lead to varying 10Be production rates in the atmosphere. Deposited in sediments and glaciers, this signal can be used to synchronise various environmental archives.



OCEAN CITIZEN

Marine forest coastal restoration: an underwater gardening socio-ecological plan

Active restoration of marine environments (ecosystems) can enhance the impact of marine protected areas. Restoration measures promote biodiversity, improve carbon sequestration and strengthen the resilience of coastal and offshore areas. The project is developing an advanced, long-term restoration programme for marine forests that combines ecological perspectives with social engagement and economic benefits for local communities. Among other things, a toolbox for restoration measures is being used at three onshore and offshore sites. One focus is on the development of



ecoengineering methods (including smart enhanced reefs). In addition, the project aims to develop a job description for a 'sea gardener'.

FUNDING

EU – Horizon Europe

PRINCIPAL INVESTIGATOR (PI) AT IOW Dr. Peter Feldens

WEBSITE

 https://oceancitizen.eu/ oH-11 ⊙H-11

GEORGE

Next generation multiplatform ocean observing technologies for research infrastructures

The ocean is a major component of the global carbon cycle. Sustainable, long-term in situ observations are essential to understand and predict the effects of climate change on marine ecosystems, to increase resilience and to develop sound mitigation and adaptation strategies. GEORGE promotes the technological maturity of novel carbon sensors that enable systematic autonomous in situ characterisation of the oceanic CO₂ system and CO₂ gas exchange. These sensors will be integrated on platforms of various European research infrastructures for ocean observation (ICOS, Euro-Argo, EMSO) to develop a state-of-the-art, crossplatform observation system for characterising the ocean carbon system.



FUNDING





FUNDING

Federal Ministry of Education and Research

PRINCIPAL INVESTIGATOR (PI) AT IOW Prof. Dr. Klaus Jürgens



https://www.io-warnemuende.de/ dam-mgf-baltic-sea-home.html

Brittlestars in a soil sample © Gogina, IOW

MGF-BALTIC SEA II

Effects of bottom contact fishing exclusion in marine protected areas (Natura 2000) of the German EEZ in the Baltic Sea; Development scenarios of benthic communities and sediment functions

MGF-Baltic investigates the effects of mobile bottomcontacting fishing (MGF), which largely includes the Natura 2000 protected areas within the EEZ in the Baltic Sea. In MGF-Baltic I, the actual state of the benthic ecosystem was documented in planned fishing exclusion areas and in comparable reference areas outside the protected areas. One important finding was that almost all ecosystem components showed no significant differences between protected and reference areas. In MGF-Baltic Sea II, the investigations after

fisheries exclusion are being continued in order to monitor the suspected regeneration of biocoenoses in the protected areas. The results will lead to an assessment of the influence of MGF on benthic ecosystem functions and to the development of indicators for MGF-related disturbances. Furthermore, the results will lead to specific recommendations for fisheries management and future monitoring strategies in protected areas.



EU – Horizon Europe

PRINCIPAL INVESTIGATOR (PI) AT IOW

Dr. Henry Bittig



• https://george-project.eu/

The IOW GEORGE project team with the ICOS class 2 label © Estelmann, IOW





Retrieving a lander © Gogina, IOW

EFFECTIVE

Enhancing social well-being and economic prosperity by reinforcing the EFFECTIVENEES of protection and restoration management in Mediterranean MPAs

The main objective of the EFFECTIVE project is to develop a comprehensive scientific basis and practical guidance combining science, technological, naturebased solutions, digitalisation and social impact for the application of ecosystem-based management to protect and restore the blue natural capital of the Mediterranean area in the EU.

FUNDING

EU – Horizon Europe

PRINCIPAL INVESTIGATOR (PI) AT IOW Dr. Miriam von Thenen

WEBSITE • https://effective-euproject.eu



CofiES

Coastal filter function under environmental stress

Coastal areas worldwide are under high pressure from various uses and are additionally threatened by climate change (including storms and high temperatures). This leads to major changes in the entire habitat, including the conversion of materials. Therefore, a comprehensive understanding of microbial processes in shallow water areas is required. However, investigations are extremely difficult due to the high dynamics and strong wave influence and require close cooperation across disciplinary boundaries. This project investigates how microbial processes in the nitrogen cycle are influenced by water-sediment interactions or benthic colonisation. Rate measurements in the field, the use of landers and laboratory experiments are carried out. The aim is to quantify the microbial processes and their interaction with near-bottom currents and to gain a better understanding of the coastal filter.

FUNDING

Björn Carlson Prize

PRINCIPAL INVESTIGATOR (PI) AT IOW Prof. Dr. Maren Voß

WEBSITE



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https://www.io-warnemuende.de/ project/308/cofies.html



Life Boosting Unit colonised by Parablennius pilicronis (nature-based technical construction unit) © OceanEcostructure

Mini Kammerlander in action off Nienhagen. The device is used to investigate oxygen consumption and nutrient release from the seabed. © IOW





ArKoBi

Investigation of the contribution of the black clam (Arctica islandica to carbon storage and biodiversity in the Baltic Sea

ArKoBi is investigating the extent to which the Arctica islandica or its associated biotopes play a role as a carbon sink (as a blue carbon ecosystem). In addition, we are investigating how climate change and anthropogenic influence their biodiversity, reproduction and population structure as well as their carbon storage capacity. The study area is the Baltic Sea, in particular the Fehmarnbelt nature reserve. ArKoBi combines basic research with marine nature conservation and determines the potential as a blue carbon ecosystem. The findings can be used to derive possible conservation measures to preserve the A. islandica-associated biotopes for climate, biodiversity and biotope protection.



FUNDING BfN - Federal Agency for Nature Conservation

PRINCIPAL INVESTIGATOR (PI) AT IOW Dr. Michael Zettler



https://www.io-warnemuende.de/focus.html

NEW FACES

HENDRIKJE WEHNERT

Diversity Spokesperson of the Leibniz Association

IOW's diversity officer, **Hendrikje Wehnert**, was re-elected by the Leibniz Diversity Network as the Leibniz Association's diversity spokesperson for a further two years, on 9 November 2022. In this role, she promotes, among other things, the networking of Leibniz institutions on the topic and supports the promotion of diversity as defined in the Leibniz Association's statutes.

PROF. DR. HELGE ARZ Interim Director PROF. DR. DETLEF SCHULZ-BULL Deputy Director

Helge Arz, since 2010 professor for Marine Geology at the University of Greifswald and head of the department of Marine Geology at the IOW, was appointed interim director of the IOW on 1st April 2022 by the chairman of the Board of Trustees, Mr Venohr, Head of department 3 at the Ministry of Science, Culture, Federal and European Affairs Mecklenburg-Western Pomerania. He held this position until the inauguration of the new director Oliver Zielinski on 1st March 2023. At the same time, **Detlef Schulz-Bull**, Professor at the University of Rostock and head of the Marine Chemistry department, was deputy director. He held this office until 30 September 2022.







PROF. DR. OLIVER ZIELINSKI Director

Oliver Zielinski decided to become a physicist when he was in fifth grade. As a doctoral student on a ship expedition, it were the colours of the ocean that fascinated him. It became clear to him how fundamentally important light is for the ocean's ecosystem. He sees one of the greatest challenges in marine research as the task of processing data and making it comprehensible in such a way that politics, science, business and civil society are able to make science-driven decisions to protect and restore marine and coastal habitats and enable their sustainable use. Together with the entire IOW team, he would like to work towards this goal. Oliver Zielinski has been director of the IOW since 1st March 2023. At the same time, he was appointed University Professor of Earth System Science at the University of Rostock.

PROF. DR. HANS BURCHARD, PROF. DR. MAREN VOSS AND DR. PETER HOLTERMANN

Colleadership of the new Research Focus 'Shallow Water Processes'

The IOW successfully applied for a special funding for a 'small-scale strategic institute expansion' for a new research focus on shallow water research, starting on 1st January 2023. Hans Burchard and Maren Voss jointly headed the implementation of the new research focus at the IOW. In August 2023, Hans Burchard handed over the co-leadership to Peter Holtermann. All three have been scientists at the IOW for a long time.

from the left: © Burchard. © Amm, IOW, © IOW





ROBERT MARS Head of Measurement Techniques & Methods

On 1st February 2023, **Robert Mars** took over the personnel and technical management of the IOW's Measurement Techniques & Methods working group. Prior to that, he had already headed the IOW's measurements for the Marine Environmental Monitoring Network (MARNET) on behalf of the Federal Maritime and Hydrographic Agency (BSH). He took over a team of 16 technicians and engineers. His responsibilities include actively implementing the marine technology requirements of the departments, as well as planning, implementing and developing specialised marine hardware and software. He also regularly goes to sea to perform quality control of data for the marine environmental monitoring network, among other things.

DR. MATTHIAS PREMKE-KRAUS

Head of Science Management

Matthias Premke-Kraus has headed the Science Management department since 1st September 2023. He succeeds Dr. Barbara Hentzsch, who went into welldeserved retirement in September 2023 after almost 30 years at the IOW. He studied biology in Greifswald and completed his doctorate in Marine Geosciences at the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) in Bremerhaven. Before moving to the IOW, he was a scientific officer at the headquarters of the Leibniz Association in Berlin.

© Amm, IOW

KAJA GENTSCH, LEONIE BARGHORN

Phd representatives

In June 2023, 43 doctoral candidates from the IOW elected Leonie Barghorn and Kaja Gentsch as their new representatives. They are the contact persons for the phd students and represent the interests of this group in the semiannual meetings with the director and in the IOW's internal Equal Opportunities Commission, among other things. Outside of the IOW, the representatives connect with the phd student representatives from other Leibniz institutions.



AWARDS, **HONOURS AND** NOMINATIONS





EGU AWARDS FOR OUTSTANDING EARLY CAREER SCIENTISTS

Dr. Florian Börgel received the '2023 Division Outstanding Early Career Scientist Award' from the European Geosciences Union (EGU) for his outstanding research in the field of the long-term influence of climate variability on regional seas. The fact that he completed his doctorate within two years with summa cum laude and the numerous publications also had a positive influence on

the evaluation.

LINK

Florian Börgel © Heidenreich, Helmholtz SynCom

BJÖRN CARLSONS OSTSEE-PREIS 2022

Prof. Dr. Maren Voß was honoured by the Swedish Björn Carlson Baltic Sea Foundation in June 2022 for her groundbreaking research on marine nitrogen cycles in the Baltic Sea. The prize is endowed with €300,000. It was awarded for the first time and handed over by Crown Princess Victoria of Sweden. The prize money will be used for further research into the filtering functions of the Baltic Sea coasts.

LINK



O:4:0 https://www.io-warnemuende.de/message/items/research-at-the-highest-levelthe-bjoern-carlson-baltic-sea-prize-hasbeen-awarded-to-iow-researcher-maren-voss.html

Awarding of the Björn Carlson Baltic Sea Prize to Maren Voß by the Crown Princess Victoria of Sweden. © AxlMedia



https://www.egu.eu/awards-medals/division-outstan-ding-ecs-award/2023/florian-borgel/ ding-ecs-award/2023/florian-borgel/

© Beck. IOW



PROF. DR. OLIVER ZIELINSKI APPOINTED TO VARIOUS COMMITTEES AND ADVISORY BOARDS

IOW-Director Oliver Zielinski

was appointed to the Advisory Board of the Deutsches Meeresmuseum Stralsund, in November 2023 and elected to the new MTS Board at the general meeting of the Department of Maritime Systems (MTS) at the University of Rostock on 20 November 2023.

BSSC OUTSTANDING STUDENT PRESENTATION AWARD

The Baltic Sea Science Conference (BSSC) awards an annual prize for the best student presentation. In 2023, David Riedinger convinced the jury with his presentation on the influence of various environmental parameters on the abundances of Vibrio vulnificus. Among other things, he is investigating whether the presence of seagrass fields or various nutrients - in conjunction with different temperatures - affects the development of the vibrios.



David Riedinger © Choisnard, IOW

APPOINTED TO THE ADVISORY BOARD OF THE BALTIC SEA RESEARCH FOUNDATION

On the basis of his expertise in knowledge transfer, **Dr. Sven Hille** was appointed as a member of the scientific advisory board of the Baltic Sea Research Foundation at the 'Stiftung Deutsches Meeresmuseum' on 21 November 2023 by the decision of the foundation board.

Sven Hille © Amm. IOW

OTTO-KRÜMMEL AWARD FOR **BACHELOR THESIS**

For her bachelor's thesis, Denise Otto, investigated the biogeochemical influence of flooding on the soils of a coastal bog. On September 2023, the young scientist was awarded the Otto Krümmel Prize in Kiel. The prize, endowed with 1.500 euros, is awarded annually by the Society for the Promotion of the GEOMAR Helmholtz Centre for Ocean Research Kiel for outstanding bachelor's theses in the field of ocean research.

Miriam von Thenen © von Thenen, IOW





SELECTED FOR THE LEIBNIZ MENTORING PROGRAMME _____

The Leibniz Association's mentoring programme for excellent female researchers with a doctorate is characterised by the combination of a mentoring partnership with an experienced researcher, an expensive seminar programme and professional process support. It is designed to enable female scientists to manage their careers in a targeted manner, expand subject-specific networks and take on leadership roles with confidence. Dr. Miriam von Thenen was selected from a large number of applicants for one of the 26 places. The programme runs from September 2023 to January 2025.



Okto https://www.leibniz-gemeinschaft.de/en/ careers/careers-in-research/taking-on-leadership-positions/leibniz-mentoring/ mentees-202021



© Gohlke, IOW

PROF. DR. **ULRICH BATHMANN** _____

Ulrich Bathmann was bid farewell in a ceremony by the state government of Mecklenburg-Western Pomerania in September 2022. He had been director of the IOW and professor of Earth System Science at the University of Rostock for more than ten years. To take up this position, he had left his previous workplace, the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), after 23 years, to take on the exciting new field of work at the IOW. During his time as director, two successful evaluations of the IOW were carried out by the Senate of the Leibniz Association, a small-scale institute extension with the special subject 'Shallow Water Research' was approved, and the Leibniz ScienceCampus Phosphorus Research Rostock was established at the IOW, of which he was spokesperson. As head of the institute, he took the opportunity to visibly consolidate the research field and the institute in German marine research. Ulrich Bathmann was also active in the Leibniz Association for many years as spokesperson for the Environmental Sciences Section and as a member of the Leibniz Association's Executive Board. In the German Marine Research Consortium (KDM). Ulrich Bathmann has highlighted the interests of coastal and shelf sea research. It was out of the KDM that he helped establish the German Marine Research Alliance (DAM). Ulrich Bathmann continues to fulfil some of his duties: the chairmanship of the KDM and the work of the DAM board.

DR. BARBARA HENTZSCH

Barbara Hentzsch, the long-standing head of the Science Management department, took her well-deserved retirement in autumn 2023. For almost 30 years, Barbara Hentzsch helped shape and mould the IOW in many ways and helped the IOW become what it is today: one of the leading coastal research institutes in the Baltic Sea region and beyond.

FAREWELLS

PROF. DR. **DETLEF SCHULZ-BULL**

Detlef Schulz-Bull retired in spring 2023. From 2002 to 2023, he headed the Marine Chemistry department at the IOW, where he established and led the Organic Pollutants working group. At the same time, he was deputy director of the institute for many years (2011 – 2022). He never tired of always standing up for the interests of the institute and the department. Detlef Schulz-Bull is a passionate marine

© Klostermann, IOW

chemist who loves expeditions and working at sea. During all his years at the IOW,

Detlef Schulz-Bull valued and cultivated international networking with colleagues from different fields of marine science and different cultural backgrounds, and he was always committed to providing state-of-the-art training for the next generation of chemical oceanographers.

© Amm, IOW



TRANSFER



SMALL BUT NICE Our Baltic Sea exhibition in the research villa

Since 2022, our small exhibition has been open to visitors again after remaining completely closed during the Corona pandemic. A new utilisation concept focuses on groups, for which guided tours are offered by appointment. Opening the exhibition to the general public in pre-pandemic times attracted few visitors and proved to be labour-intensive to look after. The exhibition is an integral part of the IOW's educational work. Around 500–600 pupils visit it every year. They are particularly interested in the Action Bound app, which allows them to interactively explore the exhibition content. The group programme is also used as part of professional development courses, IOW academic events and by senior citizens.

CONTACT PERSONS Dr. Sven Hille, Dr. Regine Labrenz

PROMINENTLY PLACED

The IOW in the permanent exhibition of the **Deutsches Meeresmuseum Stralsund**

The Australian tubeworm (Ficopomatus enigmaticus) was first detected in the south-western Baltic Sea in 2016. Since then, it has spread rapidly. Brick-sized calcareous tube formations can develop within a growth period, preferably on boat hulls and shorelines. To record the spread, the IOW continued a citizen science initiative launched 2020 with private individuals, associations and companies from the water sports industry. At the same time, the IOW built up expertise and a targeted cooperation with the Deutsches Meeresmuseum Stralsund. As a result, an impressive replica of the Australian tubeworm has been added to the Neozoa section of the Deutsches Meeresmuseum Stralsund, complementing the exhibits already displayed in the exhibition rooms.

CONTACT PERSON Dr. Sven Hille





Calcareous tube structures of a tubeworm - development in one growing season © Hille, IOW

FEMALE INVENTORS' CAMP

New ways of recruiting young talent

How can young girls be inspired by ocean technology and marine research? With a four-day camp for female students! In the summer of 2023, nine female high school students accepted the invitation of the IOW. They experienced how scientific knowledge is applied in practice and how technology can be used to protect the seas. Among other things, they went on a trip on the Warnow with the IOW workboat 'Klaashahn', learned about measurement technology, took and analysed water samples, documented data and evaluated them. They also visited the seal centre to learn about bionics. The highlight of the camp was a trip on the IOW research vessel Elisabeth Mann Borgese. There they were able to experience the use of a rosette sampler, a bottom grab sampler and a CTD probe. The programme was rounded off by information on university subjects that could lead to ca-

reers in ocean technology and marine research, as well as discussions with female scientists and engineers about professions and career paths. The camp concept was developed in the Ocean Gender project within the BMBF cluster project Ocean Technology Campus Rostock.

CONTACT PERSON Dr. Kirstin Kastell



trips.

Scientific identification of bivalve molluscs © Kastell, IOW

TRAIN MULTIPLIERS

To inspire teachers in training and further education

Activities in the area of teacher training and continuing education have been intensified because the demand for school classes is significantly higher than the capacity to supervise students. Teaching materials and experiments developed at the IOW provide suggestions on how topics of Baltic Sea research can be integrated into the classroom. In 2022/23, the focus was on the geosciences and education for sustainable development. The IOW offered advanced training events for teachers and student teachers of geography. In particular, the cooperation in teacher training is to be further expanded in the future.

CONTACT PERSON

Dr. Sven Hille



Colleagues from IOW explain how a water sampler works © IOW



Test of the Warnow probe © Hille, IOW

The Thünen Institute of Baltic Sea Fisheries, the Deutsches Meeresmuseum Stralsund, the Federal Maritime and Hydrographic Agency and the IOW invited: Around 1,000 interested citizens came to see the findings and research results on the topic 'The Baltic Sea in the Context of Climate Change' presented by researchers at booths. In a panel discussion, representatives of the four institutions, together with representatives from politics and environmental protection, discussed the hot topics of climate change and environmental changes in the Baltic Sea. The student prize in the 'My Baltic Sea 2100' competition was then presented. A special highlight of the day: three research vessels were moored at the quay, allowing visitors to experience research up close.



CONTACT PERSONS Dr. Matthias Premke-Kraus. Dr. Kristin Beck

CITIZEN SCIENCE Collecting data from the Warnow probe

Teaching students the technical basics and fields of application of marine technology - this can be achieved with a measuring probe that was developed in the Ocean Talents project at the BMBF-funded Ocean Technology Campus Rostock. The measuring unit for temperature, conductivity and pressure, called the 'Warnow Probe', is to be used in the future as a permanent measuring station, operated by students, associations, companies and public authorities. Incidentally, the technical basis of the Warnow probe was developed in 'HyFive' (a joint project of the Thünen Institute for Baltic Sea Fisheries and the IOW) to record measurement data from the Baltic Sea during fishing

CONTACT PERSON Dr. Sven Hille

Citizens at IOW's booth © Beck. IOW

CONSULTING GOVERNMENTS

The Baltic Earth Assessment Reports

The 'Baltic Earth Assessment Report' (BEAR), published in April 2023, is a report on the overall state of the environment and climate in the Baltic Sea region and the changes in the past, present and future. The BEAR report is a product of many years of intensive collaboration between research institutions in the Baltic Earth network, the international network for Earth System research in the Baltic Sea region. The lead editor is Markus Meier, head of the 'Physical Oceanography' department and the 'Dynamics of Regional Climate Systems' working group at the IOW. Markus Meier is also the lead author of the chapter on the summary of climate change in the Baltic Sea region. Senior scientist Matthias Gröger, who works in the same research group at the IOW as Markus Meier, is the lead author for another chapter in the BEAR report on Earth system modelling in the Baltic Sea region. The results of the assessment report will be fed into the deliberations of



the Helsinki Commission (HELCOM), an intergovernmental organisation of Baltic Sea countries for the protection of the marine environment.

CONTACT PERSON

Prof. Dr. Markus Meier

PUBLICATION



Meier, H. E. M., M. Reckermann, J. Langner, B. Smith and I. Didenkulova (2023). Overview: **ORT** Smith and I. Didenkutova (2020). Comment The Baltic Earth Assessment Reports (BEAR). Earth Syst. Dynam. 14: 519-531

WEBSITE BALTIC EARTH NETWORK:



 Image: state stat

ALL MEASURING DEVICES ON BOARD!

OCEAN CHANGE 2023

Arved Fuchs, a well-known polar explorer, adventurer and activist, has been studying changes in the ocans and their effects on the climate and coasts on his OCEAN CHANGE expedition since 2015. His goal: to raise public awareness of marine and climate protection and to support research institutes through citizen science by collecting data and samples, among other things. On his 2023 trip, he took on board measuring instruments for long-term data collection by the IOW, which he deployed at defined positions in the Baltic Sea.

CONTACT PERSONS

Dr. Matthias Premke-Kraus, Dr. Kristin Beck

Handover of the measuring devices to Arved Fuchs in the presence of Federal Environment Minister Steffi Lemke and Science Minister of MV Bettina Martin, Director Oliver Zielinski and Henry Bittig © Beck, IOW

INTERESTED VISITORS

Federal Environment Minister Steffi Lemke and State Science Minister Bettina Martin as guests

The stopover in Warnemünde of Arved Fuchs and his team was taken as an opportunity by Federal Environment Minister Steffi Lemke to find out more about the state of the Baltic Sea and the IOW's current research topics. After a demonstration of experiments, for example on the salt water inflow into the Baltic Sea, and a visit to the Baltic Sea exhibition, she thanked the IOW for the decades of scientific work it has done as a basis for political decisions, among other things. Bettina Martin, Minister for Science, Culture, Federal and European Affairs of Mecklenburg-Western Pomerania, accompanied the Federal Minister and also asked interested guestions about marine pollution and the overuse of the Baltic Sea.

CONTACT PERSON

Dr. Matthias Premke-Kraus

Federal Environment Minister Steffi Lemke visits the IOW © Beck. IOW

POLICY ADVICE

The 'Global Carbon Budget 2023' was published in the journal Earth System Science Data in time for the World Climate Conference (COP 28), which took place in Dubai from November to December 2023. This annual report, which appeared for the 18th time in 2023, budgets global anthropogenic CO₂ emissions from fossil fuel combustion and deforestation. It is one of the central products of the international Global Carbon Project and a collaborative effort of more than 100 scientists from about 90 research institutions in 18 countries, led by Pierre Friedlingstein of the University of Exeter (Great Britain). Gregor Rehder, head of the section 'Marine Chemistry' and the working group 'Biogeochemistry of Environmentally Relevant Gases' at the IOW, is one of the co-authors. The science-based metastudy is a central reference work for international



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policy advice in the context of the Intergovernmental Panel on Climate Change (IPCC). The bad news for the government representatives at COP 28 was that global CO₂ emissions rose again in 2023, even though they fell slightly in Europe. This means that the targets of the Paris Agreement will be missed. The recommendation to international policymakers was therefore to make further efforts towards decarbonisation.

CONTACT PERSON

Prof. Dr. Gregor Rehder

PUBLICATION



• P. Friedlingstein et al. (2023): Global Carbon Budget 2023. Earth Syst. Sci. Data 15: **○**上日 5301-5369.



• https://globalcarbonbudget.org/

IMPROVEMENTS IN SIGHT?

State of the Baltic Sea 2023

Every six years, the Helsinki Commission (HELCOM) publishes the so-called Holistic Assessment Report (HOLAS). It is an integrated synthesis of available scientific data (e.g. from monitoring programmes) and publications based on indicator sets. The synthesis thus provides important bases for political decision-making. At the end of 2023, the third Baltic Sea status report was published, covering the years 2016 to 2021. In its summary for policymakers, the report concludes that there is little sign of improvement in any of the thematic areas (e.g. biodiversity, eutrophication, fish and marine mammals). One of the key recommendations is to reduce nutrient inputs. The IOW provided essential data for the report. On the one hand, through the monitoring carried out annually on behalf of the Federal Maritime and Hydrographic Agency (BSH) during cruises of the research vessel Elisabeth Mann Borgese in the western Baltic Sea. And on the other hand, through the IOW long-term monitoring programme, which also samples central areas of the Baltic Sea.

CONTACT PERSON FOR MONITORING AND LONG-TERM OBSERVATION

Prof. Dr. Joanna Waniek

PUBLICATION





Cover of the

Leibniz

NEWS FROM THE LEIBNIZ INSTITUTES IN MECKLENBURG-WESTERN POMERANIA

Leibniz Nordost

Since 2005, the IOW has been publishing together with the three other Leibniz institutes in the state, the Leibniz Institute for Atmospheric Physics (IAP), the Leibniz Institute for Catalysis (LIKAT) and the Leibniz Institute for Plasma Science and Technology (INP) as well as the Research Institute for Farm Animal Biology (FBN) in Dummerstorf the journal of the Leibniz Institutes in Mecklenburg-Western Pomerania, 'Leibniz Nordost'. The German-language magazine is aimed at the general public and politicians. The magazine is published twice a year with a thematic focus. In the four issues published during the reporting period, the IOW contributed articles on the topics of the Baltic Sea Climate Report, the oceans as a store for CO2, microorganisms as detectors, and a new focus on coastal seas.

CONTACT PERSON

Dr. Matthias Premke-Kraus

WEBSITE

https://www.io-warnemuende.de/newsen.html



Two covers of the editions published in 2022/23

PATENT APPLICATIONS AND DEVICE DEVELOPMENTS

In recent years, the IOW has licensed out various new and further developments with intellectual property rights to industrial partners. For others, suitable commercialisation partners are still being sought. In 2022, a patent was filed for a decisive further development of an SPR sensor that can be used to detect dissolved methane in water. The innovation is based on the use of an extended spectrum of wavelengths. This means that calibration can also be carried out in an aqueous medium, making measurements with this method easier and more accurate in the future. Exploratory talks were held with companies during the reporting

UNITED STRENGTH AT THE SITE

Ocean Technology Campus Rostock

Since 2020, the IOW has been a partner in the Ocean Technology Campus Rostock (OTC Rostock). This unique cluster of stakeholders from the maritime industry and scientific institutions with marine research, funded by the BMBF as 'Clusters4Future' with 15 million euros, offers the ideal basis for transfer. The IOW is involved in two knowledge transfer projects (Ocean Talents and Ocean Gender) and three research and development projects. The latter also involve companies based in Rostock, Berlin and Kiel as partners. Through the partnerships at OTC Rostock, the network

industry.



period to jointly advance prototype development and testing in a project.

CONTACT PERSON Dr. Regine Labrenz



of industrial partners, which we need, among other things, to further develop our own (measurement) technologies and applications, is constantly expanding. The IOW has also been involved in the annual Rostock Ocean Technology Summer School (RoOT), which is attended by young professionals from academia and

CONTACT PERSON Dr. Regine Labrenz

> Network Ocean Technology Campus Rostock, 2023

CONTACT PERSONS Equal Opportunity Officers Dr. Marion Kanwischer Dr. Svenja Papenmeier

Diversity Officer

EQUAL Hendrikje Wehnert OPPORTUNITIES **AND EQUITY**

he Leibniz Institute for Baltic Sea Research Warnemünde promotes equity - that is, equal opportunities for all employees. The focus is on increasing the proportion of women in all positions/salary grades in which they are currently underrepresented, increasing the proportion of female professors and the proportion of women in leadership positions, promoting female technical staff and graduates in all specialist and research areas, providing targeted support for all employees with family and care responsibilities, and strengthening a culture of the institute that avoids discrimination and is sensitive to diversity.

CONTINUOUS COMMITMENT

IOW honoured with Total E-Quality Award for the fourth time

Every three years, the IOW applies for the Total E-Quality Award for gender and diversity equality. The application is the responsibility of the internal Equal Opportunities Commission. Existing processes, measures and instruments have been reviewed and expanded. With success: in 2022, the IOW received the award for the fourth time for its outstanding personnel and organisational policies geared towards equal opportunities and diversity. Among other things, the institute was recognised for its long tradition of gender equality efforts. The guide to career development and a course to raise awareness of stereotypes were also positively mentioned.



The label awarded © Charta der Vielfalt



'LEARNING FROM NATURE: DIVERSITY COUNTS'

Event on German Diversity Day and launch of the diversity intranet page

In May 2023, the IOW participated for the first time in the German Diversity Day of the Diversity Charter. At the internal event titled 'Learning from Nature: Diversity Counts', there was an introduction to the understanding and concepts of diversity. A subsequent lecture on 'unconscious bias' raised awareness of unconcious processes in the perception and evaluation of people. The colleagues present discussed how to raise awareness of diversity at the IOW. The intranet page on diversity was published at the same time. The IOW had already signed the Diversity Charter in 2009.

o 💿 o charta der vielfalt 🖲 🔵 🗧 Für Diversity in der Arbeitswe



EU COMPATIBLE

Women's Promotion Plan converted into a Gender **Equality Plan**

The requirements of the European Union regarding a Gender Equality Plan (GEP) were incorporated into the regular update of the IOW's 2022/23 Women's Promotion Plan. Among other things, the plan was expanded to include a chapter on working in partnership and raising awareness of discrimination, equal opportunities and diversity. The plan is now entitled 'Plan for the Promotion of Gender Equality with Special Consideration of the Underrepresentation of Women' (GEP). The director signed it in June 2023.

© Kastell, IOW

ALWAYS STAY IN TOUCH

Establishment of a Female-X-get-together

The 'talk to female scientist' with the scientific advisory board of the IOW on the occasion of the mid-term audit was the trigger: the female scientists involved realised that a cross-sectional exchange can be enriching. As a result, a monthly get-together for female researchers was set up. In order to do justice to gender diversity, the group of participants has also been extended to include people with other gender identities who are underrepresented. The Female-Xget-together has been taking place regularly since October 2023.

REVIEW 2022

JANUARY

MARCH

CRUISE WALVIS BAY. NAMIBIA (MSM105)

Joint expedition of IOW and MARUM with the Maria S. Merian (Project EVAR). Investigation of the Beluga upwelling system by means of water sampling, high-resolution turbulence measurements, extraction of sediment cores, high-resolution hydrographic data on surface layer dynamics and bottomdwelling organisms.

-

FAREWELL OF PROF. DR. ULRICH BATHMANN After more than 10 years as director, Ulrich Bathmann left the IOW at the end of March. He remains committed to the topic of marine research as chairman of the German Marine Research Consortium and the German Marine Research Alliance.

RICHTFEST OF THE STORAGE AND CRUISE EQUIPMENT BUILDING

© IOW

The new building in the courtyard significantly improves the conditions for equipping for cruises. The departments can store their equipment and expedition goods in an orderly manner. In addition, the new hall provides space for the zooplankton container and the newly built hazardous materials room

BALTIC SEA WINTER SCHOOL **'ANALYSIS OF CLIMATE** VARIABILITY'

15 young scientists from five nations took part in the virtual Baltic Earth Winter School on 'Analysis of Climate Variability' in the second half of March. Seven IOW colleagues shared their knowledge of climate analysis using historical and proxy data such as tree rings and sediment cores.

KÜNO SPRING SCHOOL **'HUMAN IMPACT ON THE** TIDAL ELBE'

Aspects of the tidal Elbe were the subject of the spring school for 19 graduates from the KüNO network. Practical exercises, laboratory work and modelling on the influence of climate change on ecology, nature conservation and flood protection, among other things, were rounded off by seminars on science communication and career development.



APRIL

© Beck. IOW



PROF. DR. HELGE ARZ APPOINTED AS INTERIM DIRECTOR

Helge Arz received his certificate of appointment as interim director from Woldemar Venohr, chairman of the Board of Trustees and head of department at the Ministry for Science, Culture, Federal and European Affairs of Mecklenburg-Western Pomerania. He will be in charge of the IOW from April onwards.

BRIESE AWARD FOR **DR. KATHRIN BUSCH**

Kathrin Busch from GEOMAR Helmholtz Centre for Ocean Research Kiel received the award donated by the Briese shipping company for her outstanding work on deep-sea sponges.



REOPENING OF THE IOW CAFÉ AFTER CORONA PANDEMIC

The IOW staff is very pleased: after a long pandemic-related break, the IOW Café, where colleagues can meet and exchange ideas while enjoying a hot drink, is open again from May 2022.



BALTIC SEA SCIENCE CONFERENCE

At the end of May/beginning of June, the 4th Baltic Earth Conference took place in Jastarnia, Poland. The conference, which is aimed at taking a comprehensive scientific inventory of the Baltic Sea region with a view to the effects of climate change, was hosted by the Baltic Earth Secretariat at the Helmholtz Centre Hereon, the Institute of Oceanology of the Polish Academy of Sciences (IO PAN) and the IOW.

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CONTINUATION **REVIEW 2022**

JUNE

BALTIC SEA DAY 2022

After a Corona pandemic-related break, the Baltic Sea Day in 2022 was a great success! The IOW, together with the BSH, the Thünen Institute of Baltic Sea Fisheries and the Deutsches Meeresmuseum Stralsund. welcomed around 1,000 guests. The three research vessels of the institutions that could be visited were a real visitor magnet.

BJÖRN CARLSON AWARD

FOR PROF. DR. MAREN VOSS For her groundbreaking research on the importance of nitrogen in marine cycles, Maren Voß received the Björn Carlson Baltic Sea Prize from the Swedish Björn Carlson Baltic Sea Foundation. The prize is endowed with 3 million Swedish crowns (approx. €300,000).

AUGUST

ROOTS – FIRST SUMMER SCHOOL OF THE OCEAN TECHNOLOGY CAMPUS (OTC) During ten days, 14 students from eleven countries got to know different areas of the OTC. For example, taking samples and cultivating bacteria were on the agenda at the IOW.

ROSTOCKER COMPANIES RUN

Three Teams of four runners each represented the IOW at the Rostocker Companies Run 2022. Along the 3.5kilometre route, they were cheered on by colleagues.



ROSTOCK'S ELEVEN

In the 'Rostock's Eleven' competition, organised by the science network 'Rostock denkt 365°', young scientists from various research institutions present their research to a jury of eleven science journalists in the context of a workshop. The best science communication presentation is honoured. Dana Kathrin Dohr, a doctoral student at the University Medical Centre Rostock, won the 2022 competition.

IESO SILVER MEDAL

In August 2022, the German delegation of the International Earth Science Olympiad (IESO) visited the IOW to prepare their practical competition project. Their topic: detection of glyphosate in the Warnow and the Baltic Sea. In the competition, they competed against students from around 40 countries and won the silver medal.



OCTOBER

For the fourth time in a row, the IOW has received the Total E-Quality Award for gender and diversity equality. © Charta der Vielfalt



SIGNING OF THE COOPERATION

AGREEMENT BETWEEN NIOZ

On 23 June 2022, the cooperation

between the IOW and the Dutch Royal

Netherlands Institute for Sea Research

(NIOZ) in Yerseke was officially signed

by a Memorandum of Understanding.

The aim is to deepen the collaboration

and prepare for EU tenders. In addition,

annual workshops and research stays

for young scientists are planned.

AND IOW

SEPTEMBER

MARISCHOOL

At its MariSchool laboratory for schoolchildren, the IOW offers practical insights into its research activities. The offers are aimed at school groups from the 8th to 13th grades (focus on secondary level II) accompanied by their teachers.



NOVEMBER

3RD SYMPOSIUM KÜNO

The final symposium of the joint project 'Coastal Research North Sea-Baltic Sea' (KüNO) took place at the IOW with 80 participants from research and practice. KüNO included 24 research institutions that, with funding from the Federal Ministry of Education and Research (BMBF), jointly developed the scientific basis for sustainable, practice-oriented coastal management.

REVIEW 2023

JANUARY

EXPEDITION FROM SAN DIEGO TO THE PATAGONIAN FJORDS (SO196/1+2)

From the end of December 2022 to mid-February 2023, the RV SONNE was sailing in the eastern Pacific under the direction of IOW. The main topics were anthropogenic material flows (Prof. Dr. Detlef Schulz-Bull) and pelagic anoxia, as well as the postglacial development of Patagonian fjords (Prof. Dr. Heide Schulz-Vogt). Both phases were dedicated to the study of land-ocean interactions.

MARCH

NEW DIRECTOR PROF. DR. OLIVER ZIELINSKI Since 1st March 2023. Oliver Zielinski has been director of the IOW and at the same time Professor of Earth System Science at the University of Rostock. His vision: to process data in such a way that informed decisions can be made regarding the protection and sustainable use of marine and coastal habitats.

APRIL

BRIESE AWARD FOR

DR. LUISA VON ALBEDYLL Luisa von Albedyll received the 2022 Briese Prize for Marine Research for her doctoral thesis on the thickness of sea ice and the factors that influence it. She took part in the AWI's MOSAiC expedition and impressed with her work, which was also produced during the expedition and parental leave.

COASTALFUTURES -FIRST ANNUAL MEETING

In mid-January, the first annual project meeting of 'CoastalFutures' took place at the IOW. About 50 guests discussed first results on the sustainable use of marine spaces. The aim is to develop an end-to-end model system for the North and Baltic Seas, coordinated by the Helmholtz Centre Hereon. The IOW is leading the climate change work package

BALTIC EARTH WINTER SCHOOL

© Beck, IO

The first Baltic Earth Winter School on 'Earth System Science for the Baltic Sea Region' brought together about 45 early-career scientists at the IOW. The Winter School is jointly organised with the Helmholtz-Zentrum Hereon, Geesthacht.

EGU-AWARD 2023 OUTSTANDING EARLY CAREER SCIENTIST AWARD FOR DR. FLORIAN BÖRGEL



© Heidenreich Helmholtz SynCom

numerous publications.

research on the influence of climate variability on regional seas, for completing his doctorate in two years with summa cum laude and for

been honoured with the EGU's 2023 Division Outstanding Early Career Scientist Award'. He recieved the

Florian Börgel has

recognition for his outstanding

MAY

FIRST-TIME PARTICIPATION IN THE GERMAN DIVERSITY DAY AND LAUNCH OF THE DIVERSITY INTRANET PAGE

In May 2023, the IOW participated in the German Diversity Day for the first time. Under the title 'Learning from Nature: Diversity Counts', diversity and unconscious perception processes were discussed. In addition, the intranet page 'Diversity' was launched. The IOW has been a signatory to the Diversity Charter since 2009.

JUNE

FEDERAL ENVIRONMENT MINIS-TER AND MINISTER OF SCIENCE OF MECKLENBURG-WESTERN POMERANIA VISIT THE IOW Federal Environment Minister Steffi Lemke and Federal Minister of Science Bettina Martin visited the IOW to learn about the state of the Baltic Sea and current research topics. The Federal Environment Minister emphasised the need for a determined environmental policy and praised the IOW for its decades of work in the field of Baltic Sea protection.

WATER DAMAGE

Water damage in the laboratory wing on 1st May has far-reaching consequences. 16 rooms are affected, including laboratories and offices, technical rooms and the library. Long-term renovation work is pending, which will restrict research in the affected areas.



TREC IN WARNEMÜNDE

In June, scientists from the Traversing European Coastlines (TREC) expedition set up their mobile laboratory in the courtyard. The expedition is dedicated to the study of European coastal ecosystems and combines sampling of soil sediments, shallow water and selected model organisms in different habitats. The aim of the expedition is to research European coastal ecosystems. The project is being carried out by the Tara Ocean Foundation and Consortium and is supported by the European Molecular Biology Laboratory (EMBL).

ARVED FUCHS OCEAN CHANGE 2023 STOPOVER AT IOW. TAKE-**OVER OF ARGOFLOATS**

In 2023, Arved Fuchs continued his expedition series OCEAN CHANGE, which has been investigating the effects of changes in the oceans since 2015. At the end of June, he made a stopover in Warnemünde, where he visited the IOW and took on board measuring instruments for long-term data collection in the Baltic Sea.





CONTINUATION **REVIEW 2023**

JULY

FIRST FEMALES INVENTORS' CAMP OF OTC GENDER

At the Females Inventors' Camp Ocean Technology of the Ocean Technology Campus Rostock on 13 July 2020, school students learned about ocean technology and marine research. It was organised by Kirstin Kastell (Science Management) as part of the Ocean Gender project.

AUGUST

IESO GOLD MEDAL

At the International Earth Science Olympiad (IESO) 2023, the German national team won a gold medal in August 2023 for their practical field research project to prove regional effects of climate change in the Baltic Sea. The students had previously prepared the work for their practical competition entry at the IOW.

SEPTEMBER

GERMAN FEDERATION FOR

BIOLOGICAL DATA (GFBIO) The IOW has become a new member of the German Federation for Biological Data (GFBio). a network for biodiversity data. The security, availability and reuse of scientific data is a central concern of the IOW's research data management. Membership in the national network is an important contribution to networking and the exchange of information.

gfbic

BSSC OUTSTANDING STUDENT PRESENTATION AWARD: DAVID RIEDINGER

In August, David Riedinger was awarded the prize for the best student presentation at the Baltic Sea Science Conference (BSSC). He convinced the jury with his research on the influence of environmental parameters such as nutrients and temperatures, as well as the occurrence of seagrass fields, on the abundance of vibrios.



RoOT SUMMER SCHOOL

The second RoOT summer school of the Ocean Technology Campus took place in September. Thirteen participants from five countries discussed and exchanged ideas about marine technology. The focus was on developing a prototype for a floater to measure salinity and temperature.



OCTOBER

COASTAL SUMMER SCHOOL

In October 2023, the IOW, together with the Helmholtz Centre HEREON and the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), organised the International Coastal Summer School on Hiddensee. The young international researchers took a close look at the sediment archives of the Baltic Sea. which serve as 'witnesses to the past' and 'indicators of the future' for biodiversity.

P-CAMPUS FINAL SYMPOSIUM On 9 and 10 October 2020, the annual international symposium of the Leibniz ScienceCampus Phosphorus Research Rostock (P-Campus) took place under the motto 'Perspectives of phosphorus research in Rostock'. At the same time, this was the preliminary closing event of the P-Campus funded by the Leibniz Association.



BILATERAL WORKSHOP WITH NIOZ AT IOW

After the IOW scientists visited the Royal Netherlands Institute for Sea Research (NIOZ) in 2022, the NIOZ colleagues made a return visit to the IOW. At the bilateral workshop, current research topics were presented and discussions about joint collaborations were intensified.



MID-TERM AUDIT

development.

On 29-31 August 2023, the mid-term

audit of the Scientific Advisory Board

(SAB) took place at the IOW. The audit

takes place in the middle of the time

between two evaluations. In the audit

progress in the implementation of the

recommendations from the evaluation

report, the SAB noted important

and provided guidance for further

NOVEMBER

DR. SONJA OBERBECKMANN On 29 November 2023.

Sonja Oberbeckmann from the Environmental Microbiology working group successfully completed her habilitation on the topic of 'Anthropogenic influence on microbial communities in marine systems'



DECEMBER

FAREWELL OF THE CHAIR OF THE SCIENTIFIC ADVISORY BOARD PROF. DR. ANDREAS OSCHLIES

As a member and chair of the scientific advisory board, Andreas Oschlies of GEOMAR Helmholtz Centre for Ocean Research Kiel has been a critical and supportive companion of the IOW for eight years. His commitment during the 2023 mid-term audit will be particularly remembered. We thank him for his dedication.



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PROJECTS

Research Focus 1 – Small and Mesoscale Processes

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
SFB-TRR 181: Energy transfers in atmosphere and ocean	DFG ¹	01.07.2016 - 30.06.2024	Hans Burchard
Baltic Proper Spring Bloom: Can micro- or mesozoo- plankton control phytoplankton spring blooms in the Baltic Proper under climate warming?	DFG	01.09.2019 - 31.08.2024	Carolin Paul
KiSNet-SGD: Königshafen submarine groundwater discharge network	DFG	01.03.2020 - 31.12.2023	Michael E. Böttcher
FORMOSA: Four-dimensional research applying model- ling and observations for the sea and atmosphere	Leibniz Association	01.06.2020 - 31.05.2023	Lars Umlauf
FunPhy: Fungal infections on phytoplankton – Cryptic perturbation of phytoplankton growth, recycling and sedimentation	DFG	01.08.2020 - 31.07.2026	Isabell Klawonn
COOLSTYLE: Oceans under stress: CARBOSTORE – Carbon storage in Germany Coastal Seas' – Stability, vulnerability and perspectives for manageability	BMBF ²	01.04.2021 - 31.07.2024	Michael E. Böttcher
BacDMS: Bacterial transformations of dimethylsulfonio- propionate in the Weddell Sea	DFG	01.08.2022 - 31.07.2024	Judith Piontek
MicroMeth: Methane production by microphytobenthos and its contribution to the benthic methane flux from the coastal zone of the Baltic Sea	DFG	01.10.2022 - 28.02.2027	Oliver Schmale
FunSeq: Cryptic cross-kingdom interactions: The impact of fungal parasitism on phytoplankton – bacteria inter- actions revealed via genome and transcriptome profiling	DFG	01.01.2023 - 31.12.2024	Isabell Klawonn
MTPSurf: Model study on turbulent processes in the oceanic surface layer	DAAD ³	01.01.2023 - 31.12.2023	Lars Umlauf
Hurri: Lake system response to Caribbean hurricane activity – A calibration study of ostracode (paleo-)biology and geochemistry (Lago Enriquillo, Dominican Republic)	DFG	13.03.2023 - 30.11.2024	Michael E. Böttcher

¹German Research Foundation

² Federal Ministry of Education and Research

³German Academic Exchange Service

Research Focus 2 – Basin-Scale Ecosystem Dynamics

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
Baltic Transcoast: Research training school 'The German Baltic Sea Coast as Terrestrial-Marine Interface of Water and Matter Fluxes'	DFG	01.01.2016 - 31.12.2024	Maren Voß
CUSCO: Collaborative project CUSCO – Coastal up- welling system in a changing ocean; Subproject: Influ- ence of wind field variability on upwelling dynamics and water mass distribution on the Peruvian shelf	BMBF	01.10.2018 - 31.12.2022	Volker Mohrholz
EVAR: The Benguela Upwelling System under climate change – Effects of variability in physical forcing on carbon and oxygen budgets	BMBF	01.01.2019 - 31.12.2022	Heide Schulz-Vogt
SaKOA: Rewetted coastal peatlands as potential nitro- gen sources or sinks for the Baltic Sea and the atmo- sphere	DBU ⁴	01.01.2019 - 30.04.2023	Anne Breznikar
PeGGO-Pop: Population structure and connectivity of the broad spawning and brooding scleractinian corals across the northern Persian Gulf and Gulf of Oman: Implication for conservation planning for coral reefs	Leibniz Association	01.02.2019 - 16.12.2022	Hans Burchard
JERICO-S3: Joint European Research Infrastructure of Coastal Observatories: Science, Service, Sustainability	EU-Horizon 2020	01.02.2020 - 31.07.2024	Gregor Rehder
NOTION: Nitrogen fixers structuring phytoplankton bio- diversity in the ocean under climate change	Fondation BNP Paribas	15.04.2020 - 31.12.2025	Maren Voß
GROCE II: Greenland Ice Shield / Ocean Interaction – From process understanding to the assessment of a coupled regional system under change; Subproject 9: Process-based quantification of subglacial melt rates	BMBF	01.07.2020 - 31.08.2023	Hans Burchard
N-Amazon: Research Cruise METEOR M174	DFG	01.08.2020- 31.08.2022	Maren Voß
MeN-ARP: Metabolism of nitrogen in the Amazon River plume and Western Tropical North Atlantic	DFG	01.11.2020 - 31.01.2024	Natalie Loick-Wilde, Maren Voß
BluEs: Blue_Estuaries – Developing estuaries as habit- able sustainable ecosystem despite climate change and stress, lead proposal, subproject: Functional diversity and network analysis Oder and Elbe estuary	BMBF	01.11.2020 <i>-</i> 29.02.2024	Maren Voß

⁴German Federal Environmental Foundation

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
C-SCOPE: Analysis of CO2 uptake and dynamics under the impact of eutrophication by expanding the CO2 observation network in the Baltic Sea	BMBF	01.01.2021 - 31.12.2024	Henry Bittig
RETAKE: CO2 removal by alkalinity enhancement: Potential, benefits and risks; Subproject: Possible direct and indirect consequences of hypothetical near-bottom alkalinity enhancement in the Baltic Sea	BMBF DAM⁵	01.08.2021 - 31.07.2024	Hagen Radtke
NArrFix: Nitrogen argon measurements for the quanti- fication of surface water nitrogen fixation in the Baltic Sea	DFG	01.10.2021 - 30.09.2024	Oliver Schmale
GESIFUS II: The genetic structure of microbial communi- ties as a signature of their functional stability	DFG	01.11.2021 - 30.04.2025	Sara Beier
PIETZ: Processes Impacting on Estuarine Turbidity Zones in tidal estuaries	DFG	01.01.2022 - 31.12.2023	Hans Burchard
MAPUCHE: Impact of pelagic Anoxia in the upwelling area of Concepción and in a pristine anoxic Fjord, and the postglacial development of the Patagonian fjord region of Chile, 03G0296A	BMBF	01.08.2022 - 31.10.2024	Heide Schulz-Vogt
SALINE: Salt intrusion in the tidal Weser as scientific support for the planned Weser adjustment	BAW ⁶	01.01.2023 - 31.01.2026	Hans Burchard
CofiEs: Coastal filter function under environmental stress	Björn Carlson Stiftung	01.02.2023 - 31.01.2026	Maren Voß
ICEstuaries: Exchange flow and mixing in ice-covered estuaries	DFG	01.11.2023 - 30.11.2026	Hans Burchard

Research Focus 3 – Changing Ecosystems

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
MoMSie : Model studies on the impact of a rise in mean sea level on the design of coastal protection structures; Project: Model studies on the interaction of sea level rise, storm surges and morphology in the Wadden Sea	BMBF	01.10.2019 – 31.12.2022	Ulf Gräwe
SolClim I+II: Solar influences on climate during the last and penultimate glacial	DFG	15.02.2020 - 31.08.2023	Helge Arz Markus Czymzik
ECAS-BALTIC: Ecosystem-supporting coastal adapta- tion strategies for the German Baltic Sea coast: Modell studies on the variability and changes of storm surges in the western Baltic Sea	BMBF	01.11.2020 - 29.02.2024	Ulf Gräwe

⁵German Marine Research Alliance

⁶Federal Waterways Engineering and Research Institute

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
CYA-REMo: Cyanobacteria under climate change: Look- ing into the past to predict the future through integra- tion of resurrection ecology, experimental evolution and ecosystem modelling approaches	DFG	01.05.2021- 31.10.2024	Anke Kremp
PHYTOARK: Predicting the future from signatures of the past: Using living sediment archives and ancient DNA to understand responses of marine primary producers to environmental changes	Leibniz-Wettbe- werbsverfahren (SAW)	01.05.2021- 30.11.2024	Anke Kremp
HyFiVe: Hydrography on fishing vessels – joint research project to develop an innovative sensor system used at fishing vessels for autonomous hydrographic measurements, data transfer and analysis	BLE ⁷	01.07.2021- 30.09.2024	Michael Naumann
Coastal Futures: Future scenarios to promote sustain- able use of marine area; Subproject: Scenarios for eco- system services	BMBF DAM	01.12.2021 - 30.11.2024	Markus Meier
SESPOD: Subantarctic eastern South Pacific surface ocean dynamics since the late Miocene (IODP Expedition 383)	DFG	01.01.2022 - 31.07.2024	Helge Arz
ID-NEP: Implementing DNA based methods in Northern European marine phytoplankton monitoring	SYKE ⁸	01.01.2022 - 31.12.2022	Anke Kremp
Arkona-Boje: Model study for the identification of alter- native positions for the Arkona Buoy	BSH ⁹	01.04.2022 - 30.09.2023	Hans Burchard
MSM113: Research cruise 113 – Research vessel Maria Sibylla Merian	DFG	01.10.2022 - 31.03.2023	Peter Feldens
LUMARE: Determination of nutrients in marine water samples	LLUR ¹⁰	01.10.2022 - 30.11.2023	Joanna J. Waniek
BaltChron: Placing the deep Baltic Sea sediment strati- graphy in a precise chronological framework: Improved paleoenvironmental studies and 14C reservoir age calibration	DFG	05.12.2022 - 04.12.2024	Markus Czymzik
Pelagische Hab 2: Innovative monitoring of pelagic habitats 2	UBA ¹¹	01.09.2023 - 31.01.2026	Carolin Paul
ArKoBi: Investigation of the contribution of Arctica islandica to the carbon storage and biodiversity in the Baltic Sea	BfN ¹²	01.12.2023 - 30.09.2026	Michael L. Zettler
 ⁷ Federal Ministry of Food and Agriculture ⁸ Finnish Environment Institute ⁹ Federal Maritime and Hydrographic Agency 			

¹⁰State Agency for Agriculture, Environment and Rural Areas Schleswig-Holstein ¹¹German Environment Agency

¹²Federal Agency for Nature Conservation

Research Focus 4 – Coastal Seas and Society

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
LEGRA: Live along the gradient: Analyse of the impact of environmental parameters on the distribution, diversity and function of benthic communities and their habitats in the southern Baltic Sea and its implications within the European marine conservation directive	BfN	01.01.2019 - 31.12.2024	Michael L. Zettler
P-Campus: Leibniz ScienceCampus Phosphor Research Rostock	Leibniz Association	01.06.2019 - 31.03.2024	Ulrich Bathmann
SAARUS: Optimization of scrubber exhaust gas scrub- bing technology to reduce environmentally harmful ship emissions	BMWK ¹³	01.06.2019 - 0.11.2022	Detlef Schulz-Bull
ERASMUS+ knowledge flows: Knowledge Flows in Marine Spatial Planning – Sharing Innovation in Higher Education	EU Erasmus+	01.09.2019 - 31.12.2022	Miriam von Thenen
SPECTROPHABS: Spectrophotometric pH-measure- ments for monitoring of marine acidification in the Baltic Sea	BSH	01.11.2019 - 30.04.2022	Gregor Rehder
MGF-Ostsee I: Protected areas Baltic Sea: Effects of the exclusion of mobile bottom trawling in marine protected areas; Key proposal; Project: Monitoring and development scenarios of benthic communities and sediment functions	BMBF DAM	01.03.2020 - 28.02.2023	Klaus Jürgens
MGF-Ostsee II: MGF-Ostsee: Effects of bottom contact fishing exclusion in marine protected areas (Natura 2000) of the German EEZ in the Baltic Sea; develop- ment scenarios of benthic communities and sediment functions	BMBF DAM	01.03.2023 - 28.02.2026	Klaus Jürgens
UBA-Meer: Expert support for the implementation of the EU Marine Strategy Framework Directive	UBA	01.08.2020 - 28.02.2022	Detlef Schulz-Bull
CRASSOBIOM: The role of host-microbiome interactions in physiological performance of the Pacific oyster Crassostrea gigas in extreme habitats	DFG	01.10.2020 - 31.12.2024	Matthias Labrenz
UBA-Eutro: The Baltic Sea action plan – Modelling of water quality indicators	UBA	01.10.2020 - 30.09.2023	Gerald Schernewski
CoTrans – KüNO Umbrella Project – Coordination and transfer, lead proposal; Project: Coordination	BMBF	01.11.2020 - 29.02.2024	Ulrich Bathmann
BaltVib: Pathogenic Vibrio bacteria in the current and future Baltic Sea waters; Subproject 1: Coordination, data management, problem-solving concepts	BMBF EU BiodivERsA	01.04.2021 - 31.03.2024	Matthias Labrenz

¹³ Federal Ministry for Economic Affairs and Climate Action

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
PaintSed: Paint particles in marine sediment: Interac- tions with Microbiota and effects on sediment processes	DFG	01.05.2021- 31.07.2024	Alexander Tagg
TouMaLi: Marine litter and sustainable waste management in North-African coastal tourism region	BMUV ¹⁴	01.05.2021- 30.04.2025	Gerald Schernewski
LABPLAS: Land-based solutions for plastics in the sea; Plastics in the environment: Understanding the sources, transport, distribution and impacts of plastics pollution	EU Horizon 2020	01.06.2021 - 31.05.2025	Juliana Assuncao Ivar do Sul
ASMASYS: Unified ASsessment framework for pro- posed methods of MArine CDR and interim knowledge SYnthesiS	BMBF DAM	01.08.2021 - 31.07.2024	Gregor Rehder
AMMOTRACe: Marine AMMunitiOn dump exploration by surface- and underwater-based laser mass spectrome-tric TRACing technology	BMWK	01.09.2021 - 31.08.2024	Detlef Schulz-Bull
OTC Stone: Automatic localization and measurement of boulders in acoustic datasets based on neural networks	BMBF	01.10.2021 <i>-</i> 30.09.2024	Svenja Papenmeier
OTC Genomics: Innovative analytical methods for environmental monitoring of aquatic habitats based on nucleic acid sequencing	BMBF	01.11.2021 - 31.01.2025	Matthias Labrenz
CREATE: Concepts for reducing the effects of anthropogenic pressures and uses on marine ecosystems and on biodiversity; Subproject: Habitat variability and bioarchives as a measure of habitat integrity using the example of the living lab Eckernförde Bay	BMBF DAM	01.12.2021- 30.11.2024	Svenja Papenmeier
CONMAR: Concepts for Conventional Marine Munition Remediation in the German North Sea and Baltic Sea	BMBF DAM	01.12.2021 <i>-</i> 30.11.2024	Ulf Gräwe
PlumeBaSe: Tracing of ship plumes and impact to seawater	DFG	01.09.2022 - 31.08.2025	Helena Osterholz
OCEAN CITIZEN: Marine forest coastal restoration: An underwater gardening socio-ecological plan	EU Horizon Europe	01.01.2023 - 31.12.2026	Peter Feldens
EFFECTIVE: Enhancing social well-being and economic prosperity by reinforcing the effectiveness of protection and restoration management in Mediterranean MPAs	EU Horizon Europe	01.06.2023 - 31.05.2027	Miriam von Thenen
UBA-MoSEA: Model simulations for an improved eutrophication assessment in the western Baltic Sea	UBA	01.08.2023 - 31.12.2025	Sarah Piehl
COP: Circular Ocean-bound Plastic	EU Interreg South Baltic	01.09.2023 - 31.08.2026	Mirco Haseler

¹⁴ Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection

Cross-Cutting Activity: Innovative Instrumentation

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
FINO II: Operation of the FINO database, oceanographic measurements on the FINO2 platform	BSH	01.09.2021 - 31.08.2024	Erik Stohr
OTC DaTA: Digital Twin & analytics-embedding semantic visual analytics methods in multisensor data evalua- tion for functional assistance systems in an industrial context	BMBF	01.10.2021 - 30.09.2024	Martin Kolbe
FACTS: Suggestions fpr the operation of fuel cell systems in various underwater operations	FMV ¹⁵	01.09.2022 - 30.06.2023	Ralf Prien
GEORGE: Next generation multiplatform ocean observ- ing technologies for research infrastructures	EU Horizon Europe	01.01.2023 - 30.06.2027	Henry Bittig

Cross-Cutting Activity: Model Development

PROJECT NAME	FUNDING	FUNDING	PRINCIPAL INVESTI-
	AGENCY	PERIOD	GATOR AT THE IOW
NuMOst: Numerical modelling of the Baltic Sea: Interfacing large scale models with local models	BAW	01.01.2020 - 31.12.2022	Hans Burchard

Others (i. a. Transfer)

PROJECT NAME	FUNDING AGENCY	FUNDING PERIOD	PRINCIPAL INVESTI- GATOR AT THE IOW
WIPANO-VVB-MV: Knowledge and technology transfer through patents and standards, univerity funding, fund- ing of commercialisation and patenting assistance	BMWK	31.03.2016 - 31.12.2023	Regine Labrenz
CTD I: Planing, developing and establishing a standard- ized workflow to create, process, archive and publish consistent, comparable, quality assured CTD measure- ments.	BMBF DAM	01.01.2021 - 31.12.2022	Martin Kolbe
CTD II: Development of a CTD-Framework	BMBF DAM	01.01.2023 - 31.12.2025	Martin Kolbe
OTC Ocean Talents: Ocean Technology Campus Rostock: Talent promoting along different educational pathways	BMBF	01.10.2021 - 30.09.2024	Regine Labrenz
OTC Gender: Ocean Technology Campus Rostock: Promotion of gender equality in underwater professions	BMBF	01.10.2021 - 30.09.2024	Oliver Zielinski

¹⁵ Research Alliance Mecklenburg-Western Pomerania

SEA CRUISES

CRUISE NO	MISSION	PERIOD	AREA	CRUISE LEADER	DEPARTMENT
MSM105	Project EVAR	11.01 23.02.2022	Eastern Atlantic	Mohrholz	Physics
EMB286	BLMP + Long-term monitoring	07.0216.02.2022	Baltic Sea	Waniek	Chemistry
EMB287	Geo practical work	22.02 25.02.2022	Western Baltic Sea	Arz	Geology
EMB288	EQUTRAWL	01.0304.03.2022	German EEZ	Feldens	Geology
EMB285	MARNET cruise	08.0311.03.2022	Western Baltic Sea	Mars	Metrology
EMB290	BLMP + Long-term monitoring	23.0303.04.2022	Baltic Sea	Dutz	Biology
EMB291	MARNET cruise	08.0413.04.2022	Western Baltic Sea	Mars	Metrology
EMB293	BLMP + Long-term monitoring	03.0523.05.2022	Baltic Sea	Mohrholz	Physics
EMB294	MARNET cruise	30.0503.06.2022	Western Baltic Sea	Mars	Metrology
	Baltic Sea Day	08.06.2022	Rostock	Hentzsch	Directorate
EMB292	Project LEGRA	10.0621.06.2022	German EEZ	Romoth	Biology
EMB308	Divers	22.0623.06.2022	Western Baltic Sea	Stohr	Metrology
EMB295	CenBase	02.0718.07.2022	Baltic Sea	Bittig	Chemistry
EMB296	MARNET cruise	25.07. – 29.07.2022	Western Baltic Sea	Mars	Metrology
EMB298	BLMP + Long-term monitoring	04.0815.08.2022	Baltic Sea	Kuss	Chemistry
EMB297	NAC (N-Turnover of Cyanobakterien)	19.0802.09.2022	Baltic Sea	Loick-Wilde	Biology
EMB300	Bio practical work	06.0914.09.2022	Baltic Sea	Kremp	Biology
EMB309	Equipment testing	15.0916.09.2022	Western Baltic Sea	Osterholz	Chemistry
EMB303	MARNET cruise	17.1021.10.2022	Western Baltic Sea	Mars	Metrology
EMB304	Equipement testing ScanFish III	25.2002.11.2022	Western Baltic Sea	Wagner	Metrology
EMB305	BLMP + Long-term monitoring	05.1118.11.2022	Baltic Sea	Kuss	Chemistry
EMB306	HOLOFLUV geological study	22.1130.11.2022	Western Baltic Sea	Feldens	Geology
EMB307	MARNET cruise	05.1210.12.2022	Western Baltic Sea	Mars	Metrology
SO296/1	Project MAPUCHE	26.12.2022 - 17.01.2023	Eastern Pacific	Schulz-Bull	Chemistry
SO296/2	Project MAPUCHE	19.0112.02.2023	Eastern Pacific	Schulz-Vogt	Biology
EMB332	Cable Test	18.01 20.01.2023	Skagerrak	Ruickoldt	Metrology
EMB310	MARNET cruise	24.0127.01.2023	Western Baltic Sea	Mars	Metrology
EMB311	BLMP + Long-term monitoring	04.0216.02.2023	Baltic Sea	Holtermann	Physics
EMB312	MARNET cruise	27.0204.03.2023	Western Baltic Sea	Mars	Metrology
EMB313	Geo practical work	07.0310.03.2023	Western Baltic Sea	Arz	Geology
EMB314	BLMP + Long-term monitoring	15.0328.03.2023	Baltic Sea	Mohrholz	Physics
EMB315	Project Plume	31.0311.04.2023	Western Baltic Sea	Osterholz	Chemistry
EMB316	SWOT	17.0428.04.2023	Eastern Gotland Basin	Mohrholz	Physics
EMB317	BLMP + Long-term monitoring	03.0515.05.2023	Baltic Sea	Naumann	Physics
EMB318	MARNET cruise	22.0526.05.2023	Western Baltic Sea	Mars	Metrology
EMB319	Project LEGRA 23	01.0609.06.2023	German EEZ	Romoth	Biology
EMB320	Project MGF-Salinity	16.0603.07.2023	Baltic Sea	Jürgens	Biology
EMB321	MARNET cruise	07.0711.07.2023	Western Baltic Sea	Mars	Metrology
EMB322	Project NArrFix	14.0701.08.2023	Baltic Sea	Schmale	Chemistry
EMB323	BLMP + Long-term monitoring	04.0816.08.2023	Baltic Sea	Kuss	Chemistry
EMB324	Project BALTRACE	19.0807.09.2023	Baltic Sea	Dellwig	Geology
EMB325	Bio practical work	12.0920.09.2023	Baltic Sea	Dutz	Biology
EMB326	MARNET cruise	25.0930.09.2023	Western Baltic Sea	Mars	Metrology
EMB328	BLMP + Long-term monitoring	02.1114.11.2023	Baltic Sea	Naumann	Physics
EMB331	MARNET cruise	17.1122.11.2023	Western Baltic Sea	Mars	Metrology

EMB – Elisabeth Mann Borgese | MSM – Maria S. Merian | SO – Sonne BLMP – Federal and State Measurement Programme

ACADEMIC **QUALIFICATIONS**

Habilitations

Sara Beier

The genetic structure of microbial communities as a signature of their functional stability. Sorbonne Université, 2023 Department Biology

Shungu Garaba

Remote sensing of floating and submerged plastics in the natural environment. Carl von Ossietzky University of Oldenburg, 2023 Directorat

Sonja Oberbeckmann

Microplastics in marine and brackish systems: sources, fate, and interaction with microbial communities. University of Rostock, 2023

Department Biology

Doctorates

Cátia Milene Ehlert von Ahn

Geochemical investigations of submarine groundwater discharge, river outflow and benthic diagenesis in the coastal Baltic Sea. University of Greifswald, 2023 Supervisor: Prof. Michael E. Böttcher

Katherine Amorim

Gradients and instability: Ecology of the macrozoobenthic communities at the Benguela Upwelling System off Namibia. University of Rostock, 2023 Supervisor: Prof. Heide Schulz-Vogt

Oscar Dario Beltran Perez

Phenology of phytoplankton blooms and its response to environmental changes in the Baltic Sea. University of Rostock, 2023 Supervisor: Prof. Joanna J. Waniek

Anne Breznikar

Rewetting effects on nutrient cycling and export dynamics in coastal peatlands of the southern Baltic Sea. University of Rostock, 2023 Supervisor: Prof. Maren Voß

Simeon Choo

Effect of fluctuating salinities on polyphosphateaccumulating bacteria from coastal habitats. University of Rostock Supervisor: Prof. Heide Schulz-Vogt

Helena Frazao

Spatial and temporal variability in the Northeast Atlantic Subtropical Gyre and implications for the biogeochemistry of the region. University of Rostock, 2022 Supervisor: Prof. Joanna J. Waniek

Katharine Heyl

GAP 2020 und die Phosphor Governance. University of Rostock, 2023 Supervisor: Prof. Dr. Ulrich Bathmann

Sebastian Jordan

Bentho-pelagic transport of methanotrophs at methane gas seep sites. University of Rostock, 2022 Supervisors: Prof. Dr. Heide Schulz-Vogt, Prof. Dr. Gregor Rehder

Tina Liesirova

Nitrogen-related processes in coastal sediments of the Baltic Sea and a flooded peatland North-east Germany. University of Rostock, 2023 Supervisor: Prof. Dr. Maren Voß

Lorena Martinez

Benthic-pelagic coupling of plankton at different scales of time and space. University of Rostock, 2022 Supervisor: Dr. Anke Kremp

Lev Naumov

Hypoxia in various coastal seas: modelling and comparison. University of Rostock, 2023 Supervisor: Prof. Dr. Markus Meier

Daniel Pönisch

Trace gas release from recent layered soils and long-term layered sediments. University of Rostock, 2023 Supervisors: Prof. Dr. Gregor Rehder, Prof. Dr. Maren Voß

Abundance, distribution and composition of microplastic in combination with organic pollutants in the particulate phase from different marine systems. University of Rostock, 2023 Supervisor: Prof. Dr. Joanna J. Waniek

Lukas Ritzenhofen

Inken Schulze

Detection of benthic life by high-frequency hydroacoustic and seismic methods. University of Greifswald, 2023 Supervisor: Prof. Dr. Helge Arz

Pascal Thova

Advancing Blue Economy in the Indian Ocean: The case of the fisheries sector. University of Hamburg, 2022 Supervisor: Dr. Kerstin Schiele

Janika Reineccius

Blue mussel farming in the Baltic Sea - economic and mitigation potential in mesohaline coastal waters. University Klaipeda, 2022 Supervisor: Prof. Dr. Gerald Schernewski

Johanna Schumacher

Tools and approaches for supporting coastal and marine policy implementation. University Klaipeda, 2022 Supervisor: Prof. Dr. Gerald Schernewski

PUBLICATIONS 2022

Publications with more than 15 authors are listed with the lead author, last author and all authors from the IOW

Articles in Peer-Reviewed Journals

Acevedo-Trejos, E., M. Cadier, S. Chakraborty, B. Chen, S. Y. Cheung, M. Grigoratou, C. Guill, C. Hassenrück, O. Kerimoglu, T. Klauschies, C. Lindemann, A. Palacz, A. Ryabov, M. Scotti, S. L. Smith, S. Våge and F. Prowe (2022). Modelling approaches for capturing plankton diversity (MODIV), their societal applications and data needs. Front. Mar. Sci. 9: 975414. doi: 10.3389/ fmars.2022.975414

Adzigbli, L., E. P. Sokolov, S. Ponsuksili and I. M. Sokolova (2022). Tissue- and substratedependent mitochondrial responses to acute hypoxia-reoxygenation stress in a marine bivalve (Crassostrea gigas). J. Exp. Biol. 225: jeb243304, doi: 10.1242/ jeb.243304

Adzigbli, L., E. P. Sokolov, K. Wimmers, I. M. Sokolova and S. Ponsuksili (2022). Effects of hypoxia and reoxygenation on mitochondrial functions and transcriptional profiles of isolated brain and muscle porcine cells. Sci. Rep. 12: 19881, doi: 10.1038/s41598-022-24386-0

Al-Okby, M. F. R., S. Neubert, T. Roddelkopf, H. Fleischer and K. Thurow (2022). Evaluating of IAQ-index and TVOC parameter-based sensors for hazardous gases detection and alarming systems. Sensors 22: 1473, doi: 10.3390/s22041473

Amorim, K., N. Loick-Wilde, B. Yuen, J. T. Osvatic, J. Wäge-Recchioni, B. Hausmann, J. M. Petersen, J. Fabian, D. Wodarg and M. L. Zettler (2022). Chemoautotrophy, symbiosis and sedimented diatoms support high biomass of benthic molluscs in the Namibian shelf. Sci. Rep. 12: 9731, doi: 10.1038/s41598-022-13571-w

Arandia-Gorostidi. N., H. Berthelot. F. Calabrese, H. Stryhanyuk, I. Klawonn, M. Iversen, N. Nahar, H.-P. Grossart, H. Ploug and N. Musat (2022). Efficient carbon and nitrogen transfer from marine diatom aggregates to colonizing bacterial groups. Sci. Rep. 12: 14949. doi: 10.1038/s41598-022-18915-0

Baccar Chaabane, A., E. Robbe, G. Schernewski and H. Schubert (2022). Decomposition behavior of biodegradable and single-use tableware items in the Warnow estuary (Baltic Sea). Sustainability 14: 2544, doi: 10.3390/su14052544

Becherer, J., H. Burchard, J. R. Carpenter, U. Graewe and L. M. Merckelbach (2022). The role of turbulence in fueling the subsurface chlorophyll maximum in tidally dominated shelf seas. J. Geophys. Res. Oceans 127: e2022JC018561, doi: 10.1029/2022JC018561

Beier, S., J. Werner, T. Bouvier, N. Mouquet and C. Violle (2022). Trait-trait relationships and tradeoffs vary with genome size in prokaryotes. Front. Microbiol. 13: 985216, doi: 10.3389/fmicb.2022.985216

Bejarano, S., V. Diemel, A. Feuring, M. Ghilardi and T. Harder (2022). No short-term effect of sinking microplastics on heterotrophy or sediment clearing in the tropical coral Stylophora pistillata. Sci. Rep. 12: 1468, doi: 10.1038/s41598-022-05420-7

Beltran-Perez, O. D. and J. J. Waniek (2022). Inter-annual variability of spring and summer blooms in the eastern Baltic Sea. Front. Mar. Sci. 9: 928633. doi: 10.3389/fmars.2022.928633

Börgel, F., H. E. M. Meier, M. Gröger, M. Rhein, C. Dutheil and J. M. Kaiser (2022). Atlantic multidecadal variability and the implications for North European precipitation. Environ. Res. Lett. 17: 044040, doi: 10.1088/1748-9326/ac5ca1

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Part of a seagrass meadow in the south-eastern Baltic Sea © IOW

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Apprentices ** Scientific service staff

238 Employees

PhD students Researchers *** Personnel (total) ****

as of 15.10. of the year

PHD DEGREES

10

Doctorates completed, thereof 6 women

50

Ongoing doctorates, thereof 34 women

HABILITATIONEN

*** without phd students

FINANCES

9.4

Mio EUR THIRD-PARTY FUNDS

6.8 Mio. EUR Bund (Federal ministries), thereof 2.7 Mio. EUR BSH-Monitoring* 0.7 Mio. EUR SAW**

Federal Maritime and Hydrographic Agency ** Leibniz Competition





16.4

Mio. EUR INSTITUTIONAL FUNDING

1.6 Mio. EUR DFG 0.1 Mio. EUR EU 0.2 Mio. EUR others

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