LEIBNIZ CENTRE
for Tropical Marine Research

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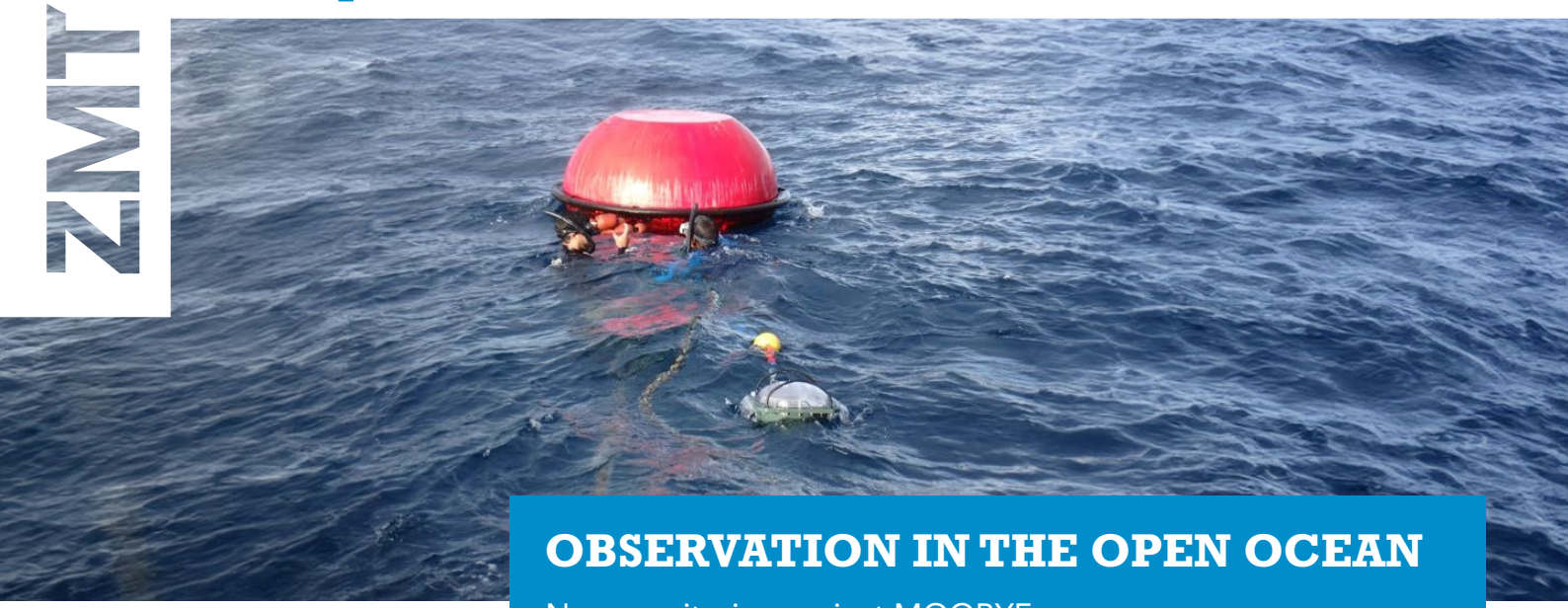

OBSERVATION IN THE OPEN OCEAN

New monitoring project MOOBYF

ON EXPEDITION

Many of them are hardly visible in the open ocean: here a bamboo raft, there a buoy, somewhere else a tiny artificial island. Hundreds of them drift around off the coast of Indonesia or the Maldives, for example. Some are attached to anchor lines several hundred metres long. And they are there due to a phenomenon that fishers around the world have observed for a long time: structures floating in the water attract certain species of pelagic fish that gather below them – a welcome habit for all those involved in the local fishery. Fish Aggregating Devices (FADs) is the name given to these artificial platforms that have now become attractive for research at ZMT.

Insight into pelagic biodiversity

Some 20 pelagic species, including tuna, are lured by FADs – an ideal opportunity to take a closer scientific look at these species, too, because normally, the inaccessible expanse of the open ocean makes it hard to observe and evaluate their biodiversity. As part of the European project "Monitoring the Open-Ocean Biodiversity with Fishers" (MOOBYF), FADs are now being equipped with scientific observation technology to gain more insights into pelagic biodiversity.

On an equal footing

This innovative form of monitoring is being facilitated by the long-term partnerships between ZMT and local communities on many tropical coasts, including those of Indonesia. "We've known some of the local researchers for years, others did their doctorates at ZMT and have been working with local fishers since then," explains ZMT's Annette Breckwoldt, a social scientist who heads the MOOBYF project at ZMT together with Sebastian Ferse. Two important MOOBYF work packages that are based at ZMT and aim to learn from the fishers and share knowledge with them can build on this trusting cooperation. "Monitoring is the first step, but in the long term we are looking to achieve more sustainable fishing and improve biodiversity," Ferse adds. "The cooperation between fishers and researchers in MOOBYF, as well as the transnational networking amongst fishers that is also planned, could lead to their voices being heard more in local politics and their knowledge taken more seriously." >MORE | >MORE

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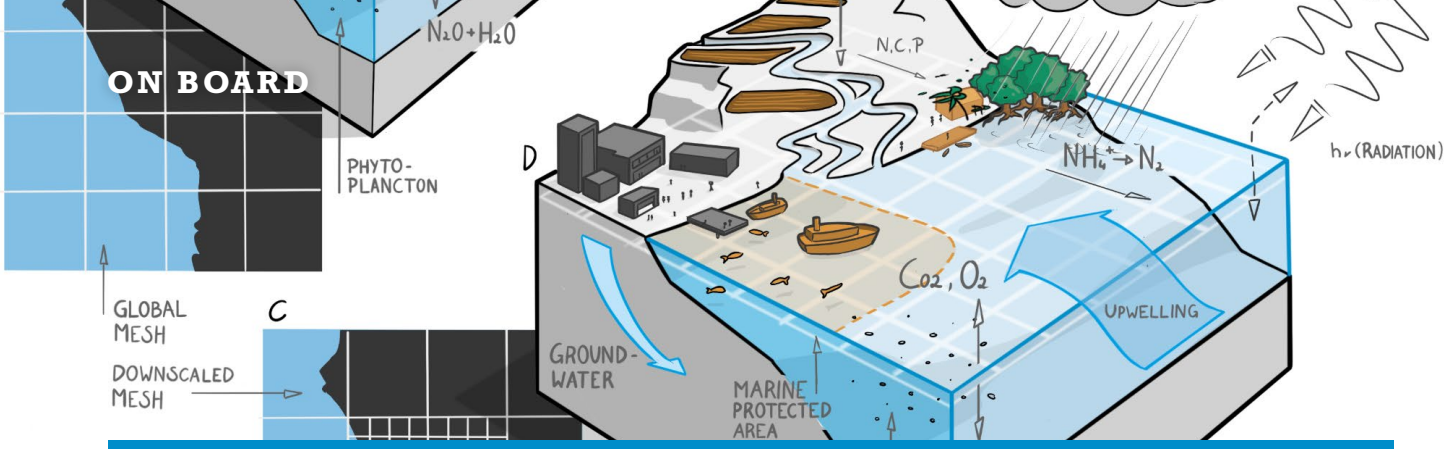

SEEING THE SYSTEM

More modelling at ZMT

If you want to reveal the complex mechanisms governing an ecosystem and explore its probable future development, you may describe this system, amongst other things, using a model informed by scientific data.

What is required is a dynamical model, thus, one that resolves the time-dependent evolution and can capture key interactions between the entities involved. Dynamical modelling is well established at ZMT and a research component in all programme areas. In the context of global climate change, however, significantly more complex, and broader-scope, modelling, known as earth system modelling, is relevant, especially for tropical coastal regions.

Earth system modelling is key

Earth system modelling not only links climate research data with biological or ecological data. "Ideally, it can also be successfully linked to socioeconomic activities and anthropogenic effects on local ecosystems in a specific region," explains Jan Härter, head of ZMT's working group Complexity and Climate. To pioneer the application of earth system models to tropical coastal regions and comprehensively couple them to human activities, the Leibniz Association and the Joint Science Conference (GWK) have now granted ZMT a generous strategic institute extension. The new funding will be allocated to TropEcS: "Modelling socio-economic dimensions across Tropical Coastal Ecosystems and the Earth System." The funding will enable additional mathematical and numerical modelling capacity, including quantitative expertise. The significant expansion of the research team will establish cross-institute cooperation to foster earth system research at ZMT.

The new team will be dedicated to various aspects of earth system modelling, including physical oceanography, atmospheric science, biogeochemical processes, and quantitative social science. In this way they will numerically incorporate the fluid dynamics of the ocean and describe overarching aspects of climate research and biogeochemical cycles – for example, which nutrients stem from the land surface near the coast and then influence the ecosystems in the ocean – as well as social and economic interrelationships.

"The strategic extension of the institute is a major breakthrough for ZMT. From now on, we shall be modelling the interaction between physical, biogeochemical and social science research questions numerically and conceptually. ZMT will be a key player in the modelling of the tropical coastal climate in marine research."
Raimund Bleischwitz, Scientific Director of ZMT

The strategic extension of the institute in modelling also enables ZMT to place a greater focus on climate change that will crucially influence life along tropical coasts. "The resolution of global climate models is not fine enough to really describe what is happening to tropical coasts locally," explains Jan Härter. With the help of ZMT's growing expertise in earth system modelling, existing climate models can now be refined. "We zoom in, so to speak, on existing climate models and can pick up on local conditions." To give an example, one focus will be on an upwelling area of the ocean off Peru where cold and nutrient-rich deep water reaches the surface. "These areas are strongly influenced by large-scale climate effects such as El Niño," says Härter. "This has complex effects on the weather, ecosystems and local fishery."

ZMT is strengthening its research capacities with the new institute extension TropEcS, which is being developed by Professor Jan Härter in close collaboration with Dr Christiane Schmidt (Science Management) and the scientific director of ZMT, Professor Raimund Bleischwitz. *>MORE*

CONSENSUS ON CLIMATE?

A mathematical model makes it easier to understand opinion dynamics in the climate change debate. A conversation with Agostino Merico and Peter Steiglechner

Climate change is a scientific fact. It is also clear that any attempts to mitigate it must be based on social consensus. Despite this, facts and measures are still under dispute. Why?

AGOSTINO MERICO: Climate change is the best example that facts only partially change opinions. The whole scientific community considers climate change a fact. This viewpoint is based on mathematics and observations and not on opinions. Nevertheless, this doesn't change many people's opinion. That's because – and we know this from cognitive science – the brain perceives information in a distorted fashion due to so-called cognitive biases.

Cognitive biases are unconscious processes that, in evolutionary terms, have aided survival and operate under certain conditions. What does that mean in the debate on climate change?

PETER STEIGLECHNER: One crucial bias is the confirmation bias. The brain falls back on existing convictions and experiences when faced with highly complex information. To put it simply, we often only accept those opinions in our social environment that confirm the ones we already hold.

AGOSTINO MERICO: In addition, random factors in the communication process, which we call "noise", also influence our judgements or decisions. Such random factors depend on personality, individual mood or ambiguities in the communication.

So, is consensus impossible?

PETER STEIGLECHNER: To answer the question theoretically, we have drawn on assumptions from the cognitive and social sciences, implemented them into a mathematical model describing a virtual society, and run a number of model simulations. We worked on the assumption that there is a majority in society that accepts climate change and is concerned. The model says that it may well be possible to break down clusters of opinion and sway the sceptical minority towards climate protection – despite, or precisely through, bias and noise.

Which conditions lead to greater consensus?

AGOSTINO MERICO: The mathematical model gives us some indications. If the cognitive bias is moderate, a society can reach consensus. In the virtual setting, this depends on who is interacting with whom. Intuitively, you would think that a situation that is unclear – i.e. when there's a lot of noise – would encourage disagreement but, in combination with a moderate confirmation bias, the model produces more communication and thus more agreement on the topic of climate change.

What does this mean in the real world?

PETER STEIGLECHNER: First of all, the mathematical model helps us to understand that communication or perception processes have a relevant but non-trivial impact on the climate change debate. And then, of course, it demonstrates that there is no reason for despair: agreement on climate change is possible despite the various factors that at first glance seem to work against it.

Professor Agostino Merico is head of the working group Systems Ecology at ZMT. Dr Peter Steiglechner is a member of the same team and recently defended his doctoral thesis on "The Complex Effects of Distorted Social Perceptions on Opinions about Climate Change". >MORE | >MORE

Fourth global coral bleaching event

Coral bleaching occurs when the microscopic algae that live in coral polyps are expelled. The corals have these myriad algae to thank for their vital energy and their colour, so they are only expelled under stress. Seawater that is too warm over an extended period is one such stress factor. Corals that do not have algae in their soft tissues turn white because their calcareous skeleton shines through the polyp that is now colourless. The corals cannot survive this bleaching for long; they die, causing the reefs to erode, too. This then poses a threat to islands protected by reefs. The latest news is alarming: according to the US National Oceanic and Atmospheric Administration (NOAA) and the International Coral Reef Initiative (ICRI), since the beginning of 2023, reefs in more than 53 countries and areas worldwide have been experiencing a global coral bleaching event. It is the second major event of its kind in the last ten years and is caused by exceptionally high seawater temperatures, exacerbated by the weather phenomenon, El Niño.

Dr Sonia Bejarano, coral reef ecologist at ZMT, monitors the state of reefs in the Eastern Tropical Pacific and, as part of the Global Coral Reef Monitoring Network, reports on developments at 72 sites. The Central American reefs have not been spared heat stress. Entire reef areas are bleached and dead, 30 of these sites show signs of severe bleaching, others are less badly affected, yet others are gradually recovering. Observation and detailed investigation aim to reveal what makes some sites more vulnerable than others so that long-term protective measures can be taken – because coral bleaching has a major impact on the economy, people's livelihoods and countries' food security. >MORE

UNESCO Co-Design Training Course

Marine researchers who want to help co-design the future of the oceans can now take part in a special course on the Ocean Teacher Global Academy (OTGA) platform: the UNESCO Co-Design Training Course for actions in the Ocean Decade supports the marine research community in co-designing a project that could lead to co-producing and sharing knowledge. The aim is to develop a proposal that can be submitted for endorsement by the Ocean Decade. The self-learning course drew inspiration from a pilot project and is a joint initiative of ZMT and UNESCO's Intergovernmental Oceanographic Commission (IOC). >MORE

Member of CEMarin

ZMT is the seventh member of the Corporation Center of Excellence in Marine Sciences (CEMarin) in Colombia. CEMarin is an international non-profit academic consortium promoted and financed by the German Academic Exchange Service (DAAD) of the German Federal Ministry of Foreign Affairs. Membership in this network not only reinforces long-term marine research cooperation between Colombia and ZMT, but it also allows CEMarin's links to researchers at the member universities in Colombia and Germany to be intensified. CEMarin provides access to the most important tropical ecosystems, both in the Pacific and in the Caribbean. Ultimately, reinforcing potential collaborations serves to improve the understanding and conservation of tropical marine ecosystems. >MORE

Drones for marine research

At the end of June, ZMT successfully held an international workshop on the challenges and opportunities inherent in using consumer-grade drones for tropical coastal and marine research. Drones are becoming an increasingly important tool in gathering data for tropical coast investigations. The workshop was supported by four members of the network, Partnership for Observation of the Global Ocean (POGO), to which ZMT also belongs. Twenty-five experts from nine countries took part. >MORE

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