

*Solving future ocean changes  
Cannot be done by the Lord's angels  
Engagement helps create this notion.  
Sustainably observe the ocean*

*Atlantis sunk beneath the waves  
They could not see their salty graves  
Let's try stop our current motion*

*Sustainably observe the ocean*

# Newsletter **2018**

Early Career Scientists in Ocean Observing – Benefit, Impact  
and Future Perspectives

Volume 1  
Issue 4

Atlant  S



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Think of food, energy, and transportation  
Overfishing, oil spills, and ocean acidification  
Everything touches emotion  
Sustainably observe the ocean

Measurements and data are diverse  
For scientists and funders that's a curse  
Integrating systems should be a devotion  
Sustainably observe the ocean

We need to join our forces  
Money and time are crucial resources  
To avoid a massive corrosion  
Sustainably observe the ocean

Imagining a system without legal basis  
Ocean governance seems like an oasis  
Prevent an uncontrolled explosion  
Sustainably observe the ocean

We need to share our work more widely  
So others do not sit their idly  
Demand inclusive, world promotion  
Sustainably observe the ocean

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July 13, 2018 by Sandra Ketelhake

## Credits

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Cover Photo: Sustainably observe the Ocean - Credit: Mario Müller (GEOMAR Helmholtz Centre for Ocean Research Kiel)

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## Editorial

**Sandra Ketelhake and Anja Reitz (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)**

The fourth AtlantOS newsletter focuses on Early Career Scientists (ECS) in Ocean Observing Sciences.

Early Career Scientists are defined as undergraduate and postgraduate (Masters/PhD) students or scientists who has received their highest degree (BSc, MSc, or PhD) within the past seven years.

It is relevant to involve and promote ECSs within all fields related to ocean observing to

- Broaden individual and institutional scientific capacities,
- Communicate expertise to future experts,
- Ensure long-term progress,
- Build a critical mass of highly qualified, engaged, and innovative people that promote and participate in capacity development in their future

The 'Focus Area' of this newsletter demonstrates

## What is the H2020 project AtlantOS

The AtlantOS H2020 EU research and innovation project pools the effort of 57 European and 5 non-European partners from 18 countries to collaborate on optimising and enhancing Atlantic Ocean observing. The project has a budget of about € 21 Million for 4 years (2015 – 2019) and is coordinated by GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany (Prof. Dr. Martin Visbeck). The vision of AtlantOS is to improve and innovate Atlantic observing by using the Framework of Ocean Observing to obtain an

the engagement of ECSs in ocean observing and how the ocean observing community (scientific research, technology development, etc.) benefit from involving ECSs, and how future perspectives might look like.

The selected contributions were written by ECSs in cooperation with senior scientists and range from (i) ethics and scientific responsibility in ocean observing, (ii) sustainability as a concept for ocean observing, (iii) microplastics, (iv) seafloor mapping, to (v) training the 21st century ocean scientists.

With these examples, we would like to encourage the ocean observing community to continue and even intensify their engagement with Early Career Scientists. In addition, ECSs are invited to actively take part e.g. in discussions about a sustainable and fit-for purpose (Atlantic) ocean observing system ranging from ocean observing requirements to enhance societal benefit, over observation structures, data management and integration, capacity as well as technology development to building a fit-for-purpose governance system.

international, more sustainable, more efficient, more integrated, and fit-for-purpose system. The AtlantOS initiative aims to have a long-lasting and sustainable contribution to realizing societal, economic and scientific benefit arising from this integrated approach with implementation extending beyond the project's lifetime. Advances will be achieved by improving the value for money, extent, completeness, quality and ease of access to Atlantic Ocean data required by industries, product supplying agencies, scientists and citizens.

## Focus Area

# Early Career Scientists in Ocean Observing



AtlantOS ECS organized a workshop during the 3rd General Assembly where they discussed topics like their view on sustainability of ocean observing and scientific responsibilities (Credit: Gianandrea Mannarini, CMCC)

## Geoethics, how to apply ethical core-values to the ocean observation community

Michèle Barbier (Institute for Science and Ethics, France)

Tobias Hahn, Anja Reitz (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)

Katsiaryna Pabortsava (National Oceanography Centre Southampton, UK)

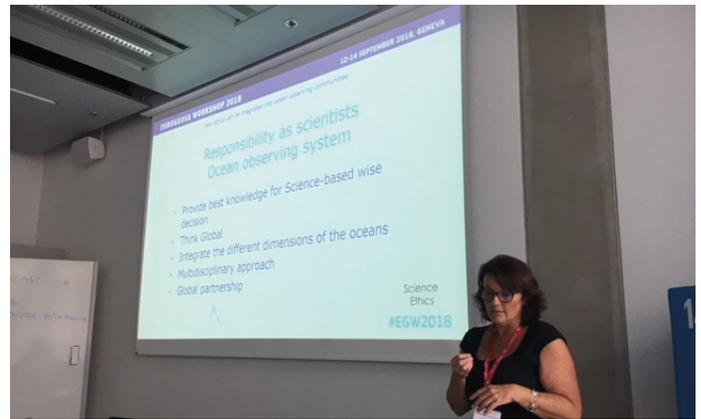
Fred Whoriskey (University of Dalhousie, Canada)

To support addressing ethical issues in geosciences, appropriate behaviours and practices have been defined to tackle ethical challenges and to choose best possible solutions. The newly developed concept of Geoethics addresses ethical, social and cultural implications of knowledge, education, research, practice and communication in geosciences, as well as the social responsibility of geoscientists when conducting their activities (e.g. Peppoloni & Di Capua, 2012). The fundamentals of

Geoethics are defined in the Cape Town Statement. It sets out the principles such as honesty, integrity, transparency and reliability of geoscience to guide research. Currently, 20 geoscience organizations endorse or support the Cape Town Statement on Geoethics. The [International Association for the Promotion of Geoethics](#) (IAPG) is the multidisciplinary scientific platform that brings together the geoscientific community around ethical issues.

Within AtlantOS, a group of Early Stage researchers studied this concept of geoethics and developed, with M. Barbier and F. Worhiskey, ethical recommendations that could be applied to the ocean observation community (M. Barbier, A. Reitz, K. Pabortsava, A.C. Wölfl, T. Hahn, & F. Whoriskey. "Introduction to ocean ethics, Part I; ethical recommendations to ocean observations", submitted to EGU publication - ADGEO (Advances in geosciences)).

The objective of these recommendations is to raise awareness among marine scientists for ethical issues and demonstrate their responsibility for the global well-being of human societies, through the production of high-quality ocean knowledge, in a coordinated and integrated manner. With the launch of the United Nations Decade of Ocean Sciences for Sustainable Development (2021-2030), the tasks of the ocean observing community will likely greatly increase and the transfer of scientifically validated information into policies will need to be accelerated. It is the duty and responsibility of politicians to ensure sustainability of economic and social activities to guarantee human demands for future generations based on scientific evidence. Accordingly, it is the duty of marine scientific communities to provide the best information, but also to adopt ethical standards and promote education and awareness for sustainable economic development, mitigation of natural hazards, protection of the environment, and



*Michèle Barbier presenting views on 'Responsible Research and Innovation in ocean science' at EuroGEOSS workshop (12 – 14 September 2018) in Geneva (Switzerland) (Credit: Anja Reitz, GEOMAR).*

improvement, resilience and well-being of societies.

Nine key principles have been elaborated that marine scientists could follow to ensure ethical approaches are followed in their innovative research. These key principles are consistent with the vision and mission of AtlantOS. These principles address issues related to free access to data, efficiency, compliance with laws, respect for the environment and nature conservation, mutual relations and cultural respect, equity and justice, knowledge transfer, governance adapted to socio-ecological systems, and the use of animals in research. These recommendations should be optimized and adopted by the entire community.

## The contribution of Early Career Scientists (ECS) to the sustainability of AtlantOS

Tobias Hahn (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)

Jan-Stefan Fritz (German Marine Research Consortium, Belgium)

**A** key aim of AtlantOS is to achieve a sustainably institutionalized network of ocean observing systems across the Atlantic Ocean. Early Career Scientists can play a substantial role in achieving this goal.

A qualitative survey during the last AtlantOS General Assembly (GA) in November among (idealistic) ECS showed that ECS do struggle to see clearly within and through the pool of discussions about sustainability of ocean observing. It became obvious that ECS had different views on the key concept of sustainability, yet considering it as a main driver for conducting their research.

As an ECS working at GEOMAR, Tobias greatly benefits from the oceanographic and operational framework

on the institutional, level and their established international partnerships. In this case, AtlantOS facilitates the enhancement and optimisation of in-situ oxygen measurements via close cooperation between research and marine technology businesses. Incorporated in the workpackage on 'Cross-cutting issues and emerging networks', Tobias is involved in the usage of an innovative technology which will potentially offer a great benefit for the ocean observing community. Certainly, scientific judgement on the realistic utilization requires extensive lab and field investigations which would have never been possible without AtlantOS. The financial viability of the research institute and AtlantOS is, of course, very important. However, AtlantOS is a joint effort driven multidisciplinary project. Here, the contribution of

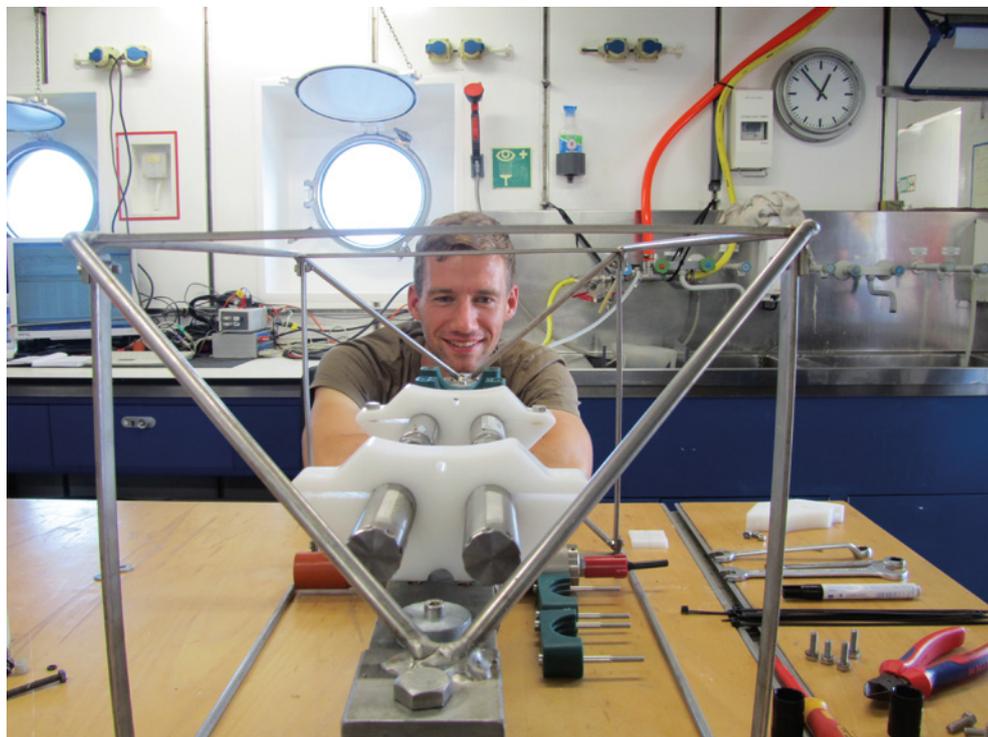
ECS and their integration to the sustainability of AtlantOS could be strengthened. A first achievement was made during the 3rd GA on Gran Canaria: An ECS delegate is since invited to participate to Steering Committee meetings.

In addition to the natural degrees of freedom which a PhD offers (e.g. evaluation of future career opportunities), Tobias realized being focused on performing on the work package task was a rather known procedure for him – a chemist by training. The real challenge was to break out into the continuous, creative process of phrasing his concrete scientific research question and the strategic context in which this is taking place. No doubt that the vision and magnitude of AtlantOS shaped Tobias' scientific profile and thinking more towards networking within and understanding the big picture of the ocean observing community than steadily digging in the scientific depth.

ECS in marine science want to understand the overall picture of strategic, political and scientific discussions about the future of ocean observing. In fact, the potential for ECS is huge when fully leveraging the international framework AtlantOS currently builds between North and South Atlantic partners. We think specific contributions that ECS can make are:

ECS can contribute massively in public engagement and can thus be multipliers in efforts to raise a broader awareness and support for ocean observing in the general public.

Many ECS are active networkers and can thus play a pivotal role in networking the ocean observing community.



*Tobias Hahn prepared novel oxygen sensors used in the EU H2020 project AtlantOS for deployment during M119 (Mindelo/Cape Verde - Recife/Brazil, 9/08/2015 - 10/12/2015). They were attached on a mooring cage at Cape Verde Ocean Observatory (CVOO, 120m depth) for sensor validation and measuring oxygen variability (Credit: Johannes Hahn, GEOMAR).*

The ECS community perhaps profits most from a network that offers science and employment perspectives, and are thus highly motivated to investing in its success.

There are many public and private funds available to fund education, specific trainings, summer schools and larger capacity building programs. A successful AtlantOS network can use such funds to strengthen the ocean observing community and offering education, training and job opportunities for ECS.

ECS, especially fresh doctoral researchers, can feel overwhelmed in big projects like AtlantOS. Besides the main supervisor and direct colleagues, one initiative could be to implement a mentoring program (ECS and external Senior Scientist) to enhance understanding and the network. Expert knowledge will help ambitious ECS to identify own interests and tackle emerging global issues.

# Microplastics - What do we know and what need to be done?

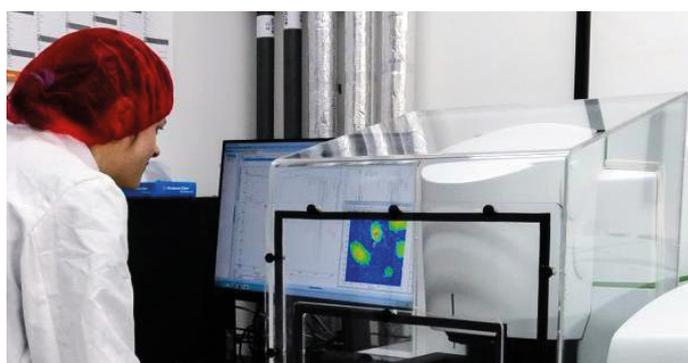
Katsiaryna Pabortsava and Richard Lampitt (National Oceanography Centre Southampton, UK)

In 2015, the global production of plastics reached 350 million tonnes (Mt) - 20 times higher than it was in 1975. More than 30% of this plastic becomes waste, of which 12 Mt enters the oceans. While the problems with large plastic litter are relatively well known, the ubiquitous and persistent presence of microscopic plastic debris termed microplastics (1-1000 micron in size) gained enormous scientific and societal concern only recently.

Microplastics are deliberately manufactured microscopic virgin pellets and microbeads for use in cosmetics and medicine, or fragmented pieces of larger plastic objects (e.g. bottles, bags, films and ropes). Because of their small size, microplastics are readily ingested by aquatic fauna at the very base of the food chain. Ingested microplastics can harm an organism both physically by blocking guts and abrading tissues and chemically by releasing substances added to plastics upon production or sorbed onto their surfaces from the surrounding. Many of these substances are bioaccumulative, toxic, carcinogenic; they can alter metabolism and disrupt reproductive and endocrine systems. There is a growing concern that microplastics and their associated contaminants may severely affect marine ecosystems with adverse consequences for ecosystem services and human health. Microplastics can potentially interfere with marine biogeochemical processes through aggregation with marine snow and incorporation into zooplankton faecal pellets with implications for the delivery of carbon to the deep ocean.

In order to fully understand the risks associated with microplastic pollution, the distribution, sources, behaviour and fate of microplastics in the marine environment and how these change in space and over time have to be robustly constrained.

At National Oceanography Centre (NOC) in Southampton, Dr. Katsia Pabortsava and Prof. Richard Lampitt have been working intensively to unveil this fundamental information. Supported by AtlantOS WP3.2 'OceanSITES biogeochemistry', they employ the capabilities of the observing systems in the Atlantic Ocean to perform the core measurement of concentrations, composition, sizes and shapes of microplastics, their downward flux to the abyss and accumulation at the sea-floor over the past three decades. The researchers survey the changes in vertical distribution of microplastics in the top 350 m across the Atlantic from North to South. They also quantify and characterise microplastics sinking to the deep ocean in different regions of the Atlantic, and how this downward flux changes over time and in relation to physical and biogeochemical processes (e.g. currents, primary production and downward particle flux). For this, they examine the sinking material collected with time-series sediment traps deployed at 3000 m depth at Porcupine Abyssal Plain (PAP) sustained observatory in the northeast Atlantic and in the centres of the North and South Atlantic oligotrophic gyres. To complete the picture, the 30-years long collection of the sediment cores from PAP (4000-5000 m) are to be examined to track the long-term accumulation of microplastics at the sea-bed.



Katsia Pabortsava analysing samples with FTIR imaging system (Credit: NOC).



Katsia Pabortsava preparing a deep sea sediment sample for microplastics analysis (PAP cruise) (Credit: Chelsey Baker).

NOC group aims to be on top of the game in providing the rigid assessment of microplastic pollution in the ocean and establishing best approaches for future monitoring. Katsia, for example, is employing her vast expertise in analysing trace elements in marine particles to develop consistent and contamination-free methods for collection and analysis of microplastics. This is a challenging and critical task given the diversity of sample composition and plastics being used everywhere. The NOC group has also

acquired a very advanced Fourier-Transform Infrared Imaging system capable of identifying microplastics as small as 2 microns in a rapid and semi-automated manner. In the next year, NOC scientists are committed to deliver some high-quality data on the scale of microplastic pollution in the ocean which would be useful for policymakers, industry and society when developing strategies to reduce and prevent microplastics pollution in the environment.

# Seafloor Mapping – Completing a big puzzle

Anne-Cathrin Wölfl and Colin Devey (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)

Although mariners have been measuring water depth for thousands of years, it is only in relatively recent times that sonar and satellite techniques have begun to open up the shape of the deep ocean. But even with these modern devices, mapping the world's oceans still remains a huge task. So far, only between 10 and 15 % of the ocean floor has been mapped in detail, leaving about 300 million km<sup>2</sup> (or 30 times the surface area of North America!) still to be mapped. By comparison, the entire surfaces of the Moon and Mars were mapped in greater detail 20 years ago. The problem of course is the ocean water - mapping the seafloor with sonar requires vessels to transit in the area with multibeam echo-sounder systems. With the currently available technology, mapping the world's oceans like this would take approximately 1000 ship years. Several initiatives have been started to try and speed up this process. One of them is Seabed 2030, a collaborative project between the Nippon Foundation and General Bathymetric Chart of the Oceans (GEBCO). The goal of the project is to generate the definitive map of the world ocean floor by 2030 by gathering all bathymetric data that is and becomes available. Very relevant in this regard is "dark data" - data which has been collected but is not freely available and/or indexed with the necessary metadata. Finding such data and making it available for international efforts is a major challenge, emphasizing the huge international importance of data sharing and avoiding duplication of effort. Furthermore, the concept of crowd-sourced bathymetry and multi-use research cruises is on the rise. Within the AtlantOS project, GEOMAR initiated the collection of underway bathymetry data, where several German research vessels collect bathymetry data on their transits.

Besides data gathering, mapping strategies are needed for future mapping surveys. Although at present the chances are still high that any particular track will cover "terra incognita", in the long term a more strategic approach from the seafloor mapping community is needed, especially in international

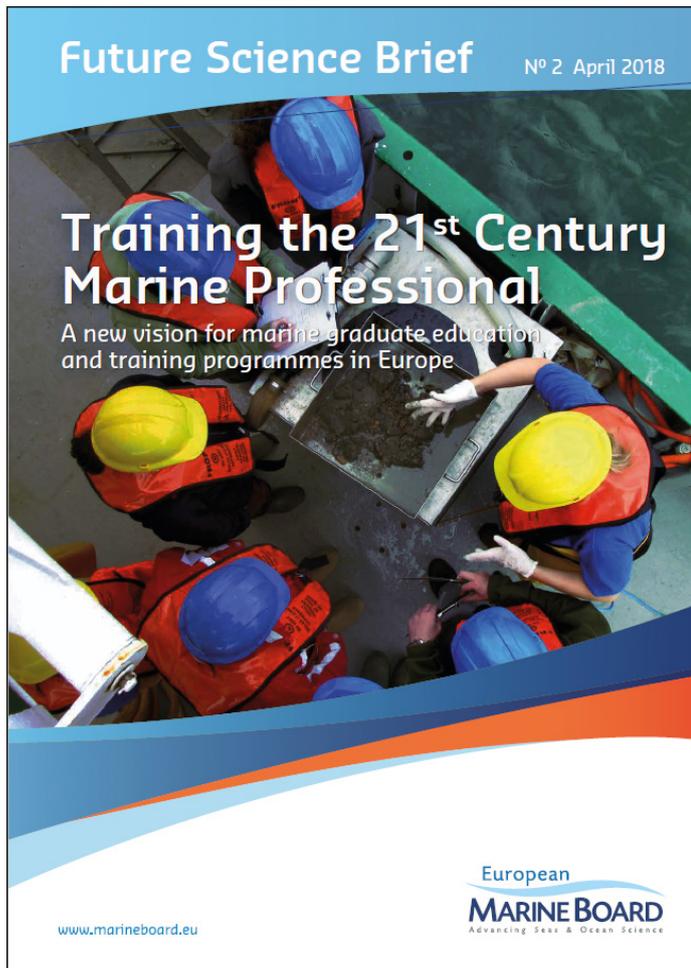
waters, in order to avoid duplication of effort and also keep environmental impacts that come along with large mapping surveys, e.g. ocean noise, to a minimum. In order to do this, it is important to have an up-to-date catalogue available at sea showing which areas have already been mapped. Work on this catalogue is on-going but one initial product has been generated by the AtlantOS project joining forces with the Atlantic Seabed Mapping International Working Group (ASMIWG) as part of the Atlantic Ocean Research Alliance (AORA) and identifying three potential pilot mapping areas that can be seen as strategic orientation for future mapping campaigns (Wölfl et al. 2017). The Geographic Information System (GIS) approach used for this work was based on multibeam data density and carefully chosen and freely available variables of the marine environment that are of interest to various ocean stakeholders. One of the three identified areas is currently being surveyed by the US research vessel Okeanos Explorer from National Oceanic and Atmospheric Administration (NOAA).

Another significant challenge is to make seafloor mapping more efficient, more accurate and more detailed. The development is clearly going into the direction of Remotely Operated Vehicles (ROVs) and Autonomous Underwater Vehicles (AUVs) that obtain data close to the seafloor down to submeter scales, a resolution that cannot be achieved in the deep ocean by ship-based systems. An ROV is still operated by a pilot from a ship, whereas the AUV is fully autonomous and can even be set up in swarms. However, there are still several aspects that need to be addressed before submersibles can replace ship-based systems, such as survey speed, long-term use and big data transfer, to name but a few.

To tackle all these topics, that are relevant for the future, it is important to support and train Early Career Scientists with regard to i.e. developing new technologies and introducing them to the network activities that are already existing.

# Training the 21st Century Ocean Scientist

Paula Kellett, Cláudia Viegas, Christine Rundt and Kate Larkin (European Marine Board, Belgium)



The marine and maritime sciences have a significant role to play in supplying high quality graduates through training programmes and initiatives which are designed to address the needs of science, industry and policy. But what does the educational landscape look like in Europe and how should marine graduate training evolve to meet blue growth opportunities and wider societal needs? In April 2018, the European Marine Board (EMB) launched a [publication](#) which explores the challenges in marine graduate training including the mis-match with the job market, and a vision for Europe with key actors and enablers to implement this.

The EMB publication reviews the broad range of [marine graduate training](#) available across Europe. It

suggests that training should move towards a more inter-disciplinary approach to equip students with the skills, experience and broad knowledge base to enter a changing workplace and the expanding marine industry sector. It also identifies that closer cooperation is essential between academia and educators, research funders and the marine industry, e.g. co-design / co-funding of training programmes.

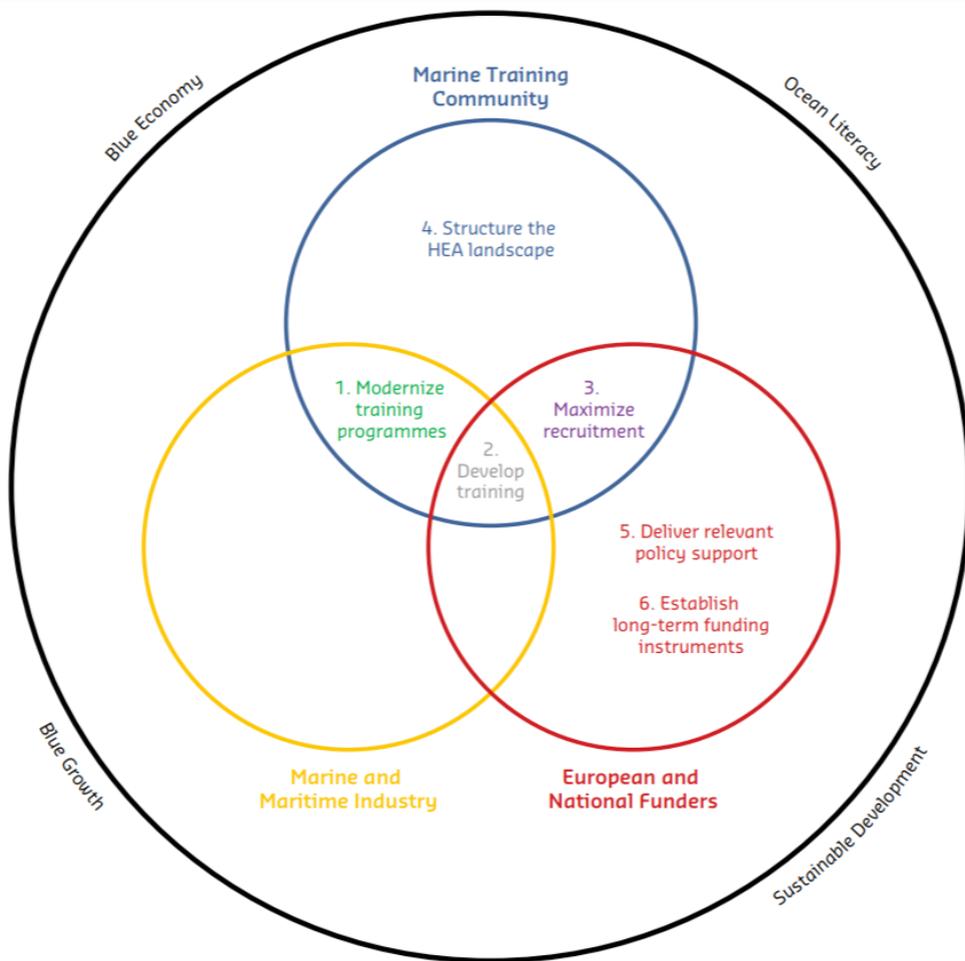
**Ocean observation:** Practical field work, including training on Research Vessels and in taking ocean observations and marine sampling, is identified as an invaluable asset in combination with theoretical training, internships or work placements. For example, the [SMART](#) initiative in Ireland and the [Partnership for Observation of the Global Ocean \(POGO\)](#) provide fellowships and courses for shipboard training.

## Marine Graduate Training Recommendations

The EMB paper sets out 6 Recommendations:

1. Modernize training programmes;
2. Develop training content across academia, government (policy & funding) and industry;
3. Maximize recruitment of students and professionals to take an interest in marine graduate training and blue careers;
4. Advance the European Higher Education Area for marine science and technology;
5. Deliver relevant policy support initiatives to address the gap between marine graduate training and Blue Growth;
6. Establish long-term, flexible funding instruments at national and EU level to support innovative marine training.

The EMB publication and recommendations also serve as input to future marine science training and capacity development plans, including the BluePrint for an Integrated Atlantic Ocean Observing System and AtlantOS European Strategy. For example, an event took place in the European Parliament (Brussels), organized by EMB, on 25 September 2018 to discuss next steps towards implementation.



Credit: European Marine Board

Credit: European Marine Board

**What do early career researchers think?** Each year, EMB hosts internships for marine graduates to experience work at the marine science-policy interface. Two 2018 interns at EMB talk about life as a marine science graduate and how an EMB internship in the European context is helping their career.



Credit: Claudia Viegas

"As a PhD student working with oceanography and modelling, the opportunity to work at EMB together with research vessel experts, and be involved in the European Ocean Observing System (EOOS) strategy development, was rewarding. I have been getting to know the main challenges regarding stakeholder coordination, data acquisition and sharing.

With the EMB inter-disciplinary approach I get to know the big picture of European marine science policy, challenges and opportunities; essential tools for my academic progress." Cláudia Viegas, PhD candidate in Sea Sciences. University of the Azores.



Credit: Christine Rundt

"My EMB internship is helping me to understand the European science-policy landscape and provided me the opportunity to get a foot in the door. My work on the EOOS strategy introduced me to the coordination structure of marine science in Europe and taught me to work in an international and interdisciplinary context.

The internship is a great opportunity to gain practical experience outside of university and will be a stepping stone for a career in the interface of science and policy." Christine Rundt, Masters programme 'Marine and Lacustrine Science and Management', VUB

EMB has a number of current activities related to ocean observation including a recent paper on biological observations, a running Working Group on research vessels and contribution to the EOOS framework and Conference on 21-23 November 2018.



*NERC prototype MAPS system, cartridge design (Credit: NERC).*

## Sensor and instrumentation innovations advanced in AtlantOS

Andrew K. R. Morris (National Oceanography Centre, United Kingdom) and AtlantOS Deliverable 6.3 'Validation of sensor and instrumentation innovations' partners

An ambition within the oceanographic community is the autonomous and in situ monitoring of key parameters across the Atlantic Ocean at much higher temporal and spatial resolution than currently achieved. The AtlantOS project has supported this goal through the development of sensors that address key gaps and by providing support to technologies from previous Oceans of Tomorrow projects to build on past success.

Effort was guided by the Global Ocean Observing System (GOOS) assessment of Essential Ocean Variables (EOVs) to ensure developments targeted

high priority data. Consequently, resources were focussed on technologies that could provide information on biology and ecosystem EOVs (such as, microbe biomass and fish abundance) and enable biogeochemical measurements (such as, nutrient and inorganic carbon readings) on a greater range of dynamic and autonomous ocean going platforms. Such an approach not only supported new technology that would deliver greater capability to the oceanographic community but also grows the capacity for existing measurements to be made in more places and more regularly.



NERC prototype for a dissolved inorganic carbon sensor (Credit: NERC).



Kongsberg Maritime Contros pH optode (Credit: KM Contros).

An example of the technology that has been supported through AtlantOS is the Marine Autonomous Plankton Sampler (MAPS). MAPS autonomously filters sea water and preserves discrete samples for later analysis for environmental DNA. It started the AtlantOS project as little more than a concept but a prototype has since been used on a research cruise and more recently it was deployed to undertake in situ sampling at the L4 station of the Western Channel Observatory. An industrial partner within the project is in close collaboration and is exploring a complimentary design to increase sample capacity and enable full submersion.



Virtual model of TELLABS reel-to-reel MAPS design (Credit: TELLABS).



NERC cartridge MAPS design installed at L4 station of the Western Channel Observatory (Credit: NERC).

In total eight technologies received direct support with more benefitting from deployment opportunities made possible through the AtlantOS project. Not all of the technology started the project with the same maturity and to assess development the widely applied Technology Readiness Level (TRL) scale was used. This scale extends from a paper study (TRL1), through component testing in a relevant environment (TRL5), all the way to successful and qualified mission operations (TRL9). By the end of the AtlantOS project 18 TRLs will have been passed, representing a major step forward across ocean observing. The support provided has accelerated what would otherwise have been possible; one technology is now exploring commercialisation whilst another is already commercially available.

The technology development undertaken through AtlantOS represents excellent value for money with partners supported across Europe, both in academia but also in private industry. A major component to this success was working with existing teams from previously funded projects so that materials, equipment and expertise could be sustained and put to immediate effect. Early Career Scientists embedded across contributing partners have also been a major benefit to the work. Their enthusiasm, ideas and perspective as new users are extremely important within technology development. Engaging with the creation of novel technology across TRLs is also an excellent training opportunity, providing in-depth technical, deployment and scientific experience. It is to the benefit of all that early career scientists take an active role in the development of technology, not only by contributing to ongoing effort but by helping shape the future goals and ambitions of the community.

Link to AtlantOS deliverable 6.3 'Validation of sensor and instrumentation innovations': [https://www.atlantos-h2020.eu/download/deliverables/AtlantOS\\_D6.3.pdf](https://www.atlantos-h2020.eu/download/deliverables/AtlantOS_D6.3.pdf).

## Opinion Page

# An overview of POGO's capacity building programme

Sophie Seeyave (Plymouth Marine Laboratory, United Kingdom)



The Partnership for Observation of the Global Oceans (POGO) has, over the last 18 years, developed a large portfolio of training programmes aimed primarily at early-career scientists from developing countries, and focussing on the topic of observational oceanography. Around 800 Early Career Scientists from almost 80 countries have been

trained by POGO, and many of these are still involved in POGO alumni networks, projects and other forms of collaboration with POGO.

POGO was founded in 1999 by directors of oceanographic institutions around the world as a forum to promote and coordinate observation of the global ocean. POGO's membership includes most of the world's leading ocean science and technology institutions. One of the reasons for the creation of POGO was to address the large gaps in geographical coverage of GOOS, in partnership with the Intergovernmental Oceanographic Commission (IOC). From its inception, POGO recognised that, to fill these gaps, and in particular to address the paucity of measurements in the Southern Hemisphere and in the coastal waters of most developing countries, it would need to assist these countries in developing the skills, expertise, infrastructure and institutional capacity required to conduct routine ocean observations, make the data freely available, produce models and forecasts for societal applications, and use the resulting products and information to inform policy. POGO has always emphasised the need for training to result in sustained capacity that would contribute to achieving POGO's vision of having, "by 2030, world-wide cooperation for a sustainable, state-of-the-art global ocean observing system that serves the needs of science and society".

Key to achievement of this vision are (1) the selection of trainees who are in a position to pass on the knowledge gained to their students and colleagues; (2) the existence of infrastructure and facilities to conduct ocean observations at the trainees' home institute, or potential for the home institute to set up and maintain an observing system; and (3) integrating the trainees into existing international networks and/or creating new ones (such as alumni networks) to ensure that the observations are being integrated into GOOS and are conducted following international standards and protocols (including data interoperability and accessibility).

The first step in capacity building for POGO was the establishment of a [Visiting Fellowship programme](#). This programme was initially run in collaboration with the Intergovernmental Oceanographic Commission (IOC) and Scientific Committee on Oceanic Research (SCOR), but has continued since 2006 as a joint POGO-SCOR programme. Under this programme, scientists from developing countries can spend up to three months receiving one-to-one training and supervision in ocean observations at a major oceanographic institution. Since then, POGO has developed a strong partnership with the Nippon Foundation, establishing a [Centre of Excellence in Observational Oceanography](#) (hosted since 2013 by the Alfred Wegener Institute in Germany), and more recently a [shipboard training programme](#), which offers fellowships to early-career scientists from developing countries to receive hands-on training before, during and after international research cruises, as well as funding dedicated training cruises (e.g. on-board Polarstern in 2015, 2016 and 2019). POGO has collaborated with AtlantOS on various fellowships, in particular on the placement of 6 shipboard training fellows on-board the Meteor M148 cruise from Brazil to Namibia, which was part of the AtlantOS project.

A world map with a blue and orange color scheme. The landmasses are in shades of green and brown, while the oceans are in shades of blue. The map is overlaid with a dense pattern of small orange dots, representing data points, which are most concentrated in the Atlantic and Indian Oceans. A dark blue banner is positioned at the top left of the map, containing the text 'News from the Private sector'.

## News from the Private sector

Overview of CDI entries per August 2018: >2.1 million data sets from 600+ originators and 110+ connected data centres  
(Credit: SeaDataNet).

## SeaDataNet – giving access to a wealth of marine and ocean data

Dick M.A. Schaap (MARIS, Netherlands)

**M**arine and ocean data are important input for many societal applications. Scientists, environmental policy makers, and industry need accurate, homogeneous, integrated marine data sets and reliable services to access these. In practice, enormous amounts of data sets are collected by thousands of actors from research, governmental, and private sectors, as part of a broad, multidisciplinary spectrum of projects and programs. Sensors measuring physical, chemical, biological, geological and geophysical parameters are installed on research vessels, submarines, aircraft, and moorings, drifting buoys, gliders, floats, fixed platforms and satellites.

SeaDataNet ([www.seadatanet.org](http://www.seadatanet.org)) is a major operational infrastructure for managing, indexing and providing access to data sets and data products, acquired by European organisations from research cruises and other observational activities in European coastal marine waters, regional seas and the global ocean. Core partners are the National Oceanographic Data Centres (NODCs) and major marine research institutes in Europe. There is close cooperation with various other ocean observing communities as well as other marine data management initiatives and infrastructures. For instance, SeaDataNet actively supports the European Marine Observation and Data network ([EMODnet](http://EMODnet)).

SeaDataNet develops, governs and promotes common standards, software tools and services for marine data management, which are freely available from its portal and widely adopted and used. It is also one of the integrators in the data management strategy of AtlantOS, aiming at giving harmonised discovery and long term access to quality controlled AtlantOS observation data.

For **Early Career Scientists** the SeaDataNet portal thus offers data management practices and a wealth of marine and ocean data and information by means of a series of online services, giving overviews of marine organisations in Europe, and their engagement in marine research projects, managing large datasets, and data acquisition by research vessels and monitoring programmes for the European seas and global oceans. The [Common Data Index \(CDI\) service](#) provides online unified discovery and access to vast resources of data sets, managed by > **110 connected SeaDataNet data centres from 34 countries** around European seas. Users can search and download datasets in a harmonised way, using a shopping basket mechanism. Currently, it gives access to more than **2.1 Million data sets**, originating from more than **600** organisations in Europe, covering physical, geological, chemical, biological and geophysical data, and acquired in European waters and global oceans.

SeaDataNet is further developing its discovery, access, ingestion, publishing, and visualisation services in the EU HORIZON 2020 **SeaDataCloud** project (2016 - 2020). This aims at upgrading and expanding the SeaDataNet architecture and services, making use of cloud services, taking into account the European Open Science Cloud (EOSC) and Blue Cloud challenges. Major objectives of the project are:

- Improve discovery and access services for users and data providers
- Improve interoperability with other European and international networks to provide users overview and access to additional data sources
- Develop a Virtual Research Environment with tools for analyzing data and generating and publishing data products.

SeaDataCloud includes a strategic and technical cooperation of SeaDataNet with EUDAT, a European network of computing infrastructures that develop and operate a common framework for managing scientific data and providing an interoperable layer of common data services. EUDAT is deeply engaged in the development of EOSC.

All SeaDataNet services and information about the SeaDataCloud progress can be found at the [SeaDataNet portal](#).

**SeaDataNet** PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT

### SEADATANET COMMON DATA INDEX (CDI) V3

**TOOLS**

ENLARGE HELP  
POSITION INDEX

Datasets 0  
BASKET RESET

**LAYER CONTROL**

- Coastlines
- GEBCO Undersea Features
- Depth contours
- Geographic grid
- Mean depth
- Mean depth full
- Display all selected records
- Only selected records in results list

**LISTING RESULTS**

○ 20 ○ 100 ● 1000 records

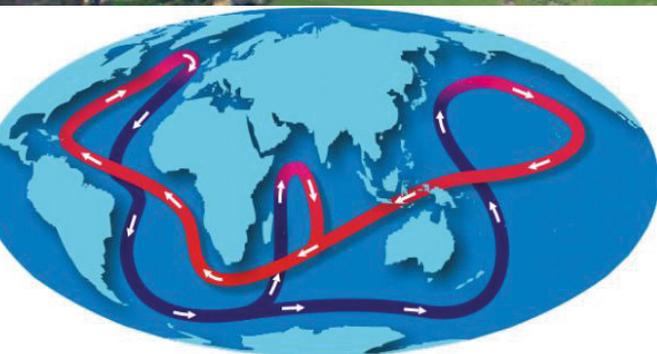
ADD TO BASKET

TIMESERIES ON SUMMARY ZOOM TO SELECTED EXPORT RESULT STORE QUERY

Refine query | New query | Found 2088567 | Show (20001-21000) | Previous 1000 | Next 1000

<input type="checkbox"/> #	Data set name	DC country	Start date	Disciplines - Topics	Instrument / gear type	Show
<input type="checkbox"/>	PF_6902669_68_A_53947901	France	20171001	Biological oceanography > Pigments Chemical oceanography > Dissolved gases Physical oceanography > Water column temperature and salinity	fluorometers, water temperature sensor, salinity sensor, dissolved gas sensors	<input checked="" type="checkbox"/>
<input type="checkbox"/>	PF_6902653_57_A_53902111	France	20171001	Physical oceanography	water temperature sensor,	<input checked="" type="checkbox"/>

CDI User Interface with selection of data points in Mediterranean Sea near Italy. Credit: SeaDataNet



## The Sea in Loiano (Italy): an elementary school course in Oceanography (Italian title: Il Mare a Loiano)

Nadia Pinardi and Claudia Romagnoli (University of Bologna, Italy)

Elena Ferretti (Istituto Comprensivo IC Loiano-Monghidoro - Primary School of Loiano, Italy)

Katia Raguzzoni (President of the Consiglio di Istituto IC, Italy) and Claudio Tamburini

### Background

A course for 3-4-5 grade primary school students was held at the elementary school of Loiano (Bologna, Italy) during three full days in March-April 2018. The main aim of the course was to give an introduction on:

1. The geological record of the sea covering Loiano 2-5 millions of years ago.
2. What is the ocean density and what are the currents that it produces.
3. What is the ocean economy.

### Section images:

*The marine sedimentary sequences at Livergnano (near Loiano): 2-5 millions ago the sea was covering the Loiano area! (Credit: Antonio J. Rodríguez Ocaña).*

*The density driven currents in the ocean: the course made a connection between the heavy and salty waters of the classroom experiment and this circulation. (Credit: National Oceanic and Atmospheric Administration).*

*The classroom experiment on the sea water density (cool, salty water sink to the bottom of the tank).*

*The teaching project mascot: a fossil skeleton of a whale was found near Loiano.*

### Part 1: The Sea in Loiano 2-5 Millions years ago

In this session, the students had the chance to handle some fossils and rocks from the Loiano area of the Bologna Apennines to get in touch with the geological history of the area including some basic concepts about geological times.

### Part 2: The seawater density and the overturning circulation in the North Atlantic

In this session, the students produced themselves cold and salty seawater to understand the concept of seawater density and its relevance for ocean current generation. Heavy ocean-like waters were produced with a combination of cold and salty waters. The ocean density differences have been correlated to large oceanic circulations.

### Part 3: The ocean economy and the jobs of the sea

The ocean is an enormous source of wealth and resources for humanity. Two main sectors of the ocean economy were illustrated: the maritime transport and the fishery.



POGO fellow students at M148 - Marco, Daniela, Odilon, Fernanda, Felipe and Ramilla (from left; credit: Mario Müller, GEOMAR).

## Scientific Capacity Building in Practice – Training and Teaching young scientists on cruise M148

Josefine Herrford, Kristin Burmeister and Jan Lüdke

(GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)

Investing in the future of young scientists - not only in their own country but worldwide - is a great idea. Grouping a variety of young oceanographers from different countries on a German research vessel in the middle of the Atlantic Ocean sounds fun and exciting - and it sure is! But how can we turn those great ideas into reality? What issues do we have to consider? Research cruise M148 (Belém, Brazil - Walvis Bay, Namibia) from May to June 2018 was a great opportunity to find out how advantageous a scientific capacity building program can be for the participants and organizers.

Firstly, it is important to clearly identify a general motivation - i.e. why should we support teaching and training of or among young scientists? We identified the following motivation:

*To support knowledge transfer for the operation and use of ocean observing platforms, data exploration, data archiving or the use of ocean observing downstream services, all with the aim of overcoming geographical, economic or political limitations, as well as to enhance international collaboration and*

*foster the exchange between early career scientists around the world.*

For decades, the GEOMAR Helmholtz Centre for Ocean Research in Kiel has supported capacity strengthening, e.g. through training and teaching at sea. GEOMAR has a large-scale sea-going infrastructure that allows it to organize and carry out multiple research cruises per year - usually covering comprehensive, interdisciplinary working programs that are part of larger international and national cooperative projects. Combining foci of the BMBF (Federal Ministry of Education and Research) collaborative projects, “Southwest African Coastal Upwelling System and Benguela Niños II (SACUS)” and “Regional Atlantic Circulation and Global Change (RACE II)”, the main goals during research cruise M148 were the quantification of the strength of the Atlantic meridional overturning circulation in the tropical South Atlantic, and the investigation of the eastern boundary circulation and upwelling off Angola.

Such cruises are always a great opportunity for young scientists and students to learn about in-situ

ocean observations as well as the use of cutting-edge research technology. Realising this opportunity, we (Dr. M. Dengler, the chief scientist of M148 and 3 highly motivated doctoral researchers - J. Herrford, K. Burmeister, J. Lüdke) developed an on-board training program and sent out a call for this program.

In winter 2017, we advertised the available berths on board via the AtlantOS project network. Surprisingly, within weeks our post went viral via social media and resulted in over 120 applications from students, technicians and young scientists from all over the world with hugely varied backgrounds - most of the applicants being students of marine sciences, while others were just people with a strong interest in the oceans. After carefully reviewing all the interesting applications, we finally selected six young scientists (Ramilla Vieira Assunção, Odilon Joel Houndegnonto, Fernanda Di Alzira Oliveira Matos, Marco Sandoval Belmar, Daniela Belen Risaro, and Felipe Ohade Lopes Branco) from Latin America and Africa in their Bachelors, Masters or early doctoral studies, as well as three scientists and technicians from our Angolan cooperation partner INIP (Instituto Nacional de Investigação Pesqueira). After recruiting our fellows, the next challenge was to find financial support for their access and return travels. Fortunately, the Nippon Foundation (NF) and Partnership for Observation of the Global Oceans (POGO) agreed to provide fellowships for the students. In addition, the NF-POGO capacity-building program went beyond our expectations in offering to fund a one-month stay at GEOMAR after cruise completion, enabling the trainees to further develop the skills learned at sea. Four of the six recruited fellows gladly accepted this opportunity to extend their training.

Finally, in May 2018 twenty scientists, technicians and students from Germany, Columbia, Spain and Angola, one Brazilian observer and six curious POGO fellows from Brazil, Argentina, Chile and Benin, embarked the German research vessel Meteor to spend the next 5 weeks together.

The scientific program during cruise M148 comprised measurements along a deep cross-Atlantic transect at 11.5°S to determine changes in the water masses and estimate the strength of the Atlantic meridional overturning circulation, investigations of the variability of eastern boundary current transports and of the advection of anomalous water masses along the eastern boundary in conjunction with coastal wave propagation, as well as a 4-day process study using moored and autonomous devices to elucidate the mechanism sustaining upwelling off Angola during the austral winter season.

All of the cruise participants were integrated into the working program by working in the on-board watch system (4h on, 8h off), which allowed measurements to be conducted 24 hours a day. While on watch, we trained the fellows in deployment and measurement techniques for the different instrumentation, sea water sampling, and sea water analyzing methods such as salinometers and Winkler titration. During the off watch period, training included analyzing the collected data as well as actively participating in seminar talks and lectures. We were surprised and impressed by the persistent curiosity of all the young scientists - even during somewhat monotonous tasks in long night shifts - and the overall mutual support among them despite cultural and language barriers. During cruise M148 the atmosphere onboard was exceptionally relaxed and pleasant - firstly, because of this diverse group of wonderful young researchers, but also thanks to the very friendly, open-minded and patient crew of METEOR.

After the cruise, four of our POGO fellows came with us back to Kiel to spend a month at GEOMAR. During this period, they were able to personally benefit from the exchange by using cruise data in individual research projects related to their doctoral or master's projects. They also used the opportunity to talk to several scientists at GEOMAR, visit our technical center or to go for short trips within the EU.



M148 participants (Credit: Henry Schabeck, FS Meteor).

To sum up, organizing the training program prior to the cruise took us more time than we expected. However, looking at the results we gained from this cruise - e.g. knowledge transfer, new ideas or ways to do things, future collaborations, a [film](#) about the (POGO) fellow students, and not just new data - it is absolutely worth supporting teaching and training possibilities for young scientists at sea.

We hope that all participants enjoyed this experience as much as we did, and that we will all meet again somewhere somehow!



Break-out session chairs (Anja Reitz and Dina Eparkhina and some speakers: Michele Barbier, Glenn Nolan and Sandra Ketelhake) (Credit: Dina Eparkhina, EuroGOOS).

## Ocean Observing showcases at #EGW2018

### EuroGEOSS workshop 2018, 12 – 14 September 2018, Geneva, Switzerland

Anja Reitz and Sandra Ketelhake (GEOMAR Helmholtz Centre Kiel, Germany)

Dina Eparkhina (EuroGOOS, Belgium)



Gilberto Camara talking about the GEO perspective to SDGs (Credit: Dina Eparkhina, EuroGOOS).

The H2020 project AtlantOS and the European Global Ocean Observing System (EuroGOOS) conducted a break-out session on Monitoring for FAIR data principles – how could European expertise foster the implementation of SDG 14 objectives? (13 September 2018).

The breakout session discussed how ocean observing experts can link their knowledge, data, and best practices with the Sustainable Development Goals (SDGs), particularly with the SDG 14 targets and indicators. With support from UN Environment, an international team of semantic technology experts has developed a FAIR-compliant knowledge representation resource (an ontology) for the SDG process. Ontologies express, integrate, harmonise, and expose human knowledge on the web, allowing computers a means to ‘understand’ what in situ and remote data and information holdings are about. Furthermore, the session discussed how the European initiatives and projects as well as GEO link with the SDG targets and how the work carried out

is implementing ethics in marine research and data management.

Speakers:

### **Best Practices in Ocean Observing**

Anja Reitz, GEOMAR, Germany (Intro)  
Pier Luigi Buttigieg, AWI, Germany

### **GEOs perspective to the 2030 agenda**

Gilberto Camâra, GEO Secretariat, Switzerland

### **EuroGOOS contribution to data needs**

Glenn Nolan, EuroGOOS, Belgium

### **INTAROS contribution to observation and data sharing**

Stein Sandven, NERSC, Norway

### **Ethics in Ocean Observing**

Michele Barbier, Institute for Science and Ethics, France

### **Briefing on UN Ocean Decade (preparation)**

Dina Eparkhina, EuroGOOS, Belgium

#### **(Panel moderation)**

Ghada El Serafy, Deltares, The Netherlands

Conclusions and recommendations to EuroGEOSS:

- Recognize achieving SDGs requires sustained and comprehensive Earth observation systems incl. both in situ and remote sensing systems
- Policy users will use the EO-generated knowledge only if it considers multidisciplinary stakeholder perspectives
- User-centric approach is welcome
- Promote multidisciplinary methodologies
- Help integrate open data, promote standards and interoperability
- Help transparency, communication and common terminology
- Leverage best practices
- Apply ethics values in data acquisition and management
- Help ensuring SDG interface ontology and FAIR principles are shaped and applied to European data systems
- Help make the connection between European policies and larger initiatives including the essential climate and ocean variables and the SDGs

Furthermore, AtlantOS organised a hands-on session on AtlantOS applications (13 September 2018). The hands-on session illustrated how ocean observing applications produced within the project have



*Pier Luigi Buttigieg (AWI, Germany) explaining the best practices achieve to better link the ocean observing activities to the SDG process (Credit: Dina Eparkhina, EuroGOOS).*

fostered the optimisation and enhancement of the Atlantic Ocean Observing System to gain integrated, international, efficient, sustainable, and fit-for-purpose information products and services.

Speakers:

### **AtlantOS monitoring tools**

Glenn Nolan, EuroGOOS, Belgium

### **Best Practices repository for Ocean Observing**

Pier Luigi Buttigieg, AWI, Germany

### **Adequacy of Atlantic Ocean Observing**

Sandra Ketelhake, GEOMAR, Germany

Conclusions and recommendations to EuroGEOSS:

- The mapping tool provides the up-to-date view of the observing system to the various stakeholders and is accordingly designed to provide a view to the inside ocean observing activities
- Best practices should consider all issues related to ocean observing (costs, feasibility, process for evolution)
- The ontologies/vocabulary relevant to ocean observing and SDGs is the background of the repository it will compare the best practices documents and tag them accordingly. In that respect, it will foster to bring together different communities to enhance and optimise integrated Ocean Observing.
- The adequacy assessment will support the coordination within and between countries, the assessment of EOVs, data management, ocean observing activities, and information product deliveries. Furthermore, it will foster coordinated resource mobilisation and capacity building as well as common future perspectives and plans.

All presentations will be made available on the [EuroGEOSS website](#).

# A morning in the Parliament

Marilena Oltmanns (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)

When I first got the telephone call and was asked to participate in a policy briefing in the European Parliament, I did not have any concrete idea what that was, but presenting my research in the Parliament sounded super exciting, so of course I said yes.

Having conveyed complex science matter to non-scientific audiences before, I was experienced in making it accessible. Yet, discussing the implications with policymakers seemed like a big responsibility, and I was nervous about the consequences of potential misunderstandings - or maybe just that I would not fully exploit this chance to get important messages across.

The policy brief, compiled with other participants in the Blue Action and AtlantOS project prior to the event, turned out to be very helpful as a guide for organizing our presentations. In this document, we listed key, new findings and what they implied. After delving so deeply in these and related climate topics, I felt comfortable talking about them, including the broader picture, and I was pleased to have this opportunity in the Parliament.

The event was a success! Many policymakers and stakeholders were interested and from their questions I could tell that they listened very attentively. Initially, I had thought that part of our task was to give them a better understanding of the importance of ocean research, but they already were convinced and, in the end, even asked us what they could do to help. I had



*Marilena Oltmanns talking about 'What to expect from the future?' at Science-Policy Briefing 'The Slowing Gulf Stream? What we know and potential impacts' in the European Parliament in Brussels (Credit: Bruno Castanho Valerio).*

not anticipated them to be so open for suggestions.

Besides, being in the Parliament was an experience in itself. Seeing the building from the outside and inside, the numerous announcements of meetings and discussions on many different issues, all within one week, the people, activity and liveliness, and the huge plenary assembly room with the flags was impressive!

Certainly, I learned as much about policy making as the policymakers learned about the ocean.

# AtlantOS represented at the Belém All-Atlantic Research Forum

Sheila Heymans (European Marine Board, Belgium)

Isabel Sousa Pinto (CIIMAR and University of Porto, Portugal)

Sabrina Speich (Ecole Normale Supérieure, Paris, France)

The Belém All-Atlantic Research Forum took place in Salvador (Brazil) from the 23 to 24th of July 2018. The objective of this meeting was to advance in the implementation of the “Belém Statement”, continuing the progress made since its signing in July 2017, in Lisbon (Portugal) and strengthening the successful partnership with the European Commission (DG- RTD) and the Department of Science and Technology of Brazil and South Africa.



Participants of the Belém All-Atlantic Research Forum (Credit: Ministério da Ciência, Tecnologia, Inovações e Comunicações, Brazil).

Just before the formal start of the Forum, on July 22nd afternoon, two more informal meetings took place: The South-South dialogue organized by Brazil and South Africa to extend the cooperation to other countries of the South Atlantic. To be noted the official participation of the delegation of the Ministers of Science and Technology from Argentina and Uruguay; In parallel, the European groups gathered together to discuss the status of the implementation of the Belém Statement and its way forward.

The Forum was officially opened on July 23rd by the local authorities and the main representatives from EU John Bell, the European Commission DG RTD Director of Bioeconomy, Thomas Auf der Heyde, Department of Science and Technology of South Africa and Andrei Polejack Ministry of Science, Technology, Innovation and Communications of Brazil and focussed on four main sessions:

1. Demonstrating the **scope of the Belém Partnership** with an overview of existing and planned research and innovation activities: This session included discussions on the new AIR Center in Portugal by Antonio Sarmiento and on the EU Earth Observation and Monitoring Programme by Fabrice Hernandez from Mecator Ocean. The session ended with a round table discussion which included **Sigi Gruber** from DG RTD on the European Commission’s support from Horizon 2020.
2. Demonstrating the socioeconomic and political **need for the Belém Partnership**: This session included the presentation by **Sabrina Speich** on the AtlantOS project, and **Isabel Sousa Pinto** on Food from the Atlantic Ocean and ended with another round table discussion which included Gilles Lericolais from IFREMER.
3. **Building the Belém Partnership** including the interventions, priorities and needs: This session included the possible future projects under the Horizon 2020 All Atlantic Research Alliance Flagship that passed the phase 1 evaluation for last year BG08 call.
4. **Supporting the Belém Partnership** through dialogue with funders, marine institutes and networks: this session included presentations from **Sheila Heymans** from the European Marine Board, **Isabel Sousa Pinto** from Euromarine and **John Hanus** and Anders Brudevoll from JPI Oceans.

The Forum was concluded with remarks from John Bell, Thomas Auf der Heyde and Andrei Polejack.

Many participants had the opportunity to visit the TAMAR project ([www.tamar.org.br](http://www.tamar.org.br)), a 35-year initiative to protect the turtles that nest or live in Brazilian waters – a local example of conservation involving the local population, specially the fisherman also providing education, and promoting ocean literacy.

The next meeting will probably take place next summer in Brussels.

# AtlantOS heads to Toulouse for the 4th GEO Blue Planet Symposium

Kate Larkin (European Marine Board, Belgium)

Gianandrea Mannarini (Euro-Mediterranean Center on Climate Change, Italy)

Patrick Lehodey (Collecte Localisation Satellites, France)

On 4-6 July 2018 over 100 international experts in ocean observation and monitoring gathered at the 4th GEO Blue Planet Symposium in Toulouse, hub of European Earth observation and European city of science (ESOF) 2018. The event brought together marine observation, data and modelling specialists, European and Regional projects, meteorological institutes, blue growth industries, science managers and policy makers for an interactive dialogue on ocean observation current status and future trends.

**Gilles Ollier**, Head of the European Commissions DG Research and Innovation Earth Observation Unit, presented Europe's contribution to earth and ocean observation research and innovation, highlighting the **H2020 AtlantOS** project as a key project for strengthening Atlantic ocean observing and trans-Atlantic collaboration. The **H2020 AtlantOS** project was well represented with a number of oral and poster presentations, in addition to panel discussions with topics ranging from the role of coastal and ocean information for the sustainable management of our oceans and seas, including marine biodiversity, to existing gaps and emerging areas in ocean observation and applications for blue growth.

**Pierre-Yves Le Traon** (Mercator Ocean, Ifremer; AtlantOS WP9, Executive Board) presented the latest developments of the Copernicus Marine Environment Monitoring Service (CMEMS) whilst **Glenn Nolan** (EuroGOOS; AtlantOS WP1,9) presented the upcoming GOOS Strategy 2020-2030 noting this would further connect to user needs since there are sustainability issues with most of the existing global ocean observing platforms and data collection, despite their clear value and use cases. **Kate Larkin** (EMB; AtlantOS WP10, Executive Board) then presented European community efforts led by EuroGOOS, EMB and other stakeholders to develop a framework to connect Europe's diverse capability in ocean observation to deliver European leadership in science, technology and innovation in ocean observation.

In discussing blue growth, **Pierre Bahurel** (Director of Mercator Ocean) urged participants to think outside of the oceanography 'bubble' and continue to

innovate services for, and with, industry. It was also noted that innovation in Ocean observation needs partnerships but also maintaining and developing a skilled workforce. This was further emphasized by the number of early career scientists and wider professionals attending from Europe and beyond e.g. South Africa and U.S.A. Bahurel also noted that it is both possible to create and destroy added value of scientific datasets, e.g. misuse of satellite data for very local applications would easily destroy its original value and credibility!

**Yves Tourre** (Columbia University) gave an inspirational keynote for the session on "Ocean and Coastal Information in Support of Blue Growth". He noted that in the 1980s people would laugh when the two words operational and oceanography were spoken altogether. Thus, he encouraged groundbreaking applications, even when they are not yet mature for the market. In fact, people would anyhow start using the prototypes, triggering further improvements through their feedbacks.

**Isabel Sousa-Pinto** (CIIMAR; AtlantOS WP1 and 6, Executive Board) spoke about international and European biological ocean observation initiatives including GEOBON and MBON and a recent EMB paper on Strengthening Europe's capability in biological ocean observation. She noted the value of long-term biological ocean observations to track and understand marine biodiversity and ecosystem functioning.

**Patrick Lehodey** (CLS; AtlantOS WP5 and WP8) presented an operational demonstration of real-time and forecast modelling of Atlantic albacore tuna. He noted that data bottlenecks remain, particularly for low-mid trophic levels including zooplankton and micronekton that are the prey of tuna and all other large marine species. Ocean low and mid-trophic functional groups are part of his model. Its validation requires a large sampling network of standardised bioacoustic data. His talk was related to a wider AtlantOS Work Package 8 poster presentation led by **Gianandrea Mannarini** (CMCC; AtlantOS WP8) including case studies on ship routing and oil spill hazard maps.



Gilles Ollier, Head of the European Commissions DG Research and Innovation Earth Observation Unit, at the 4th GEO Blue Planet Symposium (Credit: Symposium photographer).



AtlantOS partners co-presenting the European Ocean Observing System (EOOS) at the 4th GEO Blue Planet Symposium. From left to right: Jan-Bart Calewaert (EMODnet, Seascope Consultants), Kate Larkin (EMB), Isabel Sousa-Pinto (CIIMAR, Portugal), Glenn Nolan (EuroGOOS), Vicente Fernandez (EuroGOOS) (Credit: Symposium photographer).

**Jan-Bart Calewaert** (Seascope Belgium administering the EMODnet Secretariat, AtlantOS WP10), presented a poster on EMODnet’s free and open data services. The participation fits in EMODnet’s internationalization strategy to make EMODnet more visible and used by stakeholders and users beyond Europe.

The final afternoon was open to the public and focused on outreach and engagement. This included presentations on the opportunity and value of Citizen Science, including U.S. and European coordination activities for creating scientific robustness and standards for engaging the public in ocean observation and wider marine science.

# European Strategy for Atlantic Ocean Observing

Erik Buch (EuroGOOS, Belgium)

Kate Larkin (European Marine Board, Belgium),

Sandra Ketelhake (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany)

Michael Ott (Intergovernmental Oceanographic Commission – UNESCO, France)

Over the past couple of years, a group of ocean observing experts from countries surrounding the Atlantic Ocean has worked on formulating a [BluePrint](#) for an advanced, international elaborated framework for the formation of an integrated Atlantic Ocean Observing System that goes beyond the state-of-the-art and leaves a legacy of sustainability. The BluePrint will lay out the principles and plans for sustained ocean observations in the North and South Atlantic. An interesting and relevant question in this context is:

## “How can and will Europe contribute to such an integrated system?”

Addressing this important question overlaps partly with AtlantOS activities planned for Work Package 9 (Task 9.2 ‘Adequacy of ocean information for stakeholders and EOVS’ and 9.3 ‘Sustainability issues and long term national, EU and non EU Atlantic partner plans’). It is also relevant to Work Package 10 (Task 10.6 ‘Integrated Atlantic Ocean Observing System in the Context of a European Ocean Observing System’) which is assessing the links between coordination efforts in the Atlantic and the developing European Ocean Observing System (EOOS).

Therefore, at the 3rd AtlantOS General Assembly in Las Palmas on Gran Canaria in November 2017 the AtlantOS community decided to initiate a process of drafting a European Strategy for Atlantic Ocean Observing - a forward-looking document that defines a vision for 2020 and 2030. The added value of this strategy to the BluePrint is that regional examples will demonstrate the current European capabilities as well as the potential of ocean observing in the Atlantic Ocean. It showcases, which products and services the European community needs, at what stage the European governance structure is, and where the ocean observing community wants to be at 2030.

The first step in this process was to organize and conduct a workshop for invited experts, which took place in Brussels (4-5 June 2018) with 25 participants.



*Participants of the ‘A European Strategy for an Atlantic Ocean Observing System’ workshop (Credit: Kate Larkin).*

During the workshop, three main subjects were discussed:

- Requirements setting to meet the user needs / Ocean Observation Networks
- Data Infrastructure and New Technologies
- Capacity Building / Resource Mobilization

Throughout the workshop, participants were also encouraged to consider existing and new, innovative, partnerships and coordination activities that could help achieve progress in these areas and drive greater sustainability in the future Atlantic Ocean Observing System.

At the end of the workshop, the participants agreed on a list of contents for the strategy document and authors were appointed to the different chapters. By early September, a first draft will be ready and circulated within the workshop group and later on within the wider AtlantOS community. The goal is to publish a final version by late December 2018.

# Upcoming Events

## October / November

- GEO Plenary Week 2018 Kyoto, 29 October – 2 November 2018
- EOOS Conference “Evolving EOOS: Connecting communities for end-to-end solutions” (21 – 23 November 2018, Brussels, Belgium)
- Our Atlantic Ocean for Growth and Well-Being, (21-22 Nov 2018 November 2018, Mindelo, Cabo Verde)
- MICRO2018 Conference (9 - 23 November 2018, Lanzarote, Canary Islands, Spain)

## March 2019

- 4th AtlantOS General Assembly (26 – 28 March 2019, Paris, France)



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