

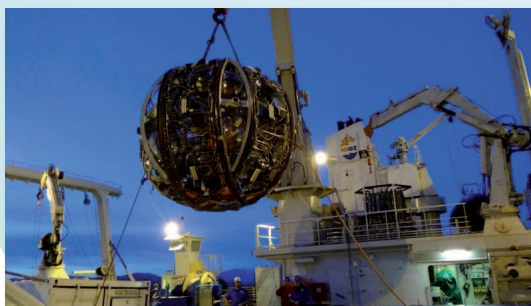
News from the POGO members

Neutrino telescope KM3NeT in Mediterranean Sea receives a 12.7 Million Euro Dutch grant



The KM3NeT optical module is a pressure resistant glass sphere housing 31 photosensors that will detect the faint flashes of light originating from interactions of neutrinos in the abyss of the Mediterranean. The full infrastructure will house about 6000 of these modules. The optical module is a Dutch design. Photo Credit: KM3NeT.

Furthermore, KM3NeT facilitates sea research and marine biology through temperature sensors and hydrophones which will be installed alongside the light sensitive detector units. Hans van Haren, sea researcher at NIOZ, appreciates these opportunities: "KM3NeT offers to build a unique 3D network of 3000 high-resolution temperature sensors in a



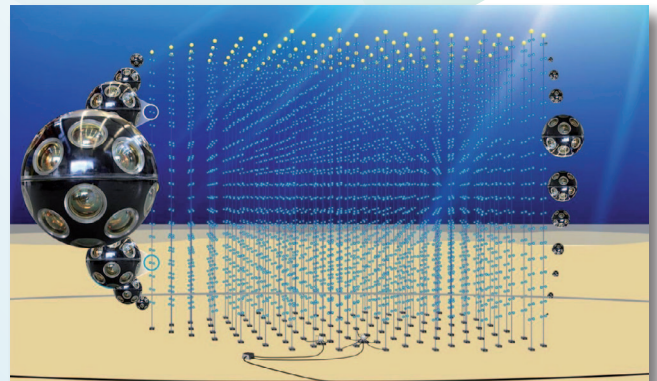
The KM3NeT strings are deployed using a launcher vehicle, developed by NIOZ. The picture shows the launcher vehicle, equipped with a detection line, being loaded on the *RV Pelagia*. The launcher is lowered to the seabed. On release, the launcher rises to the surface, unfurling the detection string like an inverted yoyo. Photo Credit: KM3NeT.

cubic hectometer of deep-sea to study essentially three-dimensional phenomena of internal wave turbulent mixing. This will enable new studies on the transport of matter, which has thus far only been done with measurements in one direction."

KM3NeT is an international collaboration of 51 institutes and universities from 15 countries. The Dutch research vessel *Pelagia* will be used to deploy the telescope in the sea. The sites in Toulon and Sicily are expected to be both fully deployed and operational in five years' time.

The Dutch contribution to the neutrino telescope KM3NeT has received an investment grant of 12.7 Million Euro, from the Netherlands Organisation for Scientific Research (NWO) in the context of its "National Roadmap for Large-scale Research Infrastructure". KM3NeT is going to perform research into the fundamental properties of neutrinos and the astrophysical sources of cosmic neutrinos, and it will facilitate sea research and marine biology. The neutrino telescope will be placed deep in the Mediterranean Sea, the planned installation sites are off the shore near Toulon (France) and Sicily (Italy).

Nikhef researcher Aart Heijboer, deputy spokesperson of KM3NeT, illustrates the opportunities for neutrino physics and neutrino astronomy: "Neutrinos are ghostly elementary particles that are produced in some of the most spectacular astrophysical regions, such as the centers of galaxies that house massive black holes. With KM3NeT, we will detect these neutrinos and pinpoint their sources, opening up a completely new way to study the Universe. Moreover, we can unravel the fundamental particle physics of neutrinos, which is important for understanding the evolution of the Universe."



Artist's impression of the KM3NeT neutrino detection array. The infrastructure comprises two arrays, ARCA and ORCA that will be placed on the bottom of the Mediterranean Sea at a depth of 3.5 km and 2.5 km, respectively. Both ARCA and ORCA consist of vertical strings, each of which is comprised of 18 optical modules. Each optical module consists of a pressure resistant glass sphere housing 31 small photo-multiplier tubes (yellowish disk in the picture) that detect the patterns of Cherenkov light created by the interactions of neutrinos (earlier detectors used one large sensor per sphere).

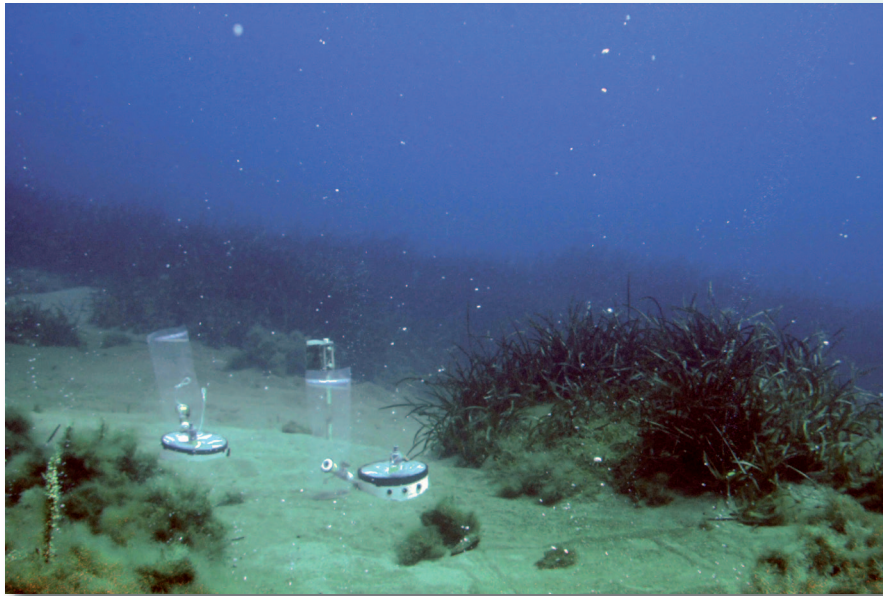
Photo Credit: KM3NeT.

News from the POGO members (cont'd)

Influence of increasing carbon dioxide levels on the seabed

New study of an international group of researchers reveals how leaking CO₂ affects the seabed habitat and its inhabitants

Storing carbon dioxide (CO₂) deep below the seabed is one way to counteract the increasing concentration of CO₂ in the atmosphere. But what happens if such storage sites begin to leak and CO₂ escapes through the seafloor? Answers to this question have now been provided by a study dealing with the effects of CO₂ emissions on the inhabitants of sandy seabed areas.



Natural CO₂-venting sites off the coast of Panarea, Italy.
Photo credit: HYDRA/C. Lott.

Day-in, day-out, we release nearly 100 million tons of carbon dioxide (CO₂) into the atmosphere. One possible measure against steadily increasing greenhouse gases is known as CCS (carbon capture and storage), whereby the carbon dioxide is captured, preferably directly at the power plant, and subsequently stored deep in the ground or beneath the seabed. However, this method poses the risk of reservoirs leaking and allowing carbon dioxide to escape from the ground into the environment.

The European research project ECO₂, coordinated at GEOMAR Helmholtz Centre for Ocean Research Kiel, addresses the question of how marine ecosystems react to such CO₂-leaks.

The field study of an international group of researchers headed by Massimiliano Molari from the HGF-MPG Joint Research Group for Deep-sea Ecology and Technology and Katja Guilini from the University of Ghent in Belgium, now published in Science Advances, reveals how leaking CO₂ affects the seabed habitat and its inhabitants.

For their study, the researchers visited natural leaks of CO₂ in the sandy seabed off the coast of Sicily. They compared the local ecosystem with locations without CO₂-venting. In addition, they exchanged sand between sites with and without CO₂-venting in order to study how the bottom-dwellers respond and if they can adapt. Their conclusion was that increased CO₂ levels drastically alter the ecosystem. "Most of the animals inhabiting the site disappeared due to the effect of the leaking CO₂", Massimiliano Molari reports. "The functioning of the ecosystem was also disrupted – and, what's more, long-term. Even a year after the CO₂-vented sediment had been transported to undisturbed sites, its typical sandy sediment community had not established."

For the first time, this current study delivers a "holistic" view of the effects of increasing CO₂ concentrations on the seafloor. It considers both biological and biogeochemical processes and different levels of the food chain, from microbes to large invertebrate animals.

CCS facilities are already in operation, for example off the Norwegian coast. Within the European Union, CCS is considered a key technology for reducing greenhouse gas emissions. "Our results clearly reveal that the site selection and planning of carbon storage systems beneath the seabed also demand a detailed study of the inhabitants and their ecosystem in order to minimize harm," emphasizes principal investigator Antje Boetius. "Having said that, global marine protection also includes taking measures against the still high CO₂-emissions.

This article was provided by Sebastian Grote, press officer, Alfred Wegener Institute (AWI).

News from the POGO members (cont'd)

Warm North Atlantic summers could weaken ocean circulation

Deep convection driven by temperature and salinity of seawater is a key process for the global ocean circulation. It occurs only in a few regions around the globe, including the Irminger Sea and the Labrador Sea near Greenland. Model calculations predict a possible weakening if additional freshwater, for example from melting glaciers, enters the system. But so far this could not be confirmed by direct observations.

In a study recently published in *Nature Climate Change*, scientists from the GEOMAR Helmholtz Centre for Ocean Research Kiel have now shown that freshwater has already impacted convection in the last decade. The study is based on the analysis of long-term data obtained from moored observatories and from oceanographic floats. In addition, satellite observations of the ocean surface and atmospheric data were included.



Deployment of an oceanographic mooring during the expedition MSM54 with *RV MARIA S. MERIAN* into the Labrador and Irminger Sea. These moorings are used for the long-term observation of ocean circulation.
Photo credit: Arne Bendinger/ GEOMAR

"For various periods over the last 60 years, we have been able to combine important processes: atmospheric variability, such as the NAO, water and air temperatures, the occurrence of fresh surface water, and the duration of convection," explains lead-author Dr. Marilena Oltmanns from GEOMAR.

The evaluation of the data shows a clear correlation between the SST in the Irminger Sea in summer, the amount of surface freshwater and the atmospheric conditions and onset of convection in the following winter. "In case that warm summers with increased surface freshwater occur within extended warm periods, the ocean loses less heat in the following winter. As a result, the fresh surface layer that formed in summer remains stable for a longer time resulting in a delayed onset of convection", says Dr. Oltmanns.

Typically, freshwater is mixed down by convection each winter. If convection sets in later, a higher proportion of freshwater remains near the surface and combines with freshwater from the following spring. This effect could add up in future warm periods.

References:

<http://dx.doi.org/10.1038/s41558-018-0105-1>

<https://www.geomar.de/en/news/article/ozeanzirkulation-im-winter-durch-warme-sommer-beeinflusst/>

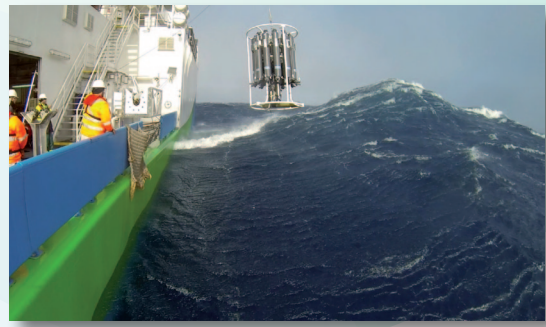
This article was provided by Jan Steffen, Communication and Media, GEOMAR Helmholtz Centre for Ocean Research Kiel.

Study reveals likely stability of ocean processes despite climate change

The ocean is a major influence on the world's climate and a critical component of modelling to predict future climate change, but the complexity of ocean biochemical processes makes it difficult to accurately simulate in models how the ocean absorbs CO₂ from the atmosphere, and how it stores this carbon as global conditions change.

A new study, led by IMAS researcher Pearse Buchanan, integrated new, dynamic ways of representing marine ecosystem processes in ocean models.

These more realistic representations showed that the ocean is more resilient to climate change than simpler models had suggested, taking up and storing carbon at similar rates regardless of global changes in physical properties, like temperature, salinity and circulation.



Australian Marine National Facility research vessel Investigator taking samples in the Southern Ocean.
Photo credit: Pete Harmsen.

Mr Buchanan said the amount of carbon stored in the ocean was half as sensitive to large physical changes as before, when using the simplistic equations.

"Due to its large volume and surface area, the biogeochemical processes in the ocean are the main control on the levels of CO₂ and other greenhouse gases in the atmosphere," Mr Buchanan said.

"By improving how we simulate the biological pump in the ocean, we both improve the model and reveal this unexpected resilience, whereby global-scale changes to the physical properties of the ocean have a smaller effect on the biological pump.

"The added resilience of the biological pump allows the ocean to remain a strong sink of atmospheric CO₂ despite warming and increasing upper ocean stratification.

"While we did not consider pH changes, we have shown that the strength of the ocean's biological pump is probably more robust to physical changes than previously understood," Mr Buchanan said.

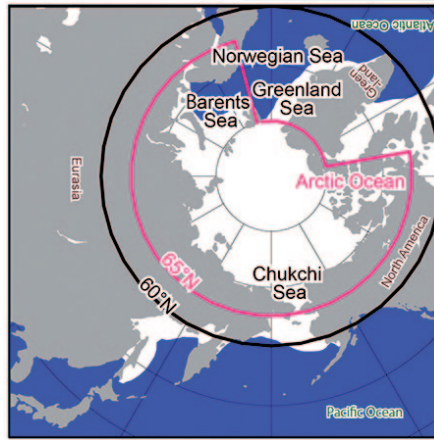
This article was provided by Andrew Rhodes, Communications Manager, Institute for Marine and Antarctic Studies, (IMAS).

News from the POGO members (cont'd)

Arctic Sea CO₂ Uptake Accounts for 10% of Total in World's Oceans

A new study successfully quantified the air-sea CO₂ fluxes in the Arctic Ocean and its adjacent seas. As a result, CO₂ uptake in the Arctic Ocean is estimated to be 10% of the total in the entire ocean, while the Arctic Ocean accounts for only 3% of the world's ocean surface area. This study project was led by Dr. Sayaka Yasunaka from the Institute of Arctic Climate and Environment Research (IACE) at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in collaboration with an international team of scientists including Meteorological Research Institute of Japan Meteorological Agency, and the U.S. National Oceanic and Atmospheric Administration (NOAA).

So far, spatial and temporal distributions of CO₂ flux in the Arctic Ocean and its adjacent seas have not been well understood, due to insufficient data coverage in the heterogeneous area.



Map of the Arctic Ocean and its adjacent seas. An area for the mapping is north of 60°N. The Arctic Ocean is defined as a region enclosed by a magenta line. White area shows the 18-year annual mean sea ice concentration of 15% or more. Photo credit: JAMSTEC.

To address this issue, scientists applied a self-organising map technique, which is a kind of neural network, to estimate monthly air-sea CO₂ fluxes in the Arctic Ocean and its adjacent seas for the 18 years from January 1997 to December 2014.

These results revealed that annual Arctic Ocean CO₂ uptake is 180±130 TgC (1 TgC = 10¹² g of carbon = 1 million tons of carbon). In addition, their successful quantification of air-sea CO₂ flux in the area also found large spatial and temporal variability.

Accurate estimation of the global CO₂ budgets is indispensable for prediction of global warming. These study results will not only contribute to it but also provide a clue to understand ocean acidification resulted from CO₂ dissolved in the ocean, which has been giving serious impacts on the Arctic Ocean.

The above results have been published in *Biogeosciences* on March 22, 2018 (JST).

<https://www.biogeosciences.net/15/1643/2018>

This article was provided by Jin Tachihara, International Affairs Division, JAMSTEC.

Study reveals new Antarctic process contributing to sea level rise and climate change

A new IMAS-led study has revealed a previously undocumented process whereby melting glacial ice sheets change the ocean in a way that further accelerates the rate of ice melt and sea level rise.

Led by PhD student Alessandro Silvano, and published in *Science Advances*, the research found that glacial meltwater makes the ocean's surface layer less salty and more buoyant, preventing deep mixing in winter and allowing warm water at depth to retain its heat and further melt glaciers from below.

"This process is similar to what happens when you put oil and water in a container, with the oil floating on top because it's lighter and less dense," Mr Silvano said.

"The same happens near Antarctica with fresh glacial meltwater, which stays above the warmer and saltier ocean water, insulating the warm water from the cold Antarctic atmosphere and allowing it to cause further glacial melting.

"We found that in this way increased glacial meltwater can cause a positive feedback, driving further melt of ice shelves and hence an increase in sea level rise."

The study found that fresh meltwater also reduces the formation and sinking of dense water in some regions around Antarctica, slowing ocean circulation which takes up and stores heat and carbon dioxide.

"The cold glacial meltwaters flowing from the Antarctic cause a slowing of the currents which enable the ocean to draw down carbon dioxide and heat from the atmosphere.

"In combination, the two processes we identified feed off each other to further accelerate climate change."

Mr Silvano said a similar mechanism has been proposed to explain rapid sea level rise of up to five metres per century at the end of the last glacial period around 15 000 years ago.



Mertz Glacier, January 2017. Photo credit: Alessandro Silvano.

This article was provided by Andrew Rhodes, Communications Manager, Institute for Marine and Antarctic Studies, (IMAS).

News from the POGO members (cont'd)

Current fishery targets may become unachievable as the planet warms



Climate change is driving down fish size.
Photo credit: Lance Anderson/ Unsplash.

A new study, led by Plymouth Marine Laboratory (PML), has found that the proportion of large fish in the North Sea may decrease as climate change unfolds, by as much as 60% in some areas. The effects of warmer waters and ocean acidification may mean proposed fisheries management targets based on fish size could be unachievable if the effects of environmental change on fish size are not considered.

Using state-of-the-art modelling and comparison with real-life surveys, the researchers demonstrated they can simulate how fish size is changing in our marine environment, under the pressures of fishing and environmental factors. This form of modelling, combining important indicators and environmental

change, can help with sustainable exploitation of fished stocks by helping policy makers consider how wild populations are impacted by changing, warmer and more acidic oceans into the future.

Indicators based on fish size are widely used in the study and management of wild populations exploited by commercial fishing. The Large Fish Indicator (LFI) is one such example, determining the biomass of fish above a certain size in a community, and used to inform policy and guide the fishing industry.

While widely used, however, these types of indicators have not previously been used alongside predictions of future conditions in line with expected climate change. Fish size closely reflects the environment, and a warming world will change the conditions in which fish live. It has been suggested that rising water temperatures in the North Sea, for example, are driving down fish size in key species. By modelling North Sea fish populations alongside predicted climate change scenarios for LFI, scientists have shown how climate change may affect fish communities, and what it may mean for fisheries.

Lead author Dr Ana Queiros, of PML's Marine Ecology and Biodiversity group, said: "In UK and European waters, as in many other regions of the world, fish populations are responding very clearly to warmer ocean conditions, exhibiting smaller individual sizes alongside other more complex evolutionary processes. Models, such as the ones we produced, can be used to explore how environmental impacts on fish size can be taken into account within policy target setting into the future. Without this consideration, these targets may be unachievable and place undue pressure on livelihoods depending on fishing."

This article was provided by Nik Hubbard, Communications Officer, PML.

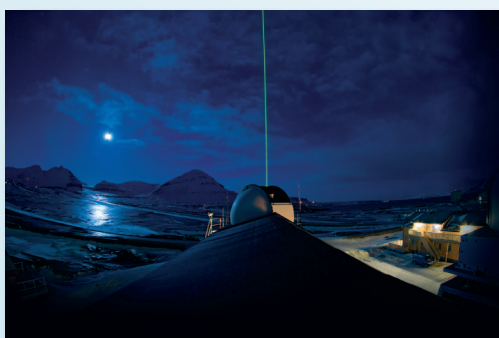
AWI publishes magazine on climate research in the Arctic and Antarctic

87 pages of reliable information on our planet's hotspots

It was with the goal of 'Making climate research accessible' in mind that the Alfred Wegener Institute released the magazine "Tracking Changes". Through articles, interviews and infographics, readers will come to realise why pursuing climate research in the polar regions is so vital. Further, the engaging and highly informative read will ensure they are prepared for the next time they find themselves in a discussion about climate change.

The Arctic is warming – and more than twice as quickly as the rest of the planet. In fact, you'd be hard pressed to find a region where the effects of climate change are more apparent. But will there soon truly be no more sea ice there in the summer? Why is damage amounting to billions of euros now arising in the Arctic infrastructure? And what will all of these changes mean for life at our latitudes? Day after day, experts at the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI) collect tremendous amounts of data and use advanced climate models to find the answers to these questions.

Their mission is to painstakingly investigate and understand climate changes in the polar regions, so as to be able to make accurate forecasts concerning the future development of our climate.



Scientists use the Lidar system to measure atmospheric aerosols. Photo credit: Alfred Wegener Institute / Rene Buerger.

A new magazine on climate research in the Polar Regions now gathers their latest findings. In fifteen articles, readers will learn how researchers arrive at this important data, and what it tells us about our planet's future. They'll find reliable information on how research expeditions into the ice, laboratory tests and climate models all contribute to our grasp of the climate. In addition, the researchers explain what drives them to return to the polar regions time and time again. And complex topics like rising sea levels are visualised with the aid of info graphics.

Download magazine: <https://bit.ly/2Ex0kOT>

This article was provided by Sebastian Grote, press officer at the Alfred Wegener Institute.

News from the POGO members (cont'd)

Lagrangian experiments to characterize particle dispersion in the continental slope of the northwestern Gulf of Mexico



Three Microstar drifters ready to be deployed aboard the *R/V Pelican* (Louisiana Universities Marine Consortium) Photo credit: Sharon Herzka, CICESE

In order to quantify the most important transport mechanisms of pollutants that could potentially be released from deep water oil rigs in the northwestern Gulf of Mexico, four dispersion experiments with surface drifters and subsurface floats were performed in 2016 and 2017 by a group of researchers from Centro de Investigación Científica y Educación Superior de Ensenada (CICESE), Woods Hole Oceanographic Institution (WHOI) and Theiss Research. Specifically, the role of various environmental factors in controlling particle dispersion are being addressed, including the effect of mesoscale eddies and fronts on cross-shelf and along-shore dispersion, the role of stratification, and the impact of wind forcing.

Two types of surface drifters (Microstar and CODE/DAVIS) drogued at 1m, and RAFOS subsurface floats designed to flow at 300m and 1500m depth, were deployed in triplets along three cross-shore transects. The drifters record positions and temperature every hour and transmit the data in near-real time. The subsurface floats are acoustically tracked by measuring the time of arrival of a sound signal sent from four fixed beacons anchored throughout the Gulf of Mexico. The floats record position, temperature and pressure every 6 hours and, at the end of their 1.5 year mission, drop a weight and rise to the surface to transmit the data via satellite. All trajectories from the 180 surface drifters have been processed. The public was invited to name them and follow their trajectories at <https://giola.cicese.mx/boyas-deriva/>. The 21 subsurface floats from the first experiment have surfaced and the data is currently being processed.

This study is part of the megaproject "Ocean observation platforms, base line, numerical modelling and scenarios of natural response capability of the Gulf of Mexico, under potential large scale oil spills", conducted by the Consorcio de Investigación del Golfo de México (CIGoM), and funded by Fondo Sectorial SENER-CONACYT-Hidrocarburos, México.

This article was provided by M.Sc. Paula García-Carrillo and Dr. Paula Pérez Brunius, Physical Oceanography Department, Centro de Investigación Científica y Educación Superior de Ensenada (CICESE).

A new review, led by PML scientists, sets priorities for the benefit of future benthic research.

The benthic environment is critical to marine ecosystems. It harbours a wealth of life on, in, and above the seabed, and is vital to ocean systems, marine biodiversity, and climate regulation. The ecosystem services it provides are important to human society.



A starfish explores the benthos.

Modelling benthic systems is crucial in helping to further understand them and their responses to the pressures they face from climate change and ocean acidification. The review, published in *Frontiers Marine Science*, has highlighted the challenges benthic models face, identifies research priorities, and offers advice on what needs to be done to ensure the complexities of the benthic environment are appropriately represented in future studies.

Among the topical challenges covered are the dynamics of the boundary layer between the benthic environment and the open water of the pelagic zone; understanding how single events such as storms or earthquakes impact benthic communities and biogeochemistry; and how best to model the primary production of the microphytobenthos – the abundant and essential microscopic algae that dwell in the seabed and contribute to the chemistry of the surrounding ocean.

The challenges can be tackled by an approach that contains three key pillars, says PML's lead author, Dr Gennadi Lessin: "As with many areas of marine science, advancement requires an interdisciplinary approach, bringing together modellers and empirical scientists. Alongside this, we need to enhance communication and

mutual understanding, and a common terminology, used across the entire benthic modelling community, will allow us to promote model integration. And finally, a framework of hierarchical complexity for benthic-pelagic models should be developed, allowing focus on specific aspects depending on the questions to be answered."

"With all three pillars in place, we could foster more interdisciplinary collaboration, and better understand, manage and predict the marine environment."

This article was provided by Nik Hubbard, Communications Officer, PML.

News from the POGO members (cont'd)

Team KUROSHIO Advance to Final Round of the \$7 Million Shell Ocean Discovery XPRIZE

A team of young Japanese scientists, from Japan Agency for Marine-Earth Science and Technology, Institute of Industrial Science, the University of Tokyo, Kyushu Institute of Technology, National Institute of Maritime, Port and Aviation Technology, Mitsui E&S Holdings Co., Ltd., Nippon Marine Enterprises, Ltd., KDDI Research, Inc. and Yamaha Motor Co., Ltd., assembled as the "Team KUROSHIO" (<https://team-kuroshio.jp/en/>) to take part in the "\$7 Million Shell Ocean Discovery XPRIZE"*.

The XPRIZE competition is composed of technical document evaluation, Round 1 (technology readiness test) and Round 2 (mapping of sea floor at 4000m depth). In February 2017, Team KUROSHIO passed the technical document evaluation and advanced to Round 1 testing in January 2018.

On 7 March 2018, XPRIZE announced nine teams advancing to the final round including Team KUROSHIO. The final round will take place in October 2018.

Venturing 4,000m into the Deep: Round 1

https://www.youtube.com/watch?v=A4j84k_7Kco

*Shell Ocean Discovery XPRIZE

The \$7 Million Shell Ocean Discovery XPRIZE is a global competition challenging teams to advance deep-sea technologies for autonomous, fast and high-resolution ocean exploration.

<https://oceandiscovery.xprize.org/>

This article was provided by Jin Tachihara, International Affairs Division, JAMSTEC.



Team KUROSHIO

Photo credit: Communication Group, Team KUROSHIO.

Capacity Building updates

Testimonial from POGO-SCOR Fellow 2017-2018



Divya David Thresyamma

Divya David Thresyamma, scientist from ESSO-National Center for Antarctic and Ocean Research (India) was hosted by The Scottish Association of Marine Science (UK). Her training focused on Regional Ocean Modelling System (ROMS).

Tell us about your training

During the training period, I investigated a number of ways to distinguish between changes in the oceanographic conditions through either a) advective or b) meteorological processes in Kongsfjorden, an Arctic fjord.

I was also trained in numerical data processing, to enable me to fully understand the driving processes and variability in Atlantic Water advection, and in the use of robotic technologies for remote data collection. In addition to these, my visit to SAMS gave me an interesting opportunity to participate in a teaching module and thereby to develop core professional skills.

How did you benefit from the programme?

The programme gave me a good grounding in current research techniques and methods employed in polar ocean sciences, which is extremely useful and important for an early career scientist like me. During my fellowship tenure, my host supervisor provided me with various opportunities to interact with experts in related fields. I firmly believe that the fellowship was a boon to help boost and develop my future career as a woman observational oceanographer. I will always cherish the SAMS memories and experiences, which I imbibed with enthusiasm. Further, I will be sharing my experiences and the relevance of this fellowship in particular to my peers and collaborators.

Your future aspirations

A research paper is ready to be communicated based on the work done during my three month of training at SAMS. This is based on a first time comparison of the temperature variations/climatologies between the two distinct dynamic locations in inner and outer Kongsfjorden, which was the study area, and also on the AW intrusions and occupancy, qualitatively and quantitatively. Some of these results will be presented in the upcoming POLAR2018 conference to be held at Davos, Switzerland in June 2018. Further, the host supervisor has agreed to provide guidance for my Phd research work which is a continuation of the work done during the fellowship period. The association with the host supervisor, which became possible through the fellowship, paved the way for me to be a co-investigator in the project 'Svalbard Integrated Observing System' which will result in wider collaborative works. There are also potential discussions going on for joint works between the parent (ESSO-NCAOR) and host (SAMS) institutes.

This article was provided by Divya David Thresyamma & POGO Secretariat.

Capacity Building updates (cont'd)

Testimonial from 2017 NF-POGO Ship-board Training Visiting Fellow

Azyyati Abdul Aziz was awarded a special Fellowship for on-board training on the GEOTRACES North Atlantic 'FRidge' Cruise. The Programme was jointly supported by POGO in partnership with the Nippon Foundation, the University of Liverpool, University of Southampton and Plymouth Marine Laboratory (PML).

Tell us about your training

Throughout this training, I have gained knowledge on biogeochemical observation concerned with dissolved oxygen and nutrients measurement. Most importantly, I gained practical hands-on experience of sampling and of handling the sea water samples in the correct way, based on International GO-SHIP guidelines. These guidelines also include analytical training, such as considerations for the preparation of reagents, the calibration of the system, and the usage of reference materials for nutrients in seawater (RMNS) which is important to improve the internal accuracy of the nutrient measurement. In addition, I was responsible for dissolved oxygen measurement and data processing on the cruise. This was a new area of study for me, and I received comprehensive skills training from expert scientists before and during the cruise. After the cruise, I had training with Dr Malcolm Woodward on how to interpret the nutrient results from a liquid capillary waveguide instrument, which was able to measure the nutrient concentration in nanomolar units.

How did you benefit from the programme?

I am a first year PhD student and to be part of this programme was a stepping stone for me. All the practical experience I acquired from the experience is necessary for my research to understand the nutrient cycling in the South China Sea, Malaysia. I have personally gained an enormous amount of knowledge and learned new skills from outstanding oceanographers. For example, this programme provided me with answers on how to improve the accuracy of the nutrient and oxygen measurements, and how to manage quality control of the analyses. During the cruise, I had the opportunity to engage in discussion with other scientists to improve my laboratory skills and this inspired me to rethink the way I plan and conduct my research effectively. The other participants were amazing and I learned a lot from their experience and insights.

Your future aspirations

At the Institute of Oceanography and Environment, Universiti Malaysia Terengganu, I am involved in collecting nutrient data from the South China Sea region. Hereafter, all the practical experience I gained will allow me to improve on our previous shortcomings, especially related to nutrients and oxygen measurement. As a young scientist with a passion for chemistry and the ocean, I am looking to become chemical oceanographer, who can contribute to a better understanding of the nutrients cycle in the Malaysian waters in order to secure our ocean.



Azyyati in front of *James Cook* Research vessel.
Photo credit: Azyyati Abdul Aziz.



The research team of stainless steel Rosette Niskin water sampler.
Photo credit: Valérie Le Guennec.



Azyyati and Malcolm Woodward with segmented nutrient autoanalyzer in the chemistry lab on board *RRS James Cook*. Photo credit: Valérie Le Guennec.

This article was provided by Azyyati Abdul Aziz, PhD candidate (Chemical Oceanography), Universiti Malaysia Terengganu.

Capacity Building updates (cont'd)

NANO Global Project "A Global Study of Coastal Productivity, Deoxygenation and Ocean Acidification" – Workshop



Housseem Smeti

NANO and the Global project

In line with the beliefs of the Nippon Foundation (NF) and the Partnership for Observation of the Global Oceans (POGO), the alumni network of past and present scholars (NF-POGO Alumni Network for Oceans - NANO) considers that the understanding of the ocean and coastal environment relies on a globally integrated observing system. Between 2012 and 2017, with the support of NF and POGO, NANO members successfully conducted joint regional research projects that tackled coastal monitoring related to different subjects (e.g., HABs, tides and currents, invasive species) ultimately, applying ocean observations for societal benefit. These served as inspiration for NANO's newest initiative, a joint project of global scale.

The NANO Global project aims to monitor productivity, deoxygenation and acidification in coastal areas with an expanded geographical coverage, taking advantage of the distribution of NANO members around the globe and the facilities provided by their home institutions (e.g., monitoring capabilities, on-going projects, existing datasets and instrumentation). In 2017, a survey conducted among NANO members indicated a total of 36 marine scientists, technicians and graduate students, representing 14 countries and 18 institutions, interested in joining the project.

Lisbon workshop

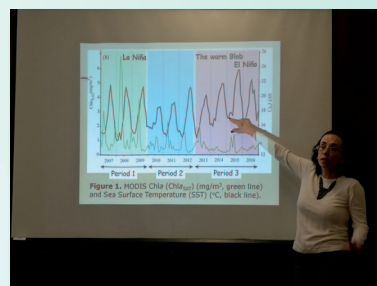
Representatives of these groups, members of the POGO Secretariat and NANO friends met in Lisbon, Portugal, between 18 and 20 April. The workshop included an introduction to the project objectives, presentations on the results of the survey and on current sampling strategies conducted in the participants' institutions.

The workshop also included talks on oceanographic data acquisition and management, and one final day for discussions and brainstorming about the 2018-2019 global project proposal and budget, to be submitted to NF-POGO by mid-May 2018.

Future aspirations

The next phase of the project (2018-2019) will focus on supporting the regular monitoring of basic oceanographic parameters (e.i. temperature, salinity, dissolved oxygen, pH) at existing time-series stations (e.g. ANTARES network) and at new sampling sites (e.g. Albion in Mauritius, Boughrara lagoon and Kuriat island in Tunisia); as well as on performing comparative studies between them. Moreover, to support these objectives, webinars with pertinent themes (e.g., oxygen and pH sensor calibration and configuration; statistics for comparative studies and time-series analysis) will be organised and a possible collaboration with the OpenMods project (Open Access Marine Observation Devices), led by the OGS (Italy) and AWI (Germany) and supported by POGO, will be proposed.

For more information visit the NANO Global Project webpage at <https://nf-pogo-alumni.org/projects/global/>



Adriana Gonzalez Silvera giving a presentation on ANTRAS Baja California time series station.



NANO Global Project Workshop group photo.



Sebastian Krieger giving a presentation on Geodata Management in Oceanography.

This article was provided by Housseem Smeti, Junior Oceanographer, United Nations Development Programme & Lilian Anne Krug, NF-POGO Alumni Network for Oceans.

POGO representation at international meetings

First Session of the Intergovernmental Oceanographic Commission (IOC) Group of Experts on Capacity Development, Paris, France

At its 29th Session (June 2017), the IOC Assembly established the IOC Group of Experts on Capacity Development. The tasks assigned to the Group are:

- (i) assist global and regional programmes with the implementation of capacity development needs assessments in a consistent manner;
- (ii) assist global and regional programmes with the development of programmatic and regionally relevant capacity development work plans based on the IOC CD strategy and related needs assessments, building on ongoing activities and making use of existing training and education facilities;
- (iii) assist with the mobilization of financial and in-kind resources to enable the implementation of global and regional capacity development work plans;
- (iv) provide advice to global and regional programmes on relevant methods and tools to improve the quality and impact of CD efforts;
- (v) advise the Assembly on, and start implementation of, the Transfer of Marine Technology Clearing House Mechanism (CHM) as requested by the IOC Criteria and Guidelines on the Transfer of Marine Technology making use, to the largest extent possible, of existing data and information systems already available at IOC.

The Group will need to submit its work to the 30th Session of the IOC Assembly in 2019.

Sophie Seeyave attended the meeting and gave a presentation on behalf of POGO. The meeting started with a presentation of the IOC CD Strategy and "Transfer of Marine Technology (TMT)" guidelines, followed by presentations on regional and global programmes and their CD work plans. On day 2, the participants were divided into groups for discussion of regional needs (gap analysis) and on the concept and implementation of a "Clearinghouse mechanism (CHM)". In the afternoon, the CHM group was divided between the regional groups as it had been recognised that there was a need for dialogue with the regional groups to determine their needs and how these could be served by the CHM. It was also recognised that IOC should not be just creating "another portal", that there should be a human dimension to the CHM and that it should build on existing efforts, both within and outside of IOC. It was useful for POGO to be present for these discussions and there was a lot of interest in POGO's activities, and in particular the Ocean Training Partnership portal (www.oceantrainingpartnership.org), which could feed into the CHM.

This article was provided by Sophie Seeyave, POGO Secretariat.

3rd IQOE Science Committee Meeting, Bremerhaven, Germany

The meeting was hosted from 12 to 14 March 2018 by the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI) and organised by IQOE Science Committee member Dr. Olaf Boebel and Dr. Ed Urban, Executive Director of SCOR. Sophie Seeyave attended on behalf of POGO.



IQOE group dinner.
Photo credit: Jennifer Miksis-Olds.

POGO was instrumental in the creation and development of the International Quiet Ocean Experiment (IQOE), in partnership with SCOR. The idea for this project was originally put forward by Jesse Ausubel, and developed during discussions at both POGO and SCOR Annual Meetings. An Open Science Meeting was held in 2011 to stimulate community input and to develop a Science Plan, which was published in 2015. The IQOE Science Committee has the major responsibility to direct the science of the project and implement the IQOE Science Plan.

The meeting started with a review of general progress of IQOE, presentations by guests on their organisational interests in IQOE (such as the U.S. Office of Naval Research, Comprehensive Test Ban Treaty Organization and the Arctic observing project INTAROS). Day 2 focussed on reviewing national IQOE-related activities and funding, reports from endorsed projects, reviewing the progress of IQOE Working Groups and other activities, and updates/discussion of communications and networking. The morning of day 3 was dedicated to discussing the Work Plan for 2018. The next meeting will take place alongside Ocean Obs' 19 in Sept 2019, and there will be a meeting of the Executive Group (including POGO) in late August 2018.

The general feeling from the meeting was that much progress had been made in the past year, and that the initiative was gaining momentum, with the Working Groups now being fully operational, with some funding for meetings obtained by Jesse Ausubel. It was recognised that the POGO-IQOE WG had yielded good results, notably the description of an Acoustic EOVS having been submitted to GOOS (still under review) and an on-line database of acoustic observing systems having been launched. The next hurdle is to secure a host and funding for an International Project Office.

POGO representation at international meetings (cont'd)

European Marine Board Spring Plenary Open Session, Fundação para a Ciência e a Tecnologia (FCT), Lisbon, Portugal, 18 April 2018

POGO Communications Officer, Fiona Beckman, represented POGO at the European Marine Board Spring Plenary Open Session, which took place in Lisbon, Portugal.

The Open Session mainly focused on the Valuation of Marine Ecosystems and Ecosystem services, in the light of a policy brief the EMB is currently preparing on the subject. Presentation topics included 'The role of non-natural capital in the co-production of marine-system services', 'Shared and cultural values of marine systems', 'European attitudes towards marine and coastal environment', and 'Marine ecosystems and services'. EMB Executive Director, Sheila Heymans, gave an update on the EMB Policy Brief, 'Valuing marine ecosystem services', which was followed by a panel discussion.

Overall, the presentations were interesting and informative, and the meeting provided a visibility and networking opportunity for POGO within the European Marine community.



The 25 de Abril Bridge. Photo credit: Fiona Beckman.



Colours of Lisbon. Photo credit: Fiona Beckman.

This article was provided by Fiona Beckman, POGO Secretariat.

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