Challenger Wave

Monthly newsletter of the Challenger Society for Marine Science (CSMS)

NEWS

Bangor Early Career Ocean Scientists win top awards

Two Bangor University Early Career Researchers (ECRs) have had their work recognised through major awards. Coral Reef Scientist Dr Laura Richarson has been awarded the Learned Society of Wales (LSW) Dillwyn Medal for her work on the impact of human activity on coral reefs across different time and space scales. Her work has proved invaluable to helping decision makers protect these vulnerable environments. Three Dillwyn medals are awarded annually by the LSW in recognition of outstanding early career research in STEMM (Science, Technology, Engineering, Mathematics, and Medicine), social sciences, education and business, and creative arts and humanities.

Climate Scientist and NERC Independent research fellow Dr Iestyn Woolway has been awarded the 2025 Yentsch-Schindler Early Career Award by The Association for the Sciences of Limnology and Oceanography (ASLO). ASLO presents the Yentsch-Schindler Early Career Award each year to an early career scientist who has made outstanding and balanced contributions to research, education, and society. The award is for Iestyn's influential work describing the effects of climate warming on lakes worldwide, including shifts in seasonal timing, stratification, ice-cover and heatwaves, in addition to his exceptional educational and outreach contributions to society and the global scientific community, including early career researchers. Iestyn was also honoured with the 2024 Philip Leverhulme Prize. This Prize is given to scholars who have already made a significant international contributions and demonstrate great promise for the future.

Mixed microplastic blend may be substantially more toxic than a single polymer on key marine food-web species

A new study indicates that a mixed microplastic blend may be substantially more toxic than a single polymer on a key marine food-web species: https://pml.ac.uk/news/impacts-of-mixed-microplastics-on-marine-life/. Using environmentally-relevant blended microplastic concentrations and with experimental endpoints such as adult survival, algal ingestion rates, egg production, egg size, larval development ratio and juvenile survival, this research supports the development of risk assessments and pollution thresholds.

Dr Zara Botterell, lead author and PhD Fellow at Plymouth Marine Laboratory and the University of Exeter, said, “This study provides important data for subsequent risk evaluations and the determination of toxicity thresholds. For adult A. tonsa there was a 50% mortality rate at a concentration of 0.182mg per litre and overall, adult survival was identified as a significantly sensitive endpoint. We provide several recommendations and suggestions which may aid and improve future toxicity test protocols, including increased replication (individual and treatment numbers) and software automation”. The full paper can be read here: Acute and partial life-cycle toxicity of a tri-polymer blend of microplastics in the copepod

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Acartia tonsa. If you would like any further information, or would like to speak with any of the authors then please do not hesitate in contacting us, Kelly Davidson kdav@pml.ac.uk.

Scientific report on deep-sea research sees 2025 as a decisive year for ocean health

A group of internationally renowned marine scientists published a Future Science Brief on deep-sea research in April. The report provides a comprehensive analysis of the current state of knowledge and offers recommendations for how both the exploration and management of the deep sea can be made more sustainable. The scientists issue a clear warning: without a thorough understanding of ecosystem processes and biodiversity, informed decisions on the sustainable use and protection of the deep sea are not possible. They are now calling for targeted research to close these knowledge gaps and ensure long-term preservation of the deep sea.

Where does the deep sea begin? Definitions vary across science and legal frameworks. For the purposes of their joint analysis, the members of the European Marine Board's (EMB) Deep Sea and Ocean Health Working Group defined the deep sea as the water column and seabed below 200 metres. Below this point, sunlight barely penetrates the water, and the habitat changes dramatically. According to this definition, the deep sea accounts for about 90 per cent of the ocean's volume. Its importance for ecosystems and biodiversity is therefore immense. However, pressure on these still relatively untouched areas of our planet is growing: human activities such as oil extraction, fishing, and potential seabed mining threaten deep-sea ecosystems, while climate change is already having a negative impact.

The working group of eleven researchers has now presented its findings and ten key recommendations on the deep sea and ocean health. Under the leadership of Professor Dr Sylvia Sander, Professor of Marine Mineral Resources at GEOMAR Helmholtz Centre for Ocean Research Kiel, and Dr Christian Tamburini from the French Mediterranean Institute of Oceanography (MIO), the team produced the report, which was launched on the 11th April by the EMB in a webinar. The document emphasises, among other points, the urgent need for major investment in deep-sea research to close knowledge gaps and provide a sound scientific basis for decisions such as those concerning deep-sea mining. "The ocean is an interconnected system stretching from the coast to the deepest depths," says Sylvia Sander. "Of course, the deep sea cannot be considered in isolation from the photic zone or the seafloor." Therefore, deep-sea research, use and conservation are intrinsically linked to overall ocean health.

The group presents ten central measures for the sustainable protection of the deep sea:

1. Effectively govern human activities in the deep sea
2. Establish an international scientific committee for deep-sea sustainability and protection
3. Contribute to develop and implement deep-sea Environmental Impact Assessment methodologies
4. Support transdisciplinary research programs to better understand the role of the deep sea in Ocean (and human) health
5. Invest in long-term monitoring in the deep sea
6. Launch large-scale and long-term multidisciplinary natural sciences projects to increase knowledge of global deep-sea processes
7. Support research efforts in specific critical research fields
8. Enhance educational, training and research opportunities for all current and future scientists addressing their unique regional challenges
9. Foster the transfer of marine technology and develop training programs
10. Continue to promote the Findability, Accessibility, Interoperability, and Reusability (FAIR) Data Principles

Until the late 19th century, the idea that life could exist in the cold, dark, high-pressure depths of the ocean was met with scepticism. It was only with the onset of deep-sea research that the first living organisms were discovered there. Today, scientists know that the deep sea hosts a remarkable diversity of life forms. Complex ecosystems can be found along continental slopes, on abyssal plains or around hydrothermal vents, so-called black smokers, many of which remain poorly understood.

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It is estimated that around 90 percent of all organisms in the deep sea are still un-described, and their roles within ecosystems remain largely unknown. Physical oceanography also faces considerable gaps, for example, in the modelling of deep currents that are crucial for the transport of nutrients and pollutants. In marine geochemistry, little is known about how biogeochemical cycles in the deep sea are affected by human activities such as mining. For instance, scientists still lack a clear understanding of how sediment plumes from the extraction of manganese nodules spread and what long-term impacts they may have on seabed communities. Technical challenges also remain: many modern sensors and monitoring systems are not yet adequately developed for extreme depths, making it difficult to gather essential data. Closing these knowledge gaps is urgently needed to support science-based decision making for deep-sea governance, the scientists argue.

What we do know for certain is that the ocean, of which the deep sea makes up the largest part, stores vast amounts of CO_2 and heat, helping to mitigate climate change. It plays a central role in the global carbon cycle and produces more than 50 percent of the planet's oxygen. Disruption of these functions could have serious global consequences. Preserving these ecosystem services requires strong protective measures and sustainable use strategies. Human activities are already affecting the deep sea in many ways. Irreversible changes on human timescales, such as warming, acidification, and oxygen loss, are threatening these sensitive habitats. At the same time, overexploitation of fish stocks and non-renewable resources such as oil, gas, and minerals is jeopardising biodiversity and ecosystem functions.

The scientists agree that 2025 is a decisive year to take action for ocean health. It is crucial to take effective measures against climate change now in order to achieve net-zero emissions by 2050. Sylvia Sander explains: "Climate change is one of the most alarming threats to our life-support systems and to life on Earth itself. Combined with biodiversity loss, it could soon lead to severe and irreversible disruptions to the entire ocean, including the deep sea and ice-covered parts of the planet." The working group emphasises that Europe should take a leading role in the international protection and sustainable governance of the deep sea, particularly through existing international agreements. "The EU could play an important role in strengthening international efforts to regulate deep-sea activities," says Sylvia Sander. "This would require the establishment of scientific committees for deep-sea protection and the development of standardised environmental impact assessments."

The researchers also call for secured funding of transdisciplinary research and long-term monitoring. Sylvia Sander: "We need to better understand the state of the ocean to protect and use the deep sea sustainably; where are changes becoming visible?" More research and technology are essential. "We also need to support underrepresented nations in deep-sea research and recognise science as a human right. Only then can we safeguard the health of the ocean, and the planet, for future generations."

Underwater gliders provide new insights into the impact of a melting megaberg

As part of a mission by a team of researchers from British Antarctic Survey (BAS) and National Oceanography Centre (NOC), a robotic glider was deployed 23 km from one of the world's largest icebergs, A-68a, close to the sub-Antarctic island of South Georgia. Results from the mission, which used gliders from the UK's National Marine Equipment Pool (NMEP), operated by and piloted remotely from NOC's site in Southampton, have now been published in the journal Nature Geoscience. The data, gathered in February 2021, provide important new measurements of the effects of iceberg meltwater on the surrounding Southern Ocean.

Gathering data on icebergs is notoriously difficult, but important for understanding complex physical and biological impacts on ocean waters and the ability to predict future ocean circulation and the health of Antarctic ecosystems. Large scale movements of giant icebergs can be tracked with satellites, but ships will not get close as smaller scale movements are currently unpredictable. This means the data needed by researchers to develop accurate models, critical for predicting future climate change, are often missing. To add to the challenges involved in this glider mission, it

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was in February 2021, with staff in 'lockdown' piloting the gliders remotely from over 12,000 km away.

A NMEP glider being deployed on the mission. Photo: Alice Marzocchi

"There were challenges, A-68a was constantly on the move, one glider was lost and the second got trapped under A-68a a few times," says Steve Woodward, glider engineering manager within the Marine Autonomous and Robotic Systems (MARS) Group at NOC. "But it did what it should and emerged 17 days later with the data the scientists needed, to help understand what's involved as these giant icebergs melt. It also achieved another step on the development pathway towards use of gliders close to and underneath icebergs, a high-risk, high-reward activity using autonomy in a very novel environment."

The gliders were deployed from the Royal Research Ship *James Cook*, also operated by NOC. The measurements gathered revealed that as the iceberg melts from beneath, a process called basal melting, a layer of water called 'Winter Water' (formed in the Austral summer when warmer waters cap cooler winter waters below) is 'eroded'. This band of cold water, only present in this time period, provides a barrier between surface and deeper waters, restricting nutrients from reaching subsurface layers. By eroding this barrier, nutrient-rich deep waters can rise towards the surface, along with mineral-rich particles, such as iron and silica, from the melting iceberg. These nutrients play a key role in stimulating primary productivity creating food for the charismatic animals that live in the Southern Ocean.

Natasha Lucas, a physical oceanographer at BAS and lead author of the study, said: "We think this is the first time measurements have been made so close to an iceberg, so it's really ground-breaking stuff. It was just really exciting to see the data come back and see how the ocean was changing so drastically. The number of giant icebergs is increasing with climate change so it's important that we understand the physical and biological processes that happen as an iceberg of this size melts, often far from its source. By mixing up these ocean layers, which are normally very stable in the Antarctic summer, the ocean's temperature, its salinity and the amount of nutrients are all changed. This ultimately impacts how much heat and carbon is exchanged between our ocean and atmosphere."

Since the A-68a calved in 2021, several more megabergs have made their way towards South Georgia. Most notable of these is A-23a, which grounded on the island's continental shelf earlier this year (2025). Researchers on the RRS *Sir David Attenborough* recently collected samples from the iceberg as they transited past as part of the BIOPOLE 2 science mission. These will be analysed back in the UK.

Concerns for deep sea ecosystems heighten as US moves to ramp up mining

In the same week as the US Government moved to accelerate offshore mining and open new opportunities for mineral extraction, as reported by Bloomberg, a new expert reflection paper co-authored by PML Honorary Fellow Torsten Thiele, urges the International Seabed Authority to declare a moratorium / precautionary pause on such activity. The paper titled 'Delivering Benefits to Humankind: Opportunities for the International Seabed Authority under a Deep-Sea Mining Moratorium' has been published by the Deep Sea Conservation

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Coalition (DSCC) and explores the "critical opportunities available to the International Seabed Authority (ISA) and the world under a moratorium or precautionary pause on deep-sea mining".

The DSCC was founded in 2004, initially in response to bottom-trawling, and now works with scientists, NGOs, intergovernmental organisations, and governments around the world to drive action to protect the deep sea. Torsten Thiele, Founder of The Global Ocean Trust, co-authored Chapter Four of the paper, 'Economics of a Deep-Sea Mining Moratorium', alongside Ussif Rashid Sumaila, Professor of Ocean and Fisheries Economics at the University of British Columbia. Torsten commented, "the value of the deep sea floor ecosystems is immense. The ISA has an important role to play in safeguarding this blue natural capital and managing exploration."

Kerry Howell, Professor of Deep-Sea Ecology at PML, who is pioneering the use of advances in AI to identify deep sea marine life, added, "new technologies are enabling a far greater understanding of the deep ocean but there is still much to be discovered and understood. The Deep Ocean plays a vital role in our planet's climate system, supporting unique habitats and species as well as acting as a carbon sink. It is vital these regions are managed sensitively as there is much at stake."

Major intercomparison of optical measurements set to revolutionise data processing for satellite ocean colour validation

A recent study, led by Plymouth Marine Laboratory (PML), has evaluated the accuracy of above-water optical sensors, using a community-developed processor, to produce the highest quality data for satellite ocean colour validation and facilitate monitoring the health of our coastal seas and global ocean. To ensure that environmental measurements and the resulting processed data are of high quality and standards, many laboratories world-wide use the same recognised Quality Management Systems (ISO) to collect them. Optical and remote sensing scientists are taking this data quality to a higher level by collecting 'Fiducial Reference Measurements', a standard developed and adopted by the scientific community and space agencies, such as the National Aeronautics and Space Administration (NASA), European Space Agency (ESA) and European Agency for the Exploitation of Meteorological Satellites (EUMETSAT).

Dr Gavin Tilstone, lead author and Bio-Optical Oceanographer at Plymouth Marine Laboratory, commented; "We are excited to share this step-change approach to optical sensor data processing for satellite ocean colour validation. Before this study we did not have confident uncertainty estimates for some of the most popular radiometers used by the ocean colour optics community. The development of this community processor will significantly increase confidence in the data intended for ocean colour research, crucial for climate change and water quality studies. Since the community processor is open-source, this means that it is widely available to countries, smaller organisations and young scientists who may have not previously had the knowledge, technical expertise and processing capability to process the optical data to these high standards." For more information, please visit https://pml.ac.uk/news/major-intercomparison-of-optical-measurements-set-to-revolutionise-data-processing-for-satellite-ocean-colour-validation/.

Loss of seaweeds will affect ocean health

An international seaweed research programme released a landmark report on the 6th May outlining the threats facing global seaweed habitats. The report highlights how human-induced threats, including global climate change, overfishing, pollution and an increase in invasive non-native species, could result in dramatic changes in distribution and diversity of seaweed species and their habitats and what this could mean for both ocean and human health. The State of the World's Seaweeds report combines the most up-to-date scientific evidence and emphasises that despite the importance of seaweeds, and the severity of the threats they face, they are afforded inadequate conservation measures. Authors of the report call for these major gaps to be addressed. The programme

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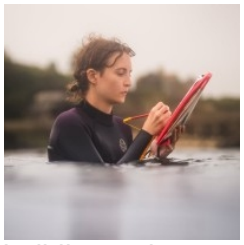
behind the report, GlobalSeaweed-SUPERSTAR, is funded by the UK's Global Centre on Biodiversity for Climate (GCBC) and led by the Scottish Association for Marine Science (SAMS).

Divers assess the health of seaweed in Malaysia

Lead author of the report, Dr Sophie Corrigan, from the Natural History Museum, London said: "Seaweeds are often the unsung heroes of the marine world. They form some of the largest marine habitats we have and underpin so many marine resources, as well as playing an important role in the function of other marine habitats such as cementing coral reefs together and protecting them from wave damage. Food, medicines and even the cosmetics industry rely on seaweed for the properties they can offer. While interest in kelp forests is rightfully building, other seaweeds have been left behind. Safeguarding the future of seaweeds and realising the full potential of seaweeds and their uses will require a global movement to unite governments, researchers, industries, charities, Indigenous Peoples and local communities in protecting seaweeds. This report is an important step in that process."



Seaweeds are red, green and brown macroalgae. The ancestors of the reds lived on the Earth over 1.6 billion years ago. Collectively seaweeds cover an area the size of Australia, making them the largest of the planet's vegetated marine habitats which many other species depend on. They play a significant role in cleaning up our world and absorb carbon dioxide at a far greater rate than many plants on land do and can help to absorb pollution from the oceans as well. There are also millions of seaweed farmers in 56 countries worldwide who rely on seaweed for their livelihoods. The vast majority of farmers are in Asia, which accounts for more than 95% of global seaweed farming.

However, seaweeds face an uncertain future: they are threatened by many pressures but the necessary data to determine the rate at which seaweed habitats are being lost globally does not exist. It is predicted that the majority of seaweeds will experience a high degree of local extinction and poleward expansions by the end of the century, with overall global declines in coverage and diversity.

Prof. Juliet Brodie of the Natural History Museum, London, along with GlobalSeaweed-SUPERSTAR programme leader Prof. Elizabeth Cottier-Cook of SAMS and Prof. Lim Phaik Eem from the University of Malaya are co-authors on the State of the World's Seaweeds report. Prof. Cottier-Cook said: "The State of the World's Seaweeds is a landmark report, providing a robust knowledge base for the development of a global conservation strategy. A strategy that will not only protect wild seaweeds, but sustain the future livelihoods of the millions of farmers dependent on this invaluable resource."

History of Oceanography talk 21 May

The next talk of the Challenger Society Special Interest Group (SIG) on the History of Oceanography will be at 5pm UK time on Wednesday 21 May. It will be given by Jo Williams of the National Oceanography Centre and will be entitled "Using Citizen Science to Rescue Historical Tide Gauge Data". The rescue of important historical data is one of the main interests of the this SIG. Jo's talk will provide an example of data rescue by talking about the history of tide gauges at the Liverpool Docks and on Hilbre Island (Wirral).

The rescue has been made as part of the Zooniverse project, turning paper records of tides into digital data. With the help of online

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volunteers at home during covid, Jo and colleagues were able to transcribe 16000 pages of records, recovering data from 1857 to 1903. The talk will mention storm surges from this period, and how they compare to modern events, and some of the stories that were uncovered along the way.

You can join the talk by using the link below (the link might be different for each talk in this series so watch out for email updates) and feel free to give this message to colleagues: https://noc-ac-uk.zoom.us/j/89895570379?pwd=oeLQzrhORcCXUhtyDopzSXAjYfUfWb.1. If you would like to give a talk yourself in this series towards the end of the year, please let us know at plw@noc.ac.uk.

Workshop on the contribution of UK Arctic Ocean science to the International Polar Year 32/33

To be held between 12:00 11th June and 16:00 12th June 2025, at NOC Southampton, in person and online. The registration deadline is the 16th May, and a pre-meeting questionnaire is open to all. The purpose of this workshop is for the UK Ocean Science community to discuss and then draft a prospectus document outlining the priority Arctic research questions the community would like to address during the run up to, throughout and beyond the International Polar Year 32/33. Additionally, to identify what unique strengths and technologies the UK has to help fill these knowledge gaps.

The second day of the workshop will be dedicated to writing groups, one for each of the priority research questions identified, from both the pre-meeting questionnaire and day one's discussions. By the end of the meeting, each group will have produced draft text and sourced supporting figures for the prospectus. Post meeting, the draft will be opened for comments and suggestions from everyone, regardless of whether they were able to attend the workshop or not. It will then be shared with UK funders (UKRI, FCDO, DSIT, ARIA) and potential international programmes with whom we would like to collaborate (e.g. Arctic 2050, Norway). It will form a basis from which wider integration with terrestrial, atmospheric and cryosphere communities can be built, e.g. at the UK Arctic Science Meeting in September in Northumbria.

To ensure balanced community and ECR representation, and to ensure that the size of the writing groups is efficient and effective, if the number of registrations from individual institutes becomes overwhelming, we may contact individuals or teams and ask that each institute selects a smaller number of individuals to attend in-person. Please wait for confirmation of in-person attendance before finalising travel arrangements. The workshop will be open to hybrid attendance and contributions on both days.

BIO-Carbon international data workshop on the role of marine life in storing carbon in the ocean

As part of the UK NERC BIO-Carbon research programme, and with the support of the MASTS Marine Biogeochemistry Forum, we are delighted to announce an international data workshop on the role of biology in helping the ocean store carbon, March 2nd-4th 2026. The hands-on workshop will bring together scientists from around the world, to pool data on key processes and to determine how we should go about capturing those processes in the next generation of climate models. A major aim of the workshop is to bring modellers, observationalists and experimentalists together to co-design roadmaps for how this should happen.

The workshop will focus on the following 10 themes, identified as key gaps in our understanding:

- calcification and the rain ratio
- plankton community structure
- phytoplankton growth and micronutrients
- the microbial loop and solubilization
- plankton respiration
- zooplankton processes
- particle characteristics & ballasting
- particle fragmentation & aggregation
- the active flux
- the physical circulation

Applications will follow later this year. However, we would already welcome expressions of interest to attend, particularly if you are interested in leading one of the 10 themes. Please do so by 14 May. It is not necessary to have registered an expression of interest to apply to attend the workshop though: https://forms.office.com/e/JizgtqVwej

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Ocean-inspired Music premiere

The piece of music, called 'Soundings', inspired by the work of Bangor University oceanographer Professor Yeung-Djern Lenn has been premiered at the Eastman School of Music, one of America's leading music conservatories. Yueng is an expert in the processes driving the ocean overturning circulation that impacts the climate of the polar oceans. She was honoured to give the 2022 AGU John F Nye lecture and was a keynote speaker at the 2024 Challenger Conference in Oban.

The new piece is by Bangor University's Professor of Music Andrew Lewis, and is for a brass ensemble and electronics. The premier was live streamed and can be found at https://www.esm.rochester.edu/live/hatch/. In 'Soundings', 15 brass players are placed around the concert hall surrounding the audience, while 16 loudspeakers project immersive electronic sounds. The movement of sounds around the hall is based on the map of the global ocean circulation system.

Marine Data Management, Governance and the MEDIN toolset

The Marine Environmental Data and Information Network (MEDIN) and OceanWise are delighted to invite you to attend our popular free online training workshop: 'Marine Data Management, Governance and the MEDIN toolset' on the 19th–23rd of May 2025. Enrol now using enrolment key: MEDIN052025. This training course is suitable for anyone responsible for collecting or managing marine environmental data, including researchers, technicians, undergraduates, post-graduates. Prior knowledge or practical experience of data management is not required.

The course features interactive training and discussion sessions, quizzes, and assignments to help attendees:

- Learn about data management principles, including the data lifecycle and quality, the role of vocabularies (or data dictionaries) and the importance of creating, maintaining, and publishing metadata.
- Explore the resources and tools provided by MEDIN and receive practical instruction in the use of the MEDIN data guidelines, metadata standard and controlled vocabularies.
- Discover how to access existing datasets available through the MEDIN portal and network of Data Archive Centres (DACs).
- Understand the importance of data archiving, sharing, publishing, and re-use.

The training is split into manageable pieces and spread over 5 days with live lessons in the morning and independent learning in the afternoons, which can be completed flexibly around your other work commitments. See the MEDIN website for more information on the workshops, or contact Roseanna Wright, if you have any questions.

Call for UN Ocean Decade actions No. 09/2025 is open

The vision of the Ocean Decade is 'the science we need for the ocean we want'. The Ocean Decade provides a convening framework for diverse sectors from around the world to co-design and co-deliver the scientific knowledge and the partnerships needed to achieve a better understanding of the ocean system, and deliver science-based solutions to achieve the 2030 Agenda for Sustainable Development.

To achieve the Ocean Decade vision, a wide range of partners will implement endorsed Decade Actions in the form of programmes, projects or activities until 2030 and beyond. You are invited to contribute to that vision by requesting endorsement for transformative Decade Actions via Call for Decade Actions No. 09/2025.

NOC Association (NOCA) AGM 2025

The 14th AGM of the NOC Association will be held on Thursday 15th and Friday 16th May 2025. This free, on-line event will take place on Zoom, across two consecutive mornings, each starting at 10:00 BST and ending at 12:30. The agenda will focus on national capability (NC) science, ships, and autonomous vehicles, and how the community can engage. There will be an update on AtlantiS and on the new marine science scoping group. All are warmly welcome

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to participate - please complete your registration here and if you have any enquiries, please contact Jackie Pearson, jfpea@noc.ac.uk, Secretary to NOCA for any other information.

VIEWS

Comprehensive Marine Carbon Dioxide Removal Ecosystem Database

Marine carbon dioxide removal (mCDR) has the potential to be a critical tool in the fight against climate change by leveraging the ocean's natural ability to clean-up and safely sequester legacy carbon pollution. To support collaboration and innovation in this growing field, Ocean Visions developed the Marine Carbon Dioxide Removal Ecosystem Database an updated and expanded version of an mCDR Ecosystem Map originally built by [C]Worthy and transferred to Ocean Visions. This comprehensive resource connects stakeholders across research, government, NGOs, and the private sector, fostering transparency and knowledge-sharing. Explore the database to stay informed, connect with key players, and drive the responsible development of mCDR solutions.

Future Marine Research Infrastructure Podcasts

If you are new to the FMRI, and/or would like really understand what the programme is aiming to deliver, please find Episode One of the podcasts live on our website Podcasts, Future Marine Research Infrastructure. To get new podcast alerts and programme updates, sign up to the FMRI newsletter. FMRI wants to hear from the marine research community. Questions, comments, and concerns can be submitted to www.FMRI.ac.uk/podcasts by the 20th of May and Helen will put them to the team for honest, open discussion on the final episode. For more information, contact Heather.Wilkins@noc.ac.uk, Communications Manager, FMRI.

SALTS

Scientists explore role of high-temperature fluid flow in explosivity of giant underwater volcanoes

Scientists from the UK's National Oceanography Centre (NOC) have led an international team on a groundbreaking expedition in and around Santorini, Greece, to enhance our ability to forecast and understand the hazards posed by Earth's most explosive volcanic eruptions. Hundreds of the most dangerous volcanoes on Earth are found in the ocean, but almost none are monitored, making the hazards for nearby coastal communities and critical infrastructure difficult to forecast. In the ocean, the explosivity of eruptions is complicated by interactions with seawater and fluids circulating through volcanoes, making them even more unpredictable.

High temperature hydrothermal venting, with bubbles composed mostly of CO2 in Kolumbo Volcano.

Using advanced underwater robots, including the NOC remotely operated vehicle (ROV) Isis, world-leading scientists and engineers have studied how circulating fluids interact with magma deep beneath the Earth's surface. By mapping how fluid pathways connect to magma chambers and how these systems respond during volcanic events, they aim to revolutionize understanding of how fluid circulation can influence the strength and hazard of volcanic eruptions.

The Minoan eruption of Santorini, and the 1650 eruption of nearby offshore Kolumbo volcano (Greece) were so large that the ground above collapsed into the space left by the emptying magma chamber, leaving a large hole in the ground, known as a caldera. Such large eruptions can have devastating consequences,

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as demonstrated recently by the 2022 Hunga Volcano eruption, the most explosive eruption this century, which generated tsunamis and severed telecommunications cables that connected the Kingdom of Tonga to the global internet.

During the expedition, scientists investigated both Santorini and Kolumbo, looking at different types of hydrothermal venting, from seeps that form underwater lakes of carbon dioxide, to bubbly venting at temperatures up to and exceeding 200 °C. By looking at the diversity of hydrothermal venting, the team aims to understand the full range of fluid flow styles and the role they could play in future volcanic activity, not just in Santorini and Kolumbo, but also around the world. This work will help to better forecast volcanic hazards and aid responses to future periods of unrest.

Dr Isobel Yeo, Marine Volcanologist and expedition lead from NOC said: “Eruptions such as Hunga Volcano in 2022 demonstrate how important it is that we understand the hazards posed by submarine volcanoes, which are much harder to monitor and observe than those on land. The role fluid circulation plays in volcanic explosivity is fundamental but poorly constrained, making future events at submarine volcanoes harder to forecast and increasing uncertainty in hazard planning and mitigation. While there is no indication the volcanoes we are working on pose an immediate risk, this internationally collaborative work will provide urgently needed constraints on these processes, working with our colleagues in Greece and around the world, to improve our understanding of the hazards at some of the most dangerous volcanoes on the planet.”

The expedition comes at a time of heightened earthquake activity in Santorini, meaning scientists onboard have also been able to support the effort to better understand the causes and locations of earthquakes, as well as the impact of the seismic activity on the volcanic systems. Professor Paraskevi Nomikou, Marine Geologist at the National and Kapodistrian University of Athens said: “Through the HYDROMOX expedition we are measuring earthquakes and investigating how the hydrothermal fields inside the calderas of Santorini and Kolumbo have been affected by the earthquakes. This is an important step towards mitigating potential risks for the Santorini-Anhydros region and will inform the Greek authorities in terms of geohazard assessment. During this expedition, we collected a plethora of fluids, gases, sediments and vent samples and conducted temperature measurements near the hydrothermal vents. The analysis of this dataset will be compared with the datasets collected before the seismic crisis under the framework of the SANTORini seafloor observatorY (SANTORY).”

Having made exciting discoveries in the field, the international team will now combine geophysical, geological and geochemical analysis of their samples and data to unravel the complicated relationships between volcanic and hydrothermal systems at Santorini and elsewhere, and aid our ability to forecast hazard at some of the world’s most dangerous volcanoes. The expedition forms part of the NOC-led Hydrothermal Controls on Caldera Explosivity project, in collaboration with project partners National and Kapodistrian University of Athens, GEOMAR Helmholtz Centre for Ocean Research Kiel, University of Southampton, Queensland University of Technology, Woods Hole Oceanographic Institute, University of Auckland, The United States Geological Survey (USGS), University of Oregon, University of Bergen, University of Ottawa, University of Leeds, University College London, Centre National de la Recherche Scientifique, Japan Agency for Marine-Earth Science and Technology and Memorial University of Newfoundland.

CALENDAR

28th-29th May 2025: The MARTECH Workshop 2025

Pasaia, Spain

The Martech Workshop 2025 is an excellent platform for showcasing innovations and collaborating with marine technology experts. MARTECH 2025 is organized by the Marine Technologies team of AZTI located at the

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Pasaia AZTI Headquarters and the Universitat Politècnica de Catalunya (UPC – SARTI). Further details about the workshop are available on their website: http://www.martech-workshop.org/.

4th-6th June 2025: The One Ocean Science Congress
Nice, France
The One Ocean Science Congress will feature a mix of plenary sessions, including opening and keynote speeches, alongside parallel oral and poster presentations. The One Ocean Science Congress is organised by CNRS and IFREMER and it is a special event of the 3rd United Nations Conference on the Ocean Endorsed by the United Nations Decade of Ocean Science for Sustainable Development. Please see more information on their website: https://one-ocean-science-2025.org/home.html

11th-12th June 2025: Townhall on the UK Arctic Ocean contribution to the International Polar Year 32/33
Southampton, UK
The Arctic is one of the most rapidly-changing regions on our planet, with impacts on global sea-level rise, changes to our climate and weather patterns, and threats to our shared biodiversity and ecosystem services. With the international community rapidly mobilising towards the International Polar Year 32/33, and with new international programmes and initiatives now being shaped, it is timely for the UK Ocean Science community to come together and articulate what its unique offerings could be to Arctic research and technology.

This hybrid 2-day meeting, to be held at the National Oceanography Centre (NOC) Southampton, is intended to start this process. Recognising the Arctic Ocean role in global Earth and Human systems, anticipated outcomes include a high-level shaping of what the UK Arctic Ocean community would like to achieve over the course of the IPY, stimulation of new collaborations and proposals for grand Arctic challenges and a baseline from which wider integration with terrestrial, atmospheric and cryosphere communities, both in the UK and overseas, can be built.

Discussions will continue in diverse forums, including the UK Arctic Science Meeting in September and at Challenger 2026. This action is supported by the UK Arctic Office and UK Arctic and Antarctic Partnership. Further details and meeting registration link will be circulated in April together with a questionnaire to help shape the agenda and discussion. In the meantime, please save the date.

23rd-24th June 2025: Advances in Marine Biogeochemistry (AMBIO) conference
Edinburgh, UK
The MASTS Marine Biogeochemistry Forum are delighted to be partnering with the Challenger Society to host the next Advances in Marine Biogeochemistry (AMBIO) conference. AMBIO provides a technical forum for students, educators, researchers, and governmental and industrial partners with shared interests in marine biogeochemistry. The MASTS Marine Biogeochemistry Forum Steering Group would like to know more about you and your marine biogeochemistry research interests! Please help by completing their community survey before the end of May.

The meeting will be held in Edinburgh at the Edinburgh Climate Change Institute https://edinburghcentre.org/. Submission of abstracts can be made here before the **2nd June**. There will be prizes for best ECR poster and presentation. Registration can be made here and will also close on the 2nd June (or sooner if spaces filled). The event is limited to 60 attendees only, so don't delay. Registration costs will cover attendance to the conference, including lunch both days, tea and coffee and a poster drinks reception on Monday 23rd (1630-1800). Please feel free to share

23rd-24th June 2025: Structures in the Marine Environment (SIME) 2025 conference
Edinburgh, UK
Call for presentation and poster abstracts. The INSITE Programme and OCF are pleased to announce SIME conference will be held once again at the National Museum of Scotland. The main sessions will cover:

- Long-term environmental impacts of contaminants & breakdown materials;
- Estimating biomass associated with structures;

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- Social Attitudes to Marine Artificial Structures;
- Monitoring, Evidence and Innovation surrounding Marine Artificial
- Structures and Decommissioning.

23rd-25th June 2025: Turbulence Grey Zone Workshop
Exeter, UK
Highlighting the opportunity to attend or participate in a workshop about advances in turbulence modelling/parametrisations, which is taking place at the University of Exeter next summer. Turbulence parametrisation is a common challenge in the modelling of fluids, including Earth's ocean and atmosphere, so the conference aims to take an interdisciplinary approach.

24th-25th June 2025: Machine Learning for Ocean Modelling workshop
Reading, UK
Announcing a new workshop taking place at the University of Reading; this will be an in-person event with the option to attend remotely for some of the sessions. The workshop, organised by colleagues from NCAS, NOC, BAS, and the Met Office, will take place over two full days. There will be keynote talks, short talks, and posters presented across some important themes, such as hybrid modelling and benchmarking.

As many of you will be aware, the space surrounding machine learning is fast evolving, so it is important that we come together as a community to identify current challenges and opportunities, particularly within the UK. For now, please save the date in your calendar if you are interested in taking part in this new workshop. We will be in touch soon to provide more concrete details and open the registration.

30th June 2025: Wind Waves Special Interest Group meeting
Liverpool, UK
The 2025 meeting of the Challenger Society Special Interest Group (SIG) on Wind Waves will take place at the National Oceanography Centre in Liverpool. The SIG aims to promote research in ocean surface waves and of their interactions with oceanographic, atmospheric and climatic processes. We provide a forum for cross-disciplinary exchange of information, and to encourage early-career researchers in this field by providing an informal platform for presentations and interactions. If you want to receive information about future events, please contact Dr Lucy Bricheno (luic@noc.ac.uk) to be added to the mailing list.

More details of our special interest group here: https://projects.noc.ac.uk/windwavesSIG/, and details of previous meetings can be found here: https://projects.noc.ac.uk/windwavesSIG/meetings.

1st-3rd July 2025: 2nd UK Coastal Research Conference
Liverpool, UK
Coastal zones are of high ecological and societal value, but as the dynamic interface between land, sea, and air, they are heavily impacted by a combination of climate-driven environmental change and human interventions. Approaches to sustainably manage the coastal zone increasingly seek to provide co-benefits such as risk mitigation, climate regulation, biodiversity gain, and supporting coastal community resilience. These require working across sectors and disciplines to better manage the UK coast in a changing climate.

The second UK Coastal Research Conference welcomes all those with an interest in UK coastal science, including academia, policy makers, practitioners and industry professionals. Our aim is for the conference to promote conversations around national coastal research strategies and coastal knowledge, connecting researchers with those involved in managing our coasts, and thereby inform sustainable future management of our coast.

Following on the first UK Coastal Research Conference, the programme will include one day with optional site visit / training course / workshops and two days for the conference including keynote, oral and poster presentations. Social activities are planned to include an icebreaker drink reception and a conference dinner. Abstract submission now open. For further information and submission form click HERE.

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15th-16th July 2025: Deep-Sea Ecosystems Special Interest Group meeting
Newcastle, UK
The 2025 meeting of the Deep-Sea Ecosystems SIG will be hosted by Will Reid at Dove Marine Lab on the outskirts of Newcastle. This year, the SIG is pleased to announce they've been given some funds from the Challenger Soc. This is going to be split to cover some of the food and drink, and to provide a travel bursary for an ECR to attend the meeting.

The registration link for the 2025 DSE-SIG meeting is now live. Registration closes on the 9th of May. As with previous years, we will look to provide remote attendance for people who are unable to attend in person.

11th-15th August 2025: Aquatic Stressors Forum
York, UK
This Forum would like to highlight an opportunity for PhD students and Early Career Researchers (ECRs), interested in ecotoxicology, to present their work in a friendly and supportive environment as well as network with like minded individuals. The University of York will be hosting SETAC's (Society of Environmental Toxicology and Chemistry) Young Environmental Scientist (YES) conference this August. Find out more here.

15th-18th September 2025: The ICES 2025 Annual Science Conference
Klaipeda, Lithuania
The ICES (International Council for the Exploration of the Sea) 2025 Annual Science Conference (ASC) taking place at Klaipeda University in Lithuania. The ASC will bring together marine scientists from around the world to share innovative research, ideas, and build lasting collaborations. The conference will feature a dynamic programme, covering key areas of ICES Science, including ecosystem science, human impacts, emerging technologies, and conservation.

23rd-25th September 2025: 8th Euro-Argo Science Meeting
Crete, Greece
More information is available on the Meeting webpage: https://www.euro-argo.eu/News-Meetings/Meetings/Euro-Argo-Users-Meetings/8th-Euro-Argo-Science-Meeting

9th October 2025: 6th Maritime Transport Efficiency Conference (MTE Conference)
Geneva, Switzerland
To take place at the Hotel President Wilson, Geneva. Held annually, the MTE Conference uniquely bridges the maritime and commodity trading sectors, addressing the shared challenges and opportunities of decarbonising the global shipping industry. Focusing on the commercial and operational aspects of decarbonisation and offering actionable strategies to reduce emissions across the maritime value chain, the event caters to shipowners, cargo owners, charterers, operators, fuel suppliers, regulatory bodies, and technology innovators.

This diverse mix of stakeholders ensures comprehensive discussions on navigating the evolving regulatory landscape, adopting sustainable procurement practices, and embracing emerging technologies, while promoting cross-industry collaborative efforts to decarbonise.

16th-18th October 2025: Arctic Circle Assembly 2025
Reykjavik, Iceland
The Arctic Circle Assembly will be held in the Harpa Concert Hall and Conference Centre, and registration will open in early June. The annual Arctic Circle Assembly brings together governments, organizations, corporations, universities, think tanks, environmental associations, Indigenous communities, citizens and others for a comprehensive and democratic Arctic dialogue. The Assembly is the largest gathering on Arctic affairs. It is a place for international engagement, cooperation, and celebration.

The Polar Dialogue will return in October. It consists of a series of sessions, consultative meetings, workshops and high-level Plenary Sessions taking place during the Assembly. The

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initiative aims to facilitate science and research cooperation in the Arctic, Antarctic and Himalaya-Third Pole region, as well as other ice-covered areas of the world. Chaired by H.E. Katrín Jakobsdóttir, Prime Minister of Iceland 2017-2024, the Polar Dialogue unites global experts and policymakers to address scientific challenges and foster collaboration.

The Business Forum will take place again during the 2025 Assembly at the Reykjavik Edition Hotel (located within the Assembly Area). It consists of a series of Sessions, consultative meetings, workshops and high-level Plenary Sessions. The Business Forum will delve further into areas of interest including tourism, the blue economy, infrastructure, innovation and more. Additionally, the assembly program has Business Forum Sessions that are open to all participants.

In addition, the Frederik Paulsen Arctic Academic Action Awards will be awarded for the fifth time at the 2025 Arctic Circle Assembly.

10th-13th November 2025: Mediterranean Geosciences Union 5th Annual Meeting
Athens, Greece
Following the remarkable success of the 2024 MedGU Annual Meeting in Barcelona, which drew 750 attendees in person and online from 65 countries, the National and Kapodistrian University of Athens in Greece will host the 2025 MedGU Annual Meeting. We warmly invite you to participate and share your most recent research contributions with us; the abstract submission deadline is the 30th June 2025.

Your participation, whether in person or virtually, will help MedGU achieve its goals of promoting scientific cooperation and creating opportunities for new and fruitful partnerships between geoscientists on both sides of the Mediterranean and from around the globe. MedGU-25 is looking forward to cordially welcoming you in Athens. Your participation will support MedGU's mission of ensuring a sustainable future for humanity in the region and for the planet.

18th-20th November 2025: 15th MASTS Annual Science Meeting
Glasgow, Scotland
The Marine Alliance for Science and Technology Scotland (MASTS) Annual Science Meeting (ASM) is a cross-disciplinary event that brings together members of the marine science community, with the aim of promoting and communicating research excellence and forging new scientific collaborations. The MASTS ASM will take place at the Technology & Innovation Centre (TIC), University of Strathclyde, Glasgow.

The first two days will bring together expert plenary speakers and contributed talks, panel sessions and e-posters outlining the latest research and management practices that address key topics related to marine science and management in the face of global climate change and a biodiversity crisis. Alongside our general science sessions, the event will include special topic sessions, and plenty of opportunities to network. The third day is devoted to workshops.

ASM Workshops:

- Thurs 20th Nov - Introduction to Open-Source GIS (QGIS). This course will introduce postgraduates, early career researchers, and anyone new to Geographical Information Systems, to the use of GIS, and specifically the Open Source QGIS program.

- Thurs 20th Nov - State-space modelling and model-based inference for animal-tracking datasets with patter. This workshop will introduce state-space modelling and model-based inference for animal-tracking data. The workshop will focus on the patter R package as a tool for model-based inference. Participants will gain the knowledge and expertise required to understand (a) where the patter sits within the animal-tracking ecosystem, (b) when to reach for the package and (c) how to apply the package with their own datasets.

Contact us now if you would be interested in:

1. Hosting a special session
2. Organising a workshop
3. Exhibiting at the event
4. Sponsoring the event

We look forward to hearing from you, masts@st-andrews.ac.uk.

22nd-27th February 2026: Ocean Sciences Meeting 2026
Glasgow, Scotland
We invite you to submit a Session or Town Hall proposal to the Ocean Sciences Meeting 2026

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Submission Deadline: 28 May 2025, 23:59 EDT/03:59 UTC. The OSM is the flagship conference for the ocean sciences and the larger ocean connected community. Every two years, the Ocean Sciences Meeting unifies the oceans community to share findings, connect scientists from around the world, and advance the impact of science. The Ocean Sciences Meeting 2026 is co-sponsored by the American Geophysical Union (AGU), the Association for the Sciences of Limnology and Oceanography (ASLO), and The Oceanography Society (TOS). This time we look forward to seeing you in Glasgow, Scotland in February 2026. Visit the Ocean Science Meeting website for up to date information.

2nd-4th March 2026: BIO-Carbon international data workshop on the role of marine life in storing carbon in the ocean

As part of the UK NERC BIO-Carbon research programme, and with the support of the MASTS Marine Biogeochemistry Forum, we are delighted to announce an international data workshop on the role of biology in helping the ocean store carbon, March 2nd-4th 2026. The hands-on workshop will bring together scientists from around the world, to pool data on key processes and to determine how we should go about capturing those processes in the next generation of climate models. A major aim of the workshop is to bring modellers, observationalists and experimentalists together to co-design roadmaps for how this should happen.

The workshop will focus on the following 10 themes, identified as key gaps in our understanding:

- calcification and the rain ratio
- plankton community structure
- phytoplankton growth and micronutrients
- the microbial loop and solubilization
- plankton respiration
- zooplankton processes
- particle characteristics & ballasting
- particle fragmentation & aggregation
- the active flux
- the physical circulation

Applications will follow later this year. However, we would already welcome expressions of interest to attend, particularly if you are interested in leading one of the 10 themes. Please do so by 14 May. It is not necessary to have registered an expression of interest to apply to attend the workshop though: https://forms.office.com/e/JizgtqVwej

8th-10th September 2026: Challenger Society for Marine Science Conference

Bangor, UK

Save the dates for the next biennial Challenger conference, which will be in Bangor, 42 years on from the first modern Challenger conference which was also held in Bangor; then organised by John Simpson, Paul Linden, Steve Thorpe and Roy Chester, and run by amongst others a very junior Ed Hill and Bill Turrell.

The CSMS email address is challenger.society@gmail.com. Contributions for next month's edition of Challenger Wave should be sent to: john@myocean.co.uk by the 30th May.

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JOBS and OPPORTUNITIES

There are jobs in the MASTS newsletter

New vacancies:

Visit our Vacancy Webpage to find all the positions listed below.

- ✔ Coastal Research Fellow - University of Hull - 21/5/25
- ✔ Knowledge Translation Fellow - University of Hull - 21/5/25
- ✔ Head of Global Ocean Team - IUCN - closing 01/6/25

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