International Research Ship Operators

INMARTECH
7 - 9 October 2025

PROCEEDINGS OF INMARTECH 2025 AT SOUTHAMPTON, UK

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Sponsored by Rockland Scientific and Omniaccess

National Oceanography Centre

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Contents

Preface

The National Oceanography Centre (NOC) was delighted to welcome the global marine technology community to INMARTECH 2025, hosted at our campus in Southampton, UK. As one of the world's leading institutions for ocean science and marine innovation, NOC provides the perfect setting for this unique gathering of marine technicians, engineers, and researchers.

Set on the historic Southampton waterfront, NOC offers state-of-the-art facilities, direct access to marine infrastructure, and a vibrant hub of scientific collaboration. This year's symposium delivered an inspiring programme of presentations, discussions, facilities tours, and networking opportunities — all in a venue dedicated to advancing our understanding of the ocean.

The INMARTECH symposia were initiated, and are co-ordinated, by the annual International Research Ship Operators meetings (IRSO) with the purpose of providing a forum for marine technicians to meet and exchange knowledge and experiences, thereby improving equipment performance and operational techniques during scientific cruises on research vessels.

Key Themes for 2025

- Vessels and platforms
- Autonomous Vehicles
- In Situ Observation Systems
- Water column and Benthic Sampling
- Sensors
- Seismics
- Continuous Underway Monitoring
- Digital Ocean
- "In House" Technical Solutions

Organising Committee

Helen Oldridge - Group Head Scientific Engineering - Chair

Juan Ward - Engineering Manager - Ship Scientific Systems

Josh Pedder - Engineering Technician - Ship Scientific Systems

Billy Platt - Senior Sensor Technician

Justin Buck - Principle Robotics Engineer

Alvaro Lorenzo Lopez - Senior Autonomy Delivery Lead

Dan Roper - Senior Robotic Systems Engineer - Delivery Lead

Craig Grosscurth - CASIS Project Lead

Emre Mutlu - ROV Software Engineer

Ian Folger - Event Manager

Sponsors

We are very grateful to Omniaccess and Rockland Scientific for sponsoring this event:

Omniaccess

Omniaccess, part of the Marlink Group, provides connectivity, IT, IoT, cybersecurity and network solutions to the superyacht, cruise and research vessel sectors. They have evolved into a reputable industry leader known for pushing boundaries and achieving the extraordinary. Find out more about them here: https://www.omniaccess.com/

Rockland Scientific

Rockland Scientific is dedicated to the measurement of turbulent flow in the marine environment. They provide measurement services, assist with technical questions and consult on the design of measurement campaigns, experimental instrumentation, and data collection and processing. Find out more about them here: https://rocklandscientific.com/

Programme

Presentations

The presentations below are listed in the order they were delivered at the conference.

Keynote: The evolving role of the onboard technician– Dr. Maaten Furlong (NOC)

In this keynote, Maaten looked at how the role of the onboard technician has changed over the past three decades, and noted that many of the same issues that concerned the participants of the first INMARTECH held in Southampton in 1996 would be familiar to us today. He explored the opportunities and threats presented by artificial intelligence and discussed the difficulty in standardizing roles due to the complex and multirole nature that most technicians take on. In conclusion, whilst the technologies used for supporting science at sea have evolved, the work of the technician has not changed much: we are still very much involved in the development, integration, operation and troubleshooting of systems that underpin science at sea.

Satcoms Upgrade on RRS James Cook and RRS Discovery – Juan Ward (NOC), Marwan Chartouny (Omniaccess)

Increasing reliance on web-based business tools, remote participation in science expeditions and growing expectation of providing modern communication methods like video call at sea have led to the requirement to upgrade our satellite communications onboard to improve both the performance and redundancy. This talk by Juan Ward (NOC) and Marwan Chartouny (Omniaccess) presented the requirements, the Omniaccess-delivered solution and implementation onboard the NOC-operated research ships *James Cook* and *Discovery*. Marwan further discussed the state of the art in satellite communications available for research ships and how to design a connectivity solution that provided redundancy even in polar regions.

New Developments and Projects at NIOZ-NMF - Yvo Witte (NIOZ)

Yvo presented three projects completed at NIOZ. Firstly, a system for ballast-free moorings releases in shallow water to meet the requirement not to leave ballast weights in protected conservation areas. Secondly, a lander system for collecting and measuring gas seeps under water. Thirdly, a prefabricated tower with an electronics package that could be mass-produced for deploying on tidal flats (by research vessel) for the monitoring of birds.

NOC's Open Source Ecosystem for Marine Autonomous Systems – Ashley Morris (NOC)

The National Oceanography Centre operates the National Marine Equipment Pool (NMEP), home to Europe's largest active fleet of Marine Autonomous Systems (MAS), including ocean gliders and our in-house Autosub family of AUVs. This versatile fleet collects data from coastal waters to the deep ocean across diverse marine environments.

Our MAS ecosystem, originally launched with a £10 million National Environmental Research Council

investment, continues to expand. We've developed a modern, platform-agnostic Onboard Control System (OCS) to power our Autosub AUVs and a web-based Command and Control (C2) system to unify the piloting of the entire fleet from any web-capable device. As flagship technologies within NOC's Marine Autonomous and Robotic Systems (MARS) group, OCS and C2 are fuelling new breakthroughs in underwater exploration and data collection.

This presentation marked the first public reveal of our decision to open source both the OCS and C2. The source code is now freely available for anyone to adopt, modify, and distribute. Unlike proprietary software, which is developed and controlled by a single entity, our open-source ecosystem invites a global community of developers to collaborate, accelerate innovation, and expand the capabilities of marine autonomous robotics systems.

Ashley discussed the rationale behind this decision, the chosen open-source license, and the opportunities for collaboration and contribution from the wider community. He presented a detailed look at the architecture of both the C2 and the OCS, highlighting their key components and design principles. Furthermore, he outlined our aims for the future development of this ecosystem and how it can benefit the Marine Autonomous Systems community.

Development of the NOC's Marine Seismic Topside Capability – Joshua Pedder (NOC)

In 2021, the seismic topside capability at the National Oceanography Centre was brought in-house. This transition has enabled consistent development and integration of systems to enhance data collection for seismic surveying.

This talk outlined the key technical advancements made since the transition, highlight recent projects that have benefited from these improvements, and discuss ongoing challenges and future areas for development.

One Instrument, Many Roles: Integrating Navigation and Ocean Measurement with Acoustic Doppler Technology – Nils Coe (Nortek UK)

Acoustic Doppler instruments are central to modern oceanographic and hydrographic research, and their importance will only grow in the years ahead.

Doppler Velocity Logs (DVLs) provide the speed-over-ground measurements needed for accurate positioning and the collection of geo-referenced hydrographic and oceanographic data from subsurface platforms. Acoustic Doppler Current Profilers (ADCPs) use the same principles to deliver current profiles up to 1 km long, wave measurements, and turbulence data with high temporal and spatial precision. Adding central echosounder transducers enables ADCPs to collect wave, biomass, sediment discharge, and ice thickness measurements, while continuing to deliver current data.

The real innovation comes when these environmental measurement and navigation functions are brought together in a single device. Autonomous underwater vehicles (AUVs) can now obtain current data, and echogram data providing an insight into suspended particulate matter of both sedimentary and biological origin, while using the same instrument for subsea positioning. Uncrewed surface

vessels (USVs) can rely on one system both to measure currents beneath the hull for safe remote ROV operations and to provide GNSS redundancy by feeding DVL data into onboard inertial navigation systems.

Looking ahead, the pressure to reduce payload size while increasing functionality will only intensify as Oceanographic and Hydrographic researchers start to increasingly rely on smaller, more numerous autonomous platforms to compliment larger research vessels. At the same time, an increasing need for robust navigation in GNSS-degraded environments means the ability for these acoustic doppler instruments to support navigation, and data collection in GNSS denied environments may also become increasingly relevant for larger research vessels themselves. These trends point to a clear conclusion: the demand for and range of innovative applications for single-device, multi-functional Acoustic Doppler instrumentation is set to increase significantly.

RRS Sir David Attenborough Moonpool Trials – Carson McAfee (BAS)

The moonpool on the RRS *Sir David Attenborough* (SDA) offers the ability to deploy instrumentation in conditions where standard deployment techniques won't work (i.e. when the vessel is in ice). In July 2023, the RRS SDA attempted a number of instrument trials through the moonpool, testing everything except the Conductivity, Temperature and Depth (CTD), due to fear of contaminating the instrumentation package. The moonpool has had several improvements, but the question remains: "Is it safe (for the instruments and data) to deploy a CTD through the moonpool". In October 2025, the vessel compared the data and samples from a moonpool deployed CTD against the standard "over the side" deployed CTD to determine if there are any measurable differences in the data. This talk discussed the testing procedure followed during the trials.

Expanding unmanned surface vessels survey capabilities; the ROTV swiss-army knife approach - Lageshan Steffan Pannerselvam (EIVA)

Autonomous and unmanned surface vessels (USVs) are increasingly popular as a solution to save costs, increase safety and reduce the environmental impact of offshore wind UXO, site characterisation and operations & maintenance (O&M) survey tasks.

Smaller platforms can be more susceptible to wave motion, however, which affects data quality. They may also not have enough payload capacity or the required set-up for hosting the array of sensors required. Additionally, with minimal to no personnel offshore available to monitor progress and make changes, risks must be minimised.

Remotely operated towed vehicles (ROTVs) such as EIVA's Viperfish can expand USV's capabilities, packing a wide array of sensors in a compact format with minimal drag. A survey swiss-army knife developed based on EIVA's well-tested ScanFish ROTVs, which are used by leading survey companies in the offshore wind market.

Our ROTVs improve the speed and quality of survey operations thanks to: improved stability, as the platform navigates underwater, closer to target; automatic navigation at a fixed height from seabed for the best sensor performance and coverage; autonomous 3D steering, to assume and steadily

maintain ideal attitude for optimal sonar data collection; and, autonomously following pre-planned runlines and seabed contours, while avoiding obstacles

The presentation looked at the latest innovations, a typical setup and detail synergistic collaborations with strong partners, such as USV manufacturers. It will showcase field operation examples, demonstrating how EIVA's ROTVs deliver improved performance and reliability during autonomous and unmanned subsea survey operations.

Underway Measurement of Seawater pCO2 on RRS James Cook and Discovery: Operational Insights and Challenges – Dr. Daniel Phillips (NOC)

The continuous measurement of seawater pCO2 from surface vessels is increasingly vital for advancing ocean biogeochemistry and climate research. Recent improvements in instrumentation have enabled more widespread deployment of underway systems.

The Ship Scientific Systems team operates and maintains General Oceanics Model 8060 pCO2 systems aboard the RRS *James Cook* and *Discovery*. These systems perform regular high-accuracy measurements of seawater and atmospheric pCO2 following well-established oceanographic best practices, and meeting the <2 µatm precision, required by the SOCAT surface fCO2 database.

The first year of operation provided valuable data and insights, despite challenges integrating the systems into existing ship infrastructure. While many technical difficulties were successfully addressed, ongoing efforts continue to refine installation procedures and improve operational challenges.

This presentation summarised lessons learned from the deployment and maintenance of pCO2 systems on both vessels, highlighting key successes and persistent challenges for underway measurements.

Onboard IT Systems modernisation and cybersecurity compliance – Juan Ward (NOC)

In preparation for the 2021 IMO requirement for ships to manage cybersecurity risks, the Ship Scientific Systems team at the National Oceanography Centre launched a cybersecurity plan, which included annual risk assessments. The risk assessments, as confirmed by external audits, highlighted severe vulnerabilities with the ships' IT systems. This talk explained the motivation for a complete overhaul and modernisation of the ships' IT systems, our requirements to meet security standards, the work done and the experience of managing these systems in the two years since.

SwathCam - a 9m long Towed Camera System – Ethan Carson (ESNZ)

The SwathCam is Earth Sciences New Zealand's (ESNZ, formerly NIWA) latest towed benthic imaging platform, conceptualized by marine ecologist Dr. Mark Morrison and designed and built by ESNZ's Marine Technology Group, led by principal electronics engineer William Quinn.

The system measures nine meters in length and incorporates six machine-vision cameras, operating to depths of 1000 m. It acquires high-resolution overlapping imagery, achieving a continuous

visualization of the seafloor measuring 10m across-track when flown at an altitude of 2m. Post-survey data workflows utilize FFMPEG for video assembly and Agisoft software for photogrammetric stitching of individual frames into georeferenced Ortho-mosaics.

Designed primarily for fisheries abundance assessments and benthic habitat surveys, the SwathCam also holds potential for broader scientific applications, including high-resolution marine bathymetry and habitat mapping. The system was successfully deployed during a benthic survey of the Hauraki Gulf, New Zealand (2024), demonstrating its capability for stable deep-water imaging and efficient data integration.

Uncontaminated Sea Water Flow Control System – Nikita Petrov (BAS)

The RRS *Sir David Attenborough* is equipped with an Uncontaminated Sea Water (UCSW) feed that supplies continuous samples for scientific systems and data collection whenever seawater is available. This feed is periodically shut off during maintenance, when transiting territorial waters, or while sailing through ice. Two issues were identified with the existing sampling wall. First, maintaining a stable flow rate for the instruments is challenging because biofouling in the pipework often obstructs the static in-line flow control valves. Second, flushing the system with fresh water when the seawater feed is shut off currently requires manual intervention.

The new system presented here addresses both problems. It employs two V-notch ball valve actuators controlled by a Siemens Logo PLC. The system continuously monitors the flow rate and automatically adjusts to maintain stable delivery, while being less susceptible to blockages. In addition, it automatically flushes the instrumentation line with fresh water when required and can be fully controlled remotely.

Mechanical solutions for movement issues – Edwin Keijzer (NIOZ)

When choosing a design solution in movement issues for scientific equipment, we sometimes look back at old mechanical inventions. These old but clever mechanical systems can have compelling reasons to become the preferred choice in a design. Edwin presented the “Geneva Mechanism”, a gear mechanism that translates a continuous rotation into an intermittent rotary motion, and demonstrated its application in a number of NIOZ projects, including a dust sampler on a buoy.

NOC seismic suite restoration – Helen Oldridge (NOC)

Co-authors: Andrew Leadbetter, Will Richardson, Jack Arnott (NOC)

In this presentation, Helen gave an overview of the seismic suite renovation for the National Equipment Marine Pool.

NOC’s New Tethered Underwater Vehicle MPUS – Alex Downer (NOC)

MPUS (Modular-Platform Underwater System) is the NOC’s new tethered underwater vehicle development project. The main objective of the project is to develop a low-operation-cost ROV/Towed vehicle Hybrid that will replace one of the company’s current vehicles, HyBIS, with a more capable and

modern version. This concept will provide a lower cost, smaller foot-print alternative to ROV Isis (NOC's work-class scientific ROV) for less complicated tasks.

The vehicle is designed to be quickly and easily configurable for different missions with separate Grab and Camera Modules that attach to the Core Module. Its Core Module consists of four vector thrusters to ensure precise control and redundancy, Full-HD video and stills camera, 8-station valve pack, fully in-house built software and electronics suite and a series of Science Buses to enable the integration of third-party sensors and instruments with different power and communications requirements. The presentation explained the electronics side of the MPUS system.

A mechanical design solution for a rotatable CTD water-sampler rosette to improve collection of suspended sediments – Charles von der Meden (NIOZ)

Understanding the transport and distribution of suspended particulate matter (SPM) is increasingly important to problems of siltation, transport of contaminants and interactions with renewable energy structures. While turbidity data is often derived from optical turbidity sensors, landers and satellite remote sensing, in-situ water sampling via vertical (CTD/Niskin) profiling casts is required to fill in a number of blanks. This is particularly true of highly dynamic nearshore waters of the Dutch Wadden Sea. Here, in-situ water sampling with vertically oriented Niskin bottles has presented some problems. Namely, unreliable capture of suspended sediment particles from high current and very-near-bottom water layers. It is thought that particles are lost (sink out) from the 'dead' water inside the Niskin bottles. We present a custom designed CTD frame that aims to improve sample collection by allowing horizontal positioning of bottles. Within the main CTD frame, a rotatable rosette of eight bottles is allowed (bounded) free movement or a fixed user-selected orientation. This makes it possible to capture suspended sediment as water flows through the horizontal bottles. It also allows a series of vertically discrete water samples to be taken from as little as ~ 0.3 to 1 m above the seabed. We document and discuss additional attempts to make the rosette 'self-orientating' with respect to prevailing currents.

Update on RV Anna Weber van Bosse - Yvo Witte (NIOZ)

NIOZ's new research vessel RV *Anna Weber van Bosse* will be doing her sea trials in November. Yvo presented an update on the build and discussed issues with the winches, cables and terminations.

Co-designing AI path planner for ocean gliders with operators, engineers and users for explainability and transparency in AI assisted glider piloting operations – Justin Buck (NOC)

Co-authors: Alvaro Lorenzo Lopez[1], Nick Hawes[2], Ben Allsup[1]. Tom Dobra[2], Tobias Ferreira[1], Dan Jones[1], Alexandra Kokkinaki[1], Bruno Lacerda[2], Ashley Morris[1], Ryan Patmore[1], Jeff Polton[1], Charlotte Williams[1], Stephen Woodward[1] (1 National Oceanography Centre, Marine Autonomous Robotics Systems (UK), 2 University of Oxford, Oxford Robotics Institute (UK))

Ocean gliders and Marine Autonomous Systems (MAS) have become a key tool used by the oceanographic community to observe the ocean. As this uptake of marine autonomous systems

increases, key challenges have emerged including: enabling researchers to have more control of MAS operations on projects while retaining pilot accountably in vehicle operations; increasing the value of MAS observations to operational models; and, making the operation of increasingly complex MAS missions more efficient for MAS pilots.

To address these challenges the National Oceanography Centre and the Oxford Robotics Institute developed a digital twin of ocean glider operations that uses data sources including daily ocean currents from ocean models, bathymetry, real-time data from gliders, and training data from previous operations. These observations are combined with a user interface to generate mission objectives. A hydrodynamic glider model, combined with machine learning techniques, is then be utilized to create mission plans for ocean gliders.

Developing a workflow that pilots can trust was a critical aspect of the development with co-design being used to facilitate this. The resulting workflow involved pre-defining and testing of glider configurations to constrain the AI decision making with an enhanced piloting interface for control and monitoring of the process for transparency and explainability of results.

This talk presented the digital twin concept, the development of the human-AI workflow with the piloting interface, and initial results from the project.

Co-ordination of multiple autonomy deployments in the mission – Dr. Alex Phillips (NOC)

Author: James Burris (NOC)

In this presentation, Alex discussed the mission planning process for the Autosub Long Range vehicle and gave an insight into how the Biocarbon ALR campaign was brought together.

Designing Data Pathways for the Digital Ocean: From Sensor to Shore – Oliver Potter (Ground Control)

Co-author: Liz Wilson

As oceanographers collect ever-greater volumes of data, ensuring efficient transmission back to shore is critical. This session examines best practices for moving data from sensors and samplers through gateways and onto global networks. We consider strategies for prioritising essential telemetry vs. bulk science data, how to optimise for low-power systems, and how to integrate multi-path communication (cellular, satellite, Wi-Fi) into a seamless architecture. Examples will show how researchers can build end-to-end systems that scale from single buoys to fleets of autonomous vessels.

Best Practices in Ocean-Bottom Seismometer (OBS) Data Acquisition: From Shipboard Operations to High-Quality Seismic Records – Gaye Bayracki (NOC)

Ocean-bottom seismometers (OBS) are indispensable for investigating sub-seafloor processes, with data quality at sea directly shaping scientific return. This talk presents best practices for OBS data acquisition, drawing on recent large-scale North Sea, Atlantic, and Aegean cruises, with emphasis on the full acquisition chain from shipboard operations to initial data validation.

Reliable deployment and recovery are critical for minimizing risk in challenging sea states and ensuring instruments function as intended on the seafloor. Accurate positioning further enhances data quality: GPS-referenced ship tracks combined with acoustic ranging, followed by relocation after recovery, significantly reduce coordinate uncertainties and improve seismic travel-time accuracy. Timing is equally essential. Although internal clocks drift during long deployments, careful synchronization with GPS before and after recovery, alongside cross-checks against shot records and environmental sensors, helps mitigate errors.

OBS records are also influenced by environmental and technical factors, including electronic cross-talk, clock drift, current-induced tilt, variable seafloor coupling, sediment conditions, and ship noise. Practical measures to reduce these issues include optimizing deployment for stable placement, monitoring tilt on horizontal channels, improving sensor–seabed coupling, and managing timing and navigation precision.

Complementary datasets further strengthen OBS experiments. High-resolution multibeam bathymetry provides essential seafloor context, while multi-channel seismic, controlled-source electromagnetic, magnetic, and gravity data offer additional constraints that integrate with OBS observations for broader geophysical interpretation.

By highlighting lessons learned across these aspects of data acquisition, this talk demonstrates how coordinated practices among scientists, technicians, and ship crews directly enhance OBS data quality. Ultimately, attention to detail in deployment, positioning, timing, and supporting measurements ensures that OBS surveys deliver the robust datasets required for high-impact marine geoscience.

Operational Highlights from the Autosub Long Range Autonomous Underwater Vehicle – Stewart Fairbairn (NOC)

The Autosub Long Range (ALR) is the National Oceanography Centre's (NOC) high-endurance autonomous underwater vehicle, designed for extended missions in remote and challenging environments. ALR is highly flexible to meet diverse deployment needs: it can be launched from shore or ship, is available in two depth-rated variants (1500m or 6000m), and supports either rechargeable lithium-ion or primary lithium thionyl chloride batteries. It supports up to 40kg of scientific sensors, allowing for tailored sensor suites based on mission objectives.

ALR is regularly used by the scientific community and has recently completed a range of demanding missions. Recent highlights include a 2-month, 2600 km fully autonomous crossing from Iceland to Scotland, and a deep-water deployment in Uruguayan waters to depths of 3000m while co-sampling with the research ship. Most recently, ALR conducted trials in Loch Ness in preparation for a 10-week Antarctic expedition in early 2026. During that deployment it will operate beneath the ice shelf, acquiring various data including multibeam sonar of the underside of the ice.

King Henry II and a Short History of Administration - Juan Ward (NOC)

Good administration supports the coordination of technical teams and work supporting oceanographic research at sea. In this talk, Juan gave an overview of the tools tried and used in one

team at the National Oceanography Centre as they've tried to improve their organisation and coordination in a team that is spread between the ships, shore and at home.

Quadcopters for science Carson McAfee (BAS)

The use of "recreational" quadcopters (DJI Mavic 2) on research vessels is not new. However, there is still a perception that they are toys, simply used for taking "public relations" related pictures. On the RRS Sir David Attenborough (SDA), the Engineering and Technology (E&T) team have been working to change this perception.

The first step was to provide a live stream of the drone footage to the bridge. This assisted with ship navigation through ice leads, and for science teams it assisted with sea mammal searches (seals). The second step was using "Open Drone Map" software to create stitched georeferenced images of larger survey areas.

This offers several scientific benefits to onboard science teams working on ice flows and islands, as well as assisting with ship's operational works when planning island visits. These actions have proven to offer benefit on the SDA, and are simple to implement without needing expensive drones, or advanced pilot training.

Marine autonomous surface vehicles – Mike Webb (Maritime Robotics)

Mike gave a talk on the ASV products and autonomous navigation system developed by Maritime Robotics and the state of play regarding legislation for autonomous vehicles.

Posters

A backseat driver system for Slocum gliders operated under ice (NOC)

Authors: Yaomei Wang ,Benjamin Allsup, Alexander B. Phillips

Polar oceans are a key location for forcing the global ocean circulation and influence both global climate and biogeochemical cycles. Due to the restricted access to seasonally ice-covered regions, these areas are severely under-sampled. As such, there is ongoing demand to expand the capabilities of marine robotics to enable observations in these regions, especially during the winter months when many of the most important climate processes (e.g. dense water formation, carbon sequestration) occur.

As one of Europe's largest combined developer and operator of marine autonomous systems for oceanographic data gathering, the Marine Autonomous Robotic Systems (MARS) Group, are being increasingly asked to operate our Slocum gliders in ice covered regions for both short term (days) or long term (months) excursions under the ice. The standard control system of Slocum gliders, while equipped with ice coping behaviours, is not designed for deliberate under-ice missions.

To enhance the capabilities of a standard glider the authors present a backseat driver system coupled with an upward-looking altimeter designed to enable more complex mission design and ensure safe surfacing clear of the ice. A backseat driver is an additional control system which enables more advanced decision making by using a combination of the glider's own state information and science sensor measurements. This backseat driver allows the gliders to (1) change heading adaptively; (2) sense the presence of and avoid collisions with sea ice; (3) customize the surfacing time and location considering the sea ice extent; (4) navigate under ice using long range acoustic beacons; and (5) monitor the glider's states and trigger contingency behaviours in the event of faults beneath sea ice.

The first generation of the developed backseat driver has been deployed for a long-term deployment in the Weddell Sea as part of the National Capability BIOPOLE programme, with short-duration under-ice missions.

ASED-II (NIOZ)

Author: Aris van der Vis

Redesign of Acoustic Sediment Meter

Autonomous eDNA sampling in the deep-sea

Authors: S.Evans, R.Brown, J,Wyatt, J,Walk, K.Saw, R.Samuel, J.Robidart

DNA is left behind or released into the environment by organisms. eDNA analysis can be used to infer species presence in biodiversity surveys, particularly for rare, difficult to visually identify species. This poster describes the Robotic Cartridge Sampling Instrument (RoCSI) which is an autonomous submersible sampler for high frequency collection and preservation of eDNA/DNA/RNA, rated to full ocean depth.

Biological Influence on Future Ocean Carbon Storage: Insights from the BIO-CARBON Project (NOC)

Author: Samuel Smith

The ocean plays a critical role in regulating Earth's climate by absorbing and storing atmospheric carbon, yet biological processes driving this carbon sequestration remain poorly constrained. The BIO-CARBON project investigates how marine life influences ocean carbon storage to improve predictions of future carbon cycling under a changing climate.

Using autonomous underwater vehicles (ALRs), gliders, and research vessels, the project conducted an extensive observational campaign from Vestmannaeyjar, Iceland, to the Isle of Harris, UK (June 2024–August 2024). Over a 57-day mission, the ALR-4 travelled 2,610 km, collecting high-resolution measurements of physical, chemical, and biological parameters across the Iceland Basin and the Extended Ellett Line. Integrated sampling with RRS Discovery enabled cross-platform data validation and near-real-time analyses.

Here we present first results on the magnitude and variability of biological carbon export, highlighting links between ecosystem dynamics and carbon sequestration potential. These findings advance understanding of oceanic carbon storage mechanisms and provide critical constraints for global carbon cycle models, informing climate projections and mitigation strategies.

Biopole BSD Glider Deployment (NOC)

Author: Ben Allsup

Results from under-ice Antarctic glider operations at NOC, measuring new back seat driver systems.

Deep Digging Dredge (NIOZ)

Authors: Dave Huijsman, Rob Witbaard, Edwin Keijzer

Development and Application of a Fully Quantitative Benthic Dredge (Triple-D) for Sampling Low-Density Species

The quantitative value of benthic dredge samples has long been debated. Holme and McIntyre (1984) suggested that dredge and trawl samples are, at best, semi-quantitative due to limited control over sampling surface and catch efficiency. However, sampling larger seafloor areas can help overcome key limitations of traditional box corers and grabs—specifically, the underrepresentation of sparsely distributed but locally abundant species and the problem of spatial patchiness in small-volume samples.

In response to these challenges, the Royal Netherlands Institute for Sea Research (NIOZ) initiated the development of a fully quantitative dredge—the Triple D (Deep Digging Dredge)—in the late 1980s. Originally designed to assess the ecological effects of bottom trawling, the Triple D enables robust sampling of low-density benthic species across a larger footprint.

The dredge comprises a steel frame with a pair of skis, a steel gridded cage with a retractable bottom, and a 7-meter-long fine-meshed net (5×5 mm). Weighing approximately 1600 kg, the system is engineered to minimize drag and maximize sampling efficiency. The cage bottom, mounted 4 cm above the skis, is hinged and fitted with a cutting blade that penetrates the seabed over a predetermined and controlled distances during towing. This enables samples obtained from well-defined surface areas and with that a full quantitative character. The actions are powered by two high-pressure diving air bottles (230 bar, regulated to 12 bar which controls the vertical movement of the cage bottom and cutting blade. The closed pneumatic system, integrated with the electronics and mounted within the cage, ensures precise control of sampling during deployment.

The Triple D has proven to be a powerful tool for benthic sampling, enabling more accurate assessments of biodiversity and species distribution in low-density, patchy habitats.

Enhancing clean water sampling facilities on a research icebreaker to meet the needs of the scientific community (Amundsen Science)

Authors: Lahaye, Quentin[1]; Morisset, Simon[1]; Guillot, Pascal[1]; Forest, Alexandre[1]; Dhifallah, Fatma[1]; Rochefort, Véronique[1]; Cullen, Jay[2]; Anderlini, Tia[2] ([1]Amundsen Science, Université Laval, Canada, [2]University of Victoria, Canada)

Working in close partnership with its scientific community, Amundsen Science provides both financial and technical support to enhance and modernize the Canadian Coast Guard Ship (CCGS) Amundsen's pool of scientific equipment.

In 2023, Amundsen Science technicians, together with the Canadian coast guard crew and various experts, designed and implemented an improved clean water sampling station tailored to the needs of researchers from the University of Victoria, who are part of the international GEOTRACES program. This scientific team conducts annual water sampling campaigns from the research vessels to study the marine biogeochemical cycles of trace elements and isotopes in Arctic waters. The new clean water station features a trace-metal rosette mounted on a custom-built telescopic arm, allowing for stabilized deployment of the rosette through the ship's moon pool.

In addition, a dedicated clean room was constructed on board to enable the collection, processing and storage of ultra-pure water samples under contamination-free conditions. Here, we present the development process, from instrumentation design to clean lab integration, highlighting the multidisciplinary collaboration required to build this custom-made sampling system on a research vessel. These innovations in pure water collection and processing not only strengthen Amundsen Science's scientific infrastructure, but also distinguish the Amundsen from other oceanographic research platforms. Finally, this initiative serves as a strong example how co-design with the user community leads to effective research infrastructure development that directly addresses scientists' needs.

Fleet Finder: The new outreach and public engagement website for National Marine Equipment Pool platforms (NOC)

Authors: Chloe Baker, Dan Jones, Trishna Saeharaseelan, Ashley Morris, Owain Jones, James Kirk, Kevin Chaplin, Alvaro Lorenzo

The National Oceanography Centre houses the National Marine Equipment Pool, which comprises Europe's largest operational fleet of MAS (Marine Autonomous Systems). The fleet operates in a wide range of marine environments, collecting data from the coast to the deep ocean. Days to months can pass between locations where the MAS systems are operated. As a result, having appropriate technology to track vehicles and monitor their status is essential.

Fleet Finder is a public facing application which primarily assists users in tracking live deployments of MAS vehicles and NOC's research ships. It was originally named the 'MARS Portal' and was first built in 2015. Since then, Fleet-Finder has undergone three significant iterations in order to accommodate growing vehicle capability, stakeholder needs, and increasing usage.

The aim of Fleet Finder is to deliver the functionality needed to provide near real-time tracking of the MARS (Marine Autonomous Robotic Systems) fleet to contribute towards delivering oceanographic data used to support world-class scientific understanding.

This poster will demonstrate how Fleet Finder uses some of its key features to contribute to promoting outreach and public engagement across all stakeholders. The significance of outreach and public engagement lies in their essential contribution towards securing funding, fostering collaboration, and garnering support from fellow researchers and institutions.

Incubation chamber 'CUBE' (NIOZ)

Author: Jesper Van Bennekom

This poster presented a system for incubating sea-cucumbers under water for the purpose of monitoring their behaviour.

Operational surveys using Uncrewed Surface Vessels (Institute of Marine Research)

Authors: Brede Fedje Andersen, Jan Arne Vågenes, Dag Hellesnes

The Institute of Marine Research's fleet of uncrewed surface vessels consists of two Kongsberg Sounder - USV Frigg and USV Frida. Delivered between august 2024 and march 2025 as part of the "armada strategy", the vessels are controlled from our in-house Remote Operations Center in Bergen, Norway.

Primarily used for acoustic survey, these vessels contributes to more efficient manned research ship time efficiency by providing more available sensor platforms in a given area. As well as reduced environmental impact compared to larger manned platforms. Integral to the operational concept is real-time or near real-time distribution of scientific data from ship-borne sensors to scientists ashore or embarked on manned research vessels enabled by Kongsberg Geomatics and increases in available bandwidth.

Porcupine Abyssal Plain Sustained Observatory (PAP-SO) near-real-time data (NOC)

Authors: Daisy Tong, Jake Ludgate, Chris Cardwell, Andrew Gates, Sue Hartman, Anita Flohr

The Porcupine Abyssal Plain Sustained Observatory (PAP-SO) is a sustained, multidisciplinary observatory in the North Atlantic, providing key information to detect and understand long-term changes in the ocean and seafloor ecosystems. The observatory mooring is equipped with ocean sensors that measure key variables like temperature, salinity, dissolved oxygen, carbon dioxide and nutrients. This poster presents the recent advances in the design of the mooring telemetry system which transmits sensors data back near-real-time; and the on-going efforts on enhancing data flow and increasing data accessibility.

The Role of Continuous Underway Monitoring in Supporting Interdisciplinary Arctic Research aboard the CCGS Amundsen (Amundsen Science)

Authors: Amirault, Daniel[1]; Guillot, Pascal[1]; Forest, Alexandre[1]; Ratsimbazafy, Tahiana[1] ;Geoffroy, Maxime[2]; Herbig, Jennifer[2]; Fury, Tony[3]; Church, Ian[3] ([1]Amundsen Science, Université Laval, Canada, [2]Fisheries and Marine Institute of Memorial University of Newfoundland, Canada, [3]Ocean Mapping Group, University of New Brunswick, Canada)

Since 2003, the CCGS Amundsen has served as a multidisciplinary hub for Arctic Research, steadily expanding on northern data archives and enabling cutting-edge scientific discoveries. Amundsen Science, the organization managing scientific operations onboard, coordinates diverse national and international research initiatives through careful planning, ensuring the Amundsen efficiently reaches each project's site of interest.

A defining feature of this coordinated approach is the central role played by the ship's interdisciplinary suite of continuous underway monitoring instruments. While Amundsen Science's team of technicians provides hands-on support for dedicated sampling activities, they also maintain and operate a wide range of continuously recording systems – including scientific echosounders, a thermosalinograph, a meteorological tower, and many others. Together, these instruments generate integrated datasets capturing seafloor topography and substrate, as well as physical, chemical, and biological characteristics of the sea-surface and water-column, and atmospheric properties.

By bridging the gap between discrete sampling stations, these continuous datasets help characterize sparsely visited and under-studied Arctic regions. Beyond their immediate use for real time evaluation and adaptive decision-making during operations, the collected data are archived by Amundsen Science and made publicly available, forming a long-term historical record of great value for future research and planning. Here, we describe the interdisciplinary array of continuous underway monitoring instruments operated by Amundsen Science and highlight their contributions across multiple scientific domains throughout all phases of the CCGS Amundsen's Arctic expeditions.

Workshops

Modular Systems – Helen Oldridge and Billy Platt

This workshop enabled participants to discuss and share experiences about containerising systems for going to sea, such as cranes, winches, laboratories, power packs and acquisition systems.

High Speed Internet Onboard: Management, Remote Access and Other Applications – Juan Ward, Basem Drawil and Marwan Chartouny

This workshop enabled participants to discuss applications of high speed internet, challenges they have faced and potential solutions. Basem Drawil (NOC), Marwan Chartouny (Omniaccess) presented the bandwidth management solution adopted by the NOC research ships, and how we use remote access to manage the ships. Getting datasets off ships in near-real time over slow links was discussed, and experiences of methods

Management of Metadata of Ship/Vehicle Data Acquisition – Dr Daniel Phillips and Dr Justin Buck

This workshop enabled participants to understand metadata and the importance of recording and managing metadata during science campaigns. The workshop discussed the key elements of sensor metadata, the story of each asset used in the campaign, and the importance of standard operating procedures. Daniel Phillips (NOC) demonstrated the NOC RVDAS Metadata service used for recording metadata for sensors on our ships , showing calibrations, coefficients and other key metadata.

Facilities Tours

Autosub Long Range – Dr Alex Phillips

Gliders – Alex Cerra

Remote Operated Vehicles – Alex Downer and Martin Yeomans