in-depth

MAPPING THE FLOOR OF OUR OCEANS

Newsletter of The Nippon Foundation-GEBCO Seabed 2030 Project

THE NIPPON FOUNDATION-GEBCO
SEABED 2030

EDITORIAL

Our ocean environment

As the nations of the world gathered in Glasgow for the most important conference yet on the future of our planet, I make an unashamed plea for the health of our ocean environment. The oceans of the world are described by the United Nations as *'our planet's life support'*, and regulate the global climate system.

> *Yet we know so much about the threats and see so little of the seabed which can help provide so many of the answers.*

Our project – The Nippon Foundation-GEBCO Seabed 2030 Project – can make a vital contribution to solving this conundrum. After all, the shape of the seabed is critical to understanding ocean circulation patterns affecting climate and weather patterns, tides, water action, sediment transport, tsunami wave propagation, and underwater geo-hazards.

Call to action

In a single 'Call to Action' from the UN's Decade of Ocean Science for Sustainable Development, of which over 60 Actions have been endorsed, our objectives are set out "to inspire, support and coordinate the mapping of all the world's oceans by the end of this decade." In 2017, when we launched our Project, only six per cent of the seabed was mapped to a modern standard.

The GEBCO digital map, which is freely available, now covers more than 20 per cent of the seabed. We acknowledge that we have a monumental task ahead of us and one that can only be achieved through global cooperation.

Seabed 2030 was established to support the UN's Sustainable Development Goal 14 to "conserve and sustainably use the ocean, seas, and maritime resources for sustainable development".

Threats to environment

The threats to our ocean environment have been frequently stated – much of it directly by humankind. Heading the list is plastic pollution and the collapse of fisheries, acidification and ocean warming. It is a concerning statistic that only 1.2 per cent of national resource budgets are allocated for ocean science, yet over three billion people depend on marine and coastal biodiversity for their livelihood.

Seabed 2030 objective

We believe, at Seabed 2030, that mapping the entire ocean floor is an international necessity which is demanding of global cooperation – not hindered by a lack of it.

In order to achieve this goal, we say that every time a research vessel adds bathymetric data gathering to its mission, every time a ship takes a slightly altered course while in transit to survey an uncharted area, they are helping to fill the gaps in the GEBCO grid.

We call on governments, organisations and individuals – not least in Glasgow – to join us and contribute data and resources to this vital global effort – and help us explore the planet's final frontier.

Jamie McMichael-Phillips
Seabed 2030 Project Director

Issue 6: December 2021

Global survey calls for greater coordination of seabed mapping activities

A new survey has given a major boost to efforts to map the entire seafloor by the end of the decade. Nearly 800 professionals representing 90 countries shared views on the value of seabed mapping and where activities to map using modern digital methods should be focused, as well as identifying some key challenges that need to be addressed in order to achieve the ambitious goal.

The survey – commissioned by Seabed 2030 and managed by Blue Economy company NLA International – drew responses from across the scientific, academic, philanthropic and business communities, as well as from government and defence officials. Headline findings included:

- 40% of online respondents considered the main benefit of mapping the ocean floor to be 'to advance scientific understanding of seabed characteristics', with 11% highlighting the need 'to monitor environmental challenges over time'.

- Bathymetric data (81.67% of respondents) was the most desired geospatial information, followed by environmental data (69%), oceanographic data (65.33%) and classification of seabed features (63.33%).

- Respondents were interested mostly in water depths less than 200m (33.57%) and greater than 5750m (31.12%).

- An overwhelming majority of respondents (58.31%) would want access to any data sets via an online marine data portal.

The survey aimed to develop a more consolidated global view of seabed mapping needs in order to move towards an agreed list of strategically important priority areas for further action. It also achieved its secondary aim of finding new data that could immediately feed into the emerging global map, with respondents identifying 154 potential sources of new data to be explored. Each new data set collected will help to develop models that can more accurately predict climate and weather patterns, tides, wave action, sediment transport, tsunami wave propagation and underwater geo-hazards.

There was universal recognition from survey respondents for the urgent need to map the world's seabed, and equally compelling praise and support of the Seabed 2030 project's objectives. However, some challenges were also identified. Many felt that current survey/environmental strategies and initiatives could do more to align within a more joined-up, coordinated approach. A consistent message emerged that scarce resources are not being used as efficiently as they could be, as too many programmes are seen to operate in isolation. In particular, seabed mapping programmes run by industry and environmental bodies were identified as not complementing national hydrographic office strategies.

The survey was supported and promoted by a significant number of international bodies and agencies, examples of which included the Intergovernmental Oceanographic Commission (IOC); Baltic and International Maritime Council (BIMCO); United Kingdom Hydrographic Office (UKHO); and the European Marine Observation and Data Network (EMODnet).

The survey findings will now be converted into a draft global priority list for seabed mapping activities that reflects all maritime sectors and users of seabed bathymetric data. This draft priority list will be shared with the world's hydrographic, oceanographic and policy agencies in order to move jointly towards an internationally recognised and supported prioritised list for seabed mapping that reflects potential cross-sector environmental, social and economic benefits across all areas.

Members of the Sea-Kit International team controlling the ship from their office in Essex as Sea-Kit moors at a harbour in Plymouth. The remote controlled drone can be controlled from hundreds of miles away and was scanning the seafloor off the coast of Plymouth for the Seabed 2030 Project.

Seabed 2030 at the fourth edition of the Paris Peace Forum

Project Director Jamie McMichael-Phillips took part in a session on ocean governance at the fourth edition of the Paris Peace Forum, which took place earlier this month.

Jamie joined representatives from France's Ministry of Foreign Affairs, the Jacques Delors Institute, Pacific Islands Forum, and Conservation International for a session which highlighted concrete initiatives from various actors worldwide to design and implement informed policy decision-making mechanisms to safeguard ocean life.

WHOI appoints Dr Kilaparti Ramakrishna as Senior Advisor on Ocean and Climate Policy

Dr Ramakrishna – Chair of Seabed 2030's Strategic Advisory Group – has joined the Woods Hole Oceanographic Institution as senior advisor to the President and Director on ocean and climate policy.

Commenting on his appointment, Dr Ramakrishna said,
"We know that oceans are an integral part of our climate system, and it is time to make them an integral part of climate solutions."

Dr Ramakrishna

COP26

Seabed 2030 was pleased to participate in Schmidt Ocean Institute's panel at COP26, discussing Climate and the Deep Sea World.

The deep sea has always been unfathomable because we had no idea what existed there. Once thought to be barren of life, we now know this couldn't be further from the truth - life exists under extreme conditions at these depths and with every deep-sea expedition we gain a greater understanding of the crucial services it provides our planet.

SOI hosted a panel centered on climate impacts in the deep sea and how we can better understand and mitigate this in order to improve the overall health of our planet.

Watch the full session on YouTube.

Esri and Seabed 2030

As the world's sixth largest private information technology company, specializing in geographic information systems (GIS) and spatial data science, the mission of the Environmental Systems Research Institute, Inc. (Esri) is to inspire and enable people to positively impact their future through a deeper understanding of the changing world around them.

This understanding involves a commitment to the ocean, to ocean science and to the maritime industry. In 2012 Esri launched a major ocean GIS initiative across the company (e.g., in Professional Services, Software Development, Software Products, and Industry Solutions/Marketing). This is particularly in the areas of seabed mapping and marine spatial planning for which GIS provides a crucial decision-support engine. As such, Esri continues to expand its service portfolio with emphases on hydrographic matters including nautical charting, bathymetric data, Marine SDI and marine spatial planning, applications for commercial shipping, maritime defense and intelligence, and offshore energy, and oceanographic science. Esri's strong user base and closest partners include Fugro, the International Hydrographic Organization (IHO), the Port of Rotterdam, the US National Oceanic and Atmospheric Administration (NOAA), Quality Positioning Services (QPS), the Group on Earth Observation's (GEO) Blue Planet and Marine Biodiversity Observation Network (MBON), TCarta, the Scripps Institution of Oceanography Corporate Alliance, and many more.

Since its founding in 1969, Esri has cultivated collaborative relationships with partners who share the company's commitment to solving Earth's most pressing challenges with geographic expertise. To this end, Esri is proud to count Seabed 2030 as a formal collaborative partner. For many years Esri had already incorporated the GEBCO grid into its Esri Ocean basemap, in order to serve the broader GIS community. And over the years Seabed 2030 has reached out to Esri for technical advice and consultation on bathymetric processing workflows, managing and serving large raster data, and the production of various data products.

These activities continue as part of Esri's main contributions to Seabed 2030. Under the formal collaborative agreement with Seabed 2030, Esri seeks to contribute bathymetric data from its many partners; to share and promote methods and best practices in technological innovation, infrastructure, and solutions for ocean mapping and bathymetric data management; and to promote Seabed 2030 and its initiatives in all forms of social media. Esri Chief Scientist Dawn Wright serves on the Seabed 2030 Strategic Advisory committee, and Esri Maritime Consultant Caitlyn Raines serves as the Vice Chair of GEBCO's Technical Subcommittee on Ocean Mapping (TSCOM). Esri's technology is used aboard several research vessels that collect bathymetric data, and within several of Seabed 2030's regional centers. The University of New Hampshire's interactive globe of the latest GEBCO 2021 grid is also powered by Esri technology, ArcGIS Earth.

As Esri continues its strong relationship with Seabed 2030, it will also continue to focus on a greater engagement with the ocean science community and to evolve the Blue Economy. To this end, Esri has also launched a new website about climate action planning, with resources for strategizing around mitigation and adaptation using geospatial technology. The company is also deeply involved in supporting a number of climate change initiatives directly related to the UN 26th Framework Convention on Climate Change Conference of the Parties (COP26), the 15th Convention on Biological Diversity (CBD), and of course, the UN Decade of Ocean Science for Sustainable Development.
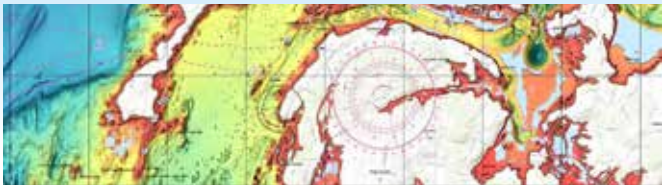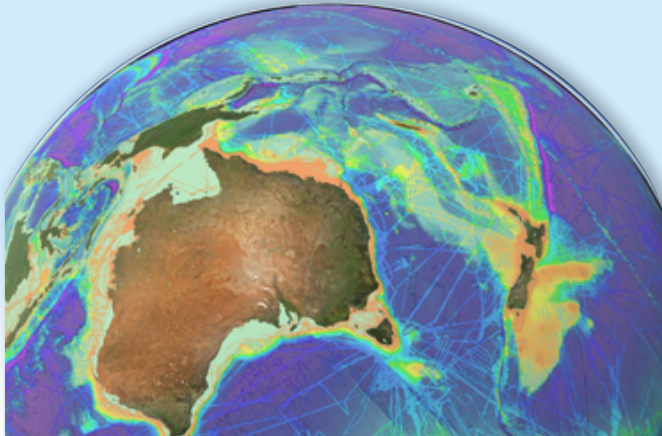

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For more information, please visit Esri's ocean science portfolio and its suite of maritime software products.

ocean science portfolio

maritime software products

Atlantic-Indian Regional Center

Data Assembly efforts at the Atlantic-Indian Regional Center (AIORC) have been focused on newly available data including multibeam data, crowdsourced bathymetry, and satellite derived bathymetry. Processing of data made publicly available in the IHO Data Center for Digital Bathymetry (DCDB) is ongoing and our efforts have recently focused on data contributed by Fugro. We welcomed three students from the College of Charleston to work with us to help process these data during their summer break, and their efforts are gratefully acknowledged! Other notable data contributions in the Atlantic and Indian Oceans include gridded multibeam data from IFREMER and GEOMAR. The AIORC Team also recently met with Dr. John Hall, a long-time contributor to GEBCO, to discuss details about the best ways to integrate the large dataset of digitized nautical charts and soundings that he has provided for integration into the GEBCO grid.

Over the last two months, the AIORC Team continued to increase outreach and connection with the Alumni from The Nippon Foundation GEBCO Training Program. The Center developed a flyer emphasizing the importance of Seabed 2030 and highlighting data gaps for specific regional communities. Adapted versions of these flyers were distributed to Alumni from the North Indian Ocean Region for them to use for outreach and engagement within their local and regional networks. Virtual meetings with Alumni from the North Indian Ocean region took place in August to discuss topics including opportunities to contribute to The Nippon Foundation-GEBCO Seabed 2030 Project and how the Center could guide them with local seafloor mapping initiatives. The Center looks forward to continuing to work closely with Alumni throughout the region to help accelerate progress.

Stakeholder engagement over the past few months also included direct engagement with Regional Hydrographic Commissions, either through direct virtual presentations (e.g. East Atlantic Hydrographic Commission, EAtHC) or by providing reports for their meetings (e.g. Southwest Atlantic (SWAtHC), North Indian Ocean Hydrographic Commission (NIOHC)). These interactions help to establish a solid foundation upon which collaboration and cooperation can be built. Dr. Vicki Ferrini, the AIORC Center Head, also participated in a UN Decade Predicted Oceans Satellite Activity by the US National Ocean Mapping, Exploration and Characterization (NOMEC) Council to talk about Synergies and Opportunities between NOMEC and The Nippon Foundation-GEBCO Seabed 2030 Project.

Center Head: Dr Vicki Ferrini | atlantic-indian@seabed2030.org

South and West Pacific Ocean Regional Data Center

The South and West Pacific Ocean Regional Data Center (SaWPac) held the third Regional Mapping Community meeting on 21-23 July 2021. The online event was attended by 70 people from 18 different countries. Topics discussed were the countries' mapping activities and initiatives, main partners, research and not-for-profit organizations mapping expedition programs and data contribution to the project. Data processing and analysis tools and techniques were also reviewed. The meeting, accessible using the link (right), was concluded by an open discussion to understand how countries and entities can help one another to facilitate ocean mapping and data processing.

The Center successfully facilitated acquiring satellite-derived bathymetry products for very shallow waters in the entire Maldives, NW coast of Madagascar, and half of Federated States of Micronesia. Work on crowdsourced bathymetry (CSB) has also been initiated, aiming to promote citizen science starting in New Zealand and consequently in the region. Four NMEA data loggers were sent to two vessels in Auckland for installation and configuration. The voyage departed in November within New Zealand's exclusive economic zone. SaWPac has also established a good connection with the Palau National Marine Sanctuary who are keen to provide data and collaborate on the ongoing CSB project lead by the Palau Bureau of Marine Transportation.

The Center is currently processing a lot of raw data, with the most recently processed dataset from cruise RR1402 covering a huge part of Palau's EEZ. SaWPac's repository is also up-to-date on the AusSeabed portal.
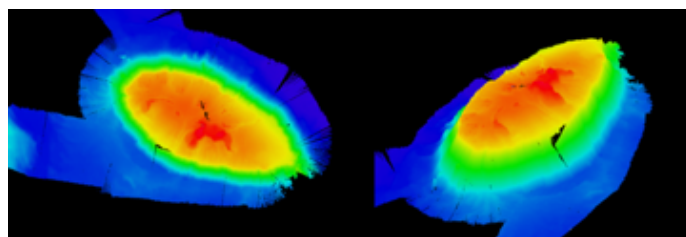
Click here to find out more about NIWA's contribution to the Seabed 2030 initiative.

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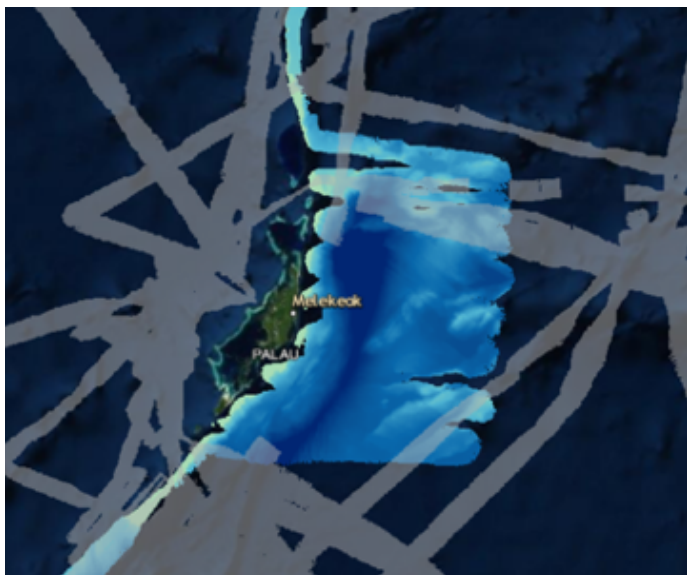
Additional data coverage on eastern Palau (Roger Revelle cruise RR1402). Coverage in grey (semi-transparent) is GEBCO_2021 TID 11.
Credit: Beth Watson / Ocean Image Bank

IN2019_V04 from CSIRO

An almost perfectly-shaped guyot in Coral Sea, northeast off Australia.
Shallowest depth: ~1,075 m
Height: ~2,950 m
Length: ~5,000 m

Southern Ocean

In a great tribute to the combined effort, we are pleased to announce that The International Chart of the Southern Ocean v2 (IBCSO v2) has recently been submitted to an international peer-reviewed journal for publication. In addition to the thorough report on the methods used to generate the grid, there is an overview of the included datasets from lead soundings to high-resolution multibeam data. The chart covers the area south of 50°S, 2.4 times the seafloor area of the previous IBCSO version. Due to the increase of spatial data coverage, it is a major improvement of the portrayal of the seafloor of the Southern Ocean.

A large component to generating the IBCSO gridded product is the unsung work that occurs behind the scenes here at the Southern Ocean Regional Center. Since the project began, we have been developing a workflow that can generate yearly products from a variety of datasets using algorithms that create seamless transition zones and tables that contain a plethora of background information. The work was originally created for the first version of the International Chart of the Southern Ocean (IBCSO) in 2013, and was significantly augmented at all levels to account for the substantial influx of data. Now utilizing high-performance processing computers at the Alfred Wegener Institute, the team was able to program a finalized workflow coined SEAHORSE. SEAHORSE is highly flexible and can be adapted easily for the best possible generation of the compilation grid to include the highest quality measurements.

Here at the Southern Ocean Regional Center, we are greatly appreciative of the collaborations of so many bathymetry specialists who help gather data as well as provide the most up-to-date bathymetry. We hope we can continue working together to generate yearly improvements to the grid collaboratively working towards the goal of mapping the world's oceans by 2030.

Ms Laura Hehemann   Center Head: Dr Boris Dorschel
Data Manager and Curator, IBCSO
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Arctic and North Pacific Ocean Regional Center

The Arctic and North Pacific Ocean Regional Center has reported several notable achievements since the publication of the previous newsletter. The Project has made a significant contribution to the collection of new unmapped seafloor data and contributed to the first demonstration of an exciting new seafloor mapping technology through its support of the maiden voyage of the Saildrone SURVEYOR from San Francisco to Honolulu Hawaii in June and July of 2021. The Saildrone SURVEYOR is a unique 22m autonomous sailing craft built specifically for long, uncrewed ocean voyages and the collection of deep-water bathymetric data along with a range of other important environmental data.

On 25 August, Healy – the largest US Coast Guard icebreaker – departed Seward Alaska and arrived in Nuuk Greenland on 13 September with a team of mappers from the Center of Coastal and Ocean Mapping (CCOM) at the University of New Hampshire. Healy travelled a total of approximately 5,250 nautical miles and this voyage provided members of the CCOM team the opportunity to collect data, helping to fill gaps in current hydrographic coverage.

Additionally, on 20 September, the Seabed 2030 crew of Stockholm University returned with icebreaker Oden to Helsingborg, Southern Sweden, after completing an expedition in the central Arctic Ocean. The expedition managed to reach portions of the continental shelf of North Greenland never mapped before by any surface vessel. Multibeam bathymetry was collected throughout the cruise which will help update areas of the International Bathymetric Chart of the Arctic Ocean (IBCAO) grid compiled within the Seabed 2030 project.

Center co-Heads: Professor Martin Jakobsson and Professor Larry Mayer | arctic-pacific@seabed2030.org

The Surveyor carries a sophisticated array of sonars in its keel, including the Kongsberg EM 2040 and EM 304, to map the seafloor to a depth of 23,000 feet (7,000 m). *Credit: Saildrone*

Seabed 2030 is pleased to announce the following partnerships, in support of the global initiative to produce the complete map of the ocean floor:

Kongsberg Maritime

Kongsberg Maritime provides solutions for safe, efficient and sustainable maritime operations. The solutions are suitable for offshore energies, seaborne transportation, hydrography, science, navy, coastal marine, aquaculture, training services and more. Kongsberg Maritime is the largest business area within Kongsberg Gruppen ASA. The Group has an integrated portfolio of solutions for businesses, partners and nations operating from the depths of the sea, to outer space and to the digital frontier.

Find out more about Kongsberg Maritime.

Woods Hole Oceanographic Institution

Woods Hole Oceanographic Institution (WHOI) is a private, non-profit institution dedicated to advancing knowledge of the ocean and its connection with the Earth system through a sustained commitment to excellence in science, engineering, and education, and to the application of this knowledge to problems facing society. WHOI scientists and engineers are committed to understanding all facets of the ocean as well as its complex connections with Earth's atmosphere.

Find out more about Woods Hole Oceanographic Institution.

EOMAP

EOMAP develops and generates tools and data to map and monitor shallow waters and aquatic ecosystems with satellite data analytics. Its mission is to develop and apply high quality satellite-derived methods and data to precisely map and monitor the aquatic environment and thus, contribute to an effective management and understanding on this crucial environment.

Find out more about EOMAP.

Argans

ARGANS specialises in satellite-based Earth Observation, remote-sensing applications and services, and geographical information systems used to map and monitor the marine, atmospheric and terrestrial environments. ARGANS offers satellite mission solutions across a range of services, including development of ground segment algorithms and applications, data quality assessment and validation while keeping a strong scientific expertise in remote sensing science.

Find out more about Argans.

TCarta

TCarta has been a global innovator in Satellite Derived Bathymetry (SDB), marine remote sensing and space-based hydrospatial technologies since its founding in 2014. The company has extensive experience producing custom, project-specific SDB, as well as en masse through automation and cloud computation. TCarta is currently underway in grant research, funded by the National Oceanic and Atmospheric Administration (NOAA) to pursue advancements in on-platform parameterization of satellite imagery collection for improved SDB data.

Find out more about TCarta .

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