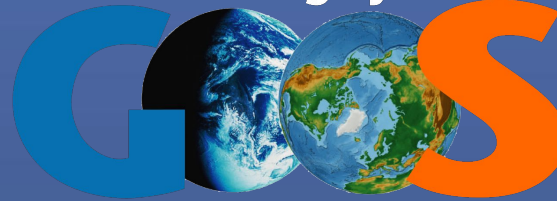




The Global Ocean
Observing System



Update from GOOS Biogeochemistry Panel

Véronique Garçon (IOCCP co-Chair, IPGP, France), **Adrienne Sutton** (IOCCP co-Chair, NOAA, USA),
Maciej Telszewski (IOCCP Director, IO PAN, Poland)

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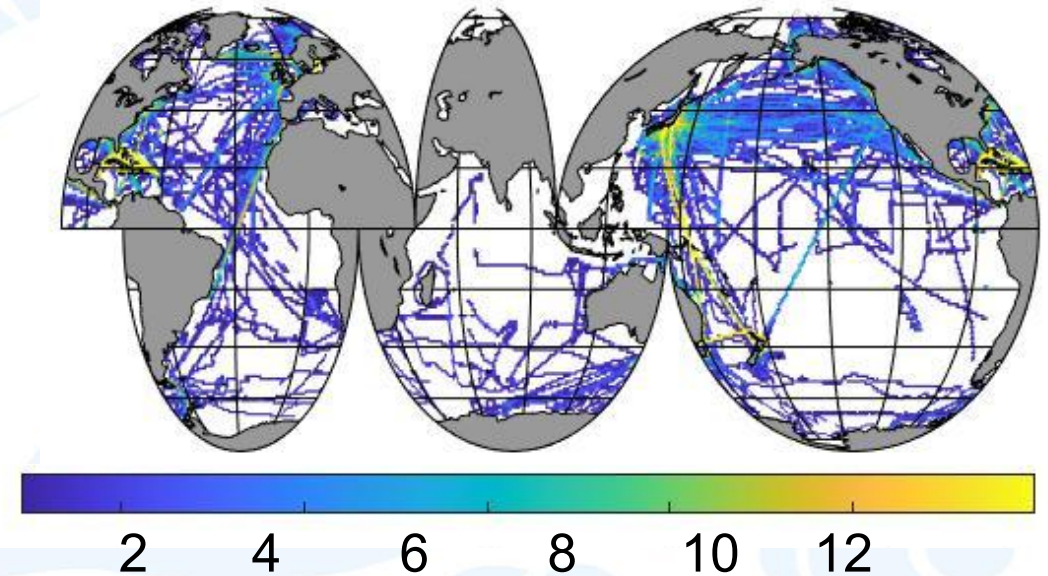
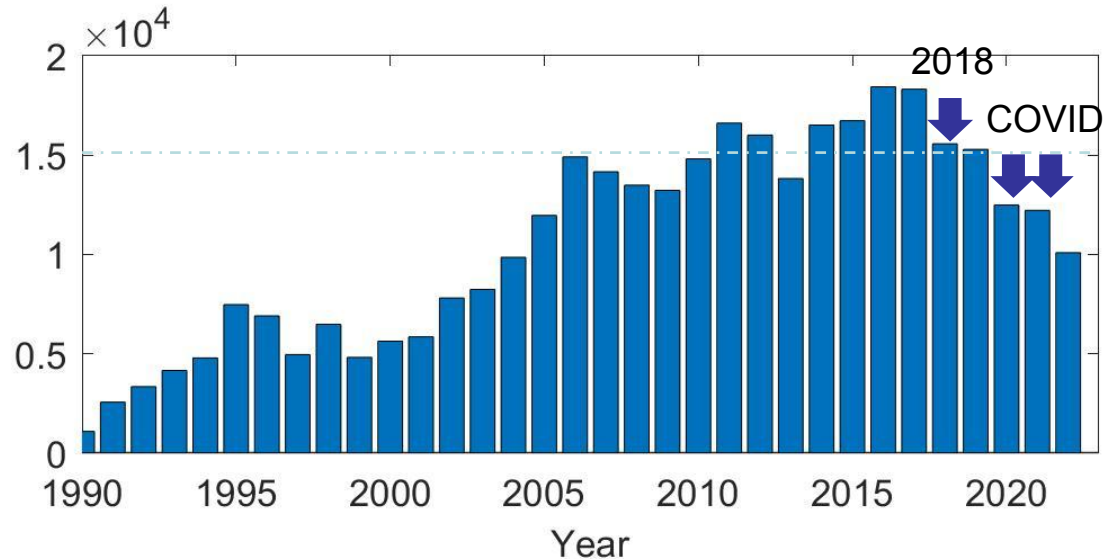


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Alarming decline in open ocean CO₂ measurements

2018-2021



Number of months with surface ocean CO₂ (V2023)

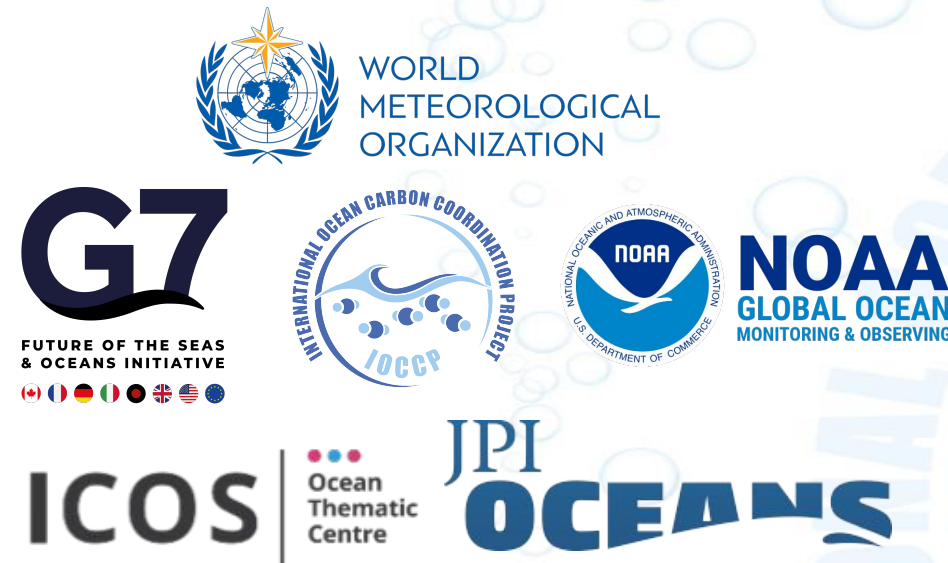
Surface Ocean CO₂ Atlas (www.socat.info)

- Synthesis of *in situ* surface ocean CO₂ measurements
- Annual public release
- 36 million CO₂ values (1957-2022), accuracy < 5 μatm in monthly 1° x 1° gridded products
- 7 million CO₂ sensor data, accuracy 5-10 μatm

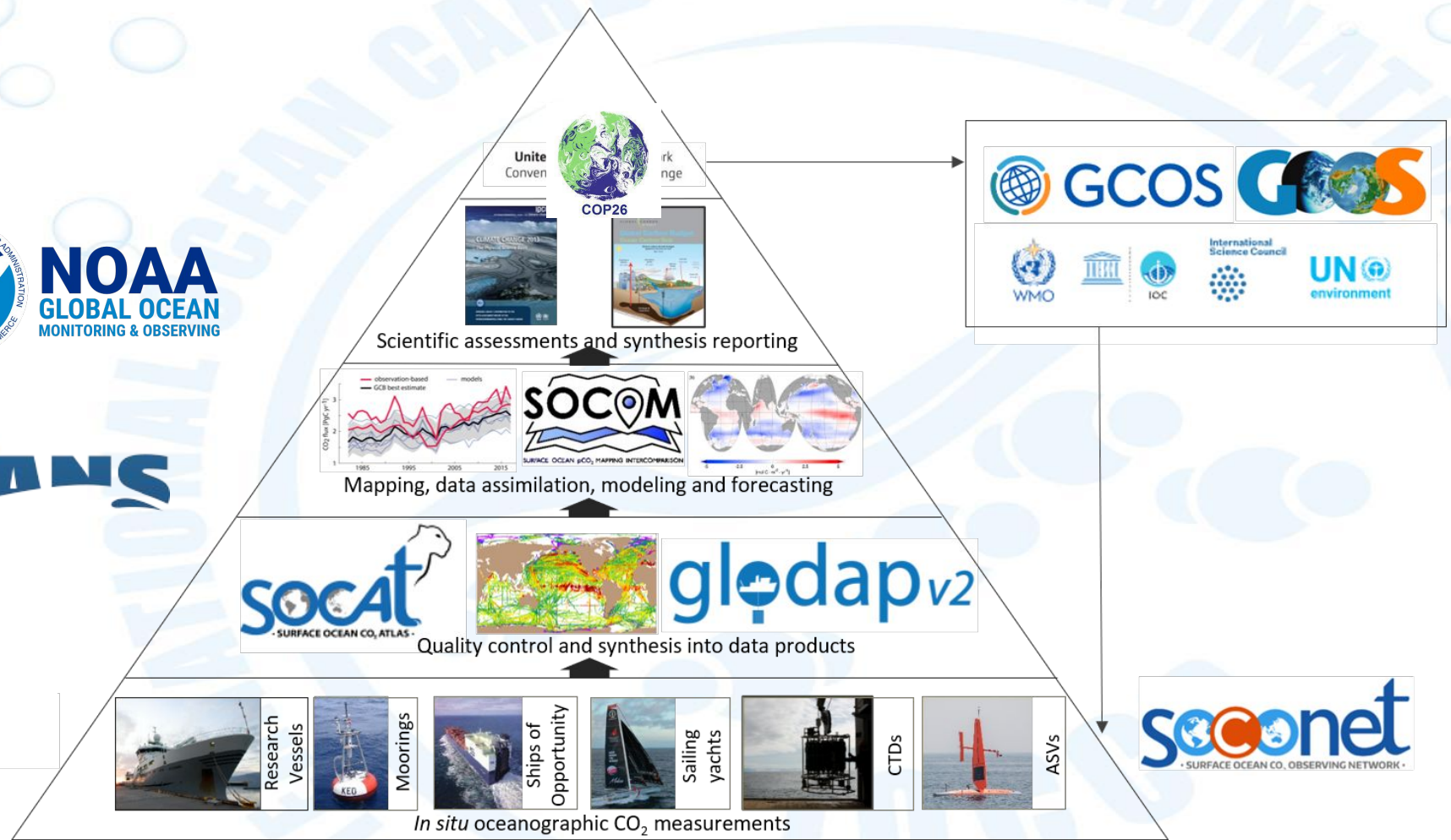
Ocean CO₂ observing capacity at risk

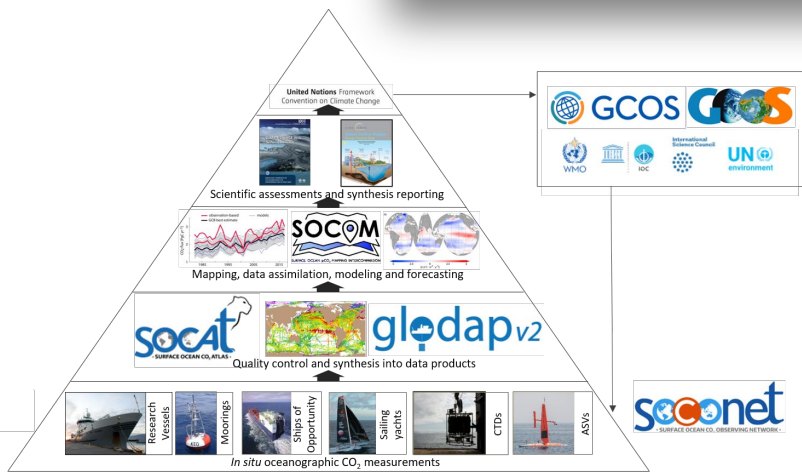
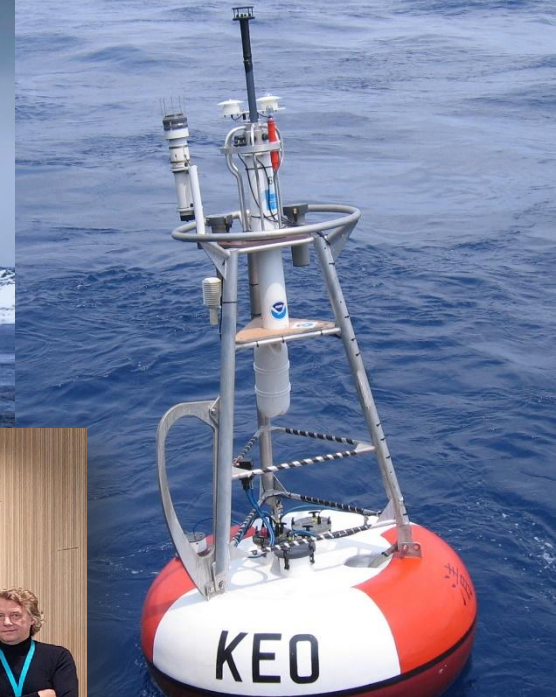
- An alarming decline in open ocean CO₂ measurements
- SOCAT lost a regional hub and has funding shortfalls.
- SOCAT's IT infrastructure needs modernization.

Requirement to rapidly and operationally link ocean data through to policy makers and minimize mitigation/ adaptation costs



WMO Congress in May 2023 endorsed the GGGW and requested development of a detailed, costed GGGW IP.





Surface Ocean pCO₂ workshop
 6-9 November 2023, Ostend, Belgium, hybrid,
[https://www.icos-otc.org/node](https://www.icos-otc.org/node/217)

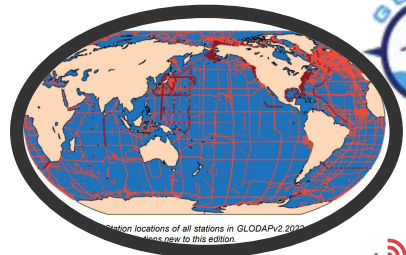
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Seawater carbonate system Reference Materials critical for ocean carbon science and policy



- Using RMs enables ocean carbon measurements with known quality.
- These measurements allow assessing changes in the ocean carbon cycle, quantifying ocean acidification and informing the IPCC and global environmental policies.



gloDAP GLODAPv2.2023: A data product of internally consistent ocean biogeochemical observations

Shirley K. Lauzelle, Nico Lange, Torbjørn Tjeltveit, Henry C. Billig, Are Olsen, Alex Kozay, Maria Alvarez, Kumiko Aze-Ito, Susan Becker, Peter J. Brown, Brendan R. Carter, Leida Cotrim da Cunha, Richard A. Feely, Maria Hoppe, Matthew Humphreys, Masao Ishii, Emil Jeansson, Steve P. Jones, Gladys Lo Monaco, Akiniko Murata, Jens Daniel Müller, Fiz F. Pérez, Carsten Schröck, Reiner Steinbüchel, Toru Suzuki, Brian Tilbrook, Adam Ulloa, Anton Velio, Ryan J. Vitorasio, and Robert M. Key

Abstract—The Global Ocean Data Analysis Project (GLODAP, www.gloDAP.info) data product provides access to quality controlled surface to bottom ocean biogeochemical data, with an emphasis on seawater inorganic carbon. GLODAPv2.2023 is an update of the previous version. GLODAPv2.2023 includes measurements from more than 1.4 million water samples from the global oceans collected on 1108 cruises. The data for the 13 core variables have undergone extensive quality control, especially systematic evaluation of bias. Data are available at https://www.ioos.gov/oceans/oceans/GLODAPv2_2023/

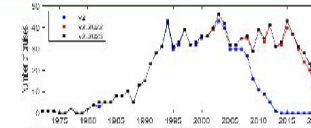
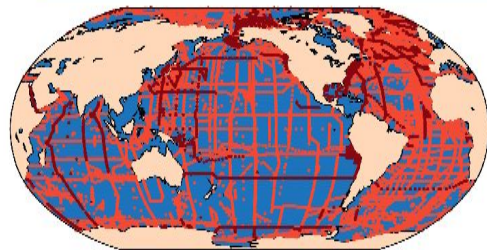
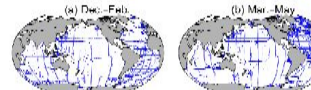
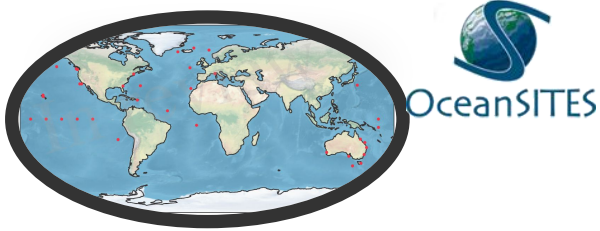
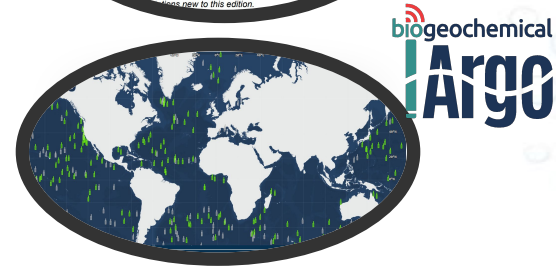
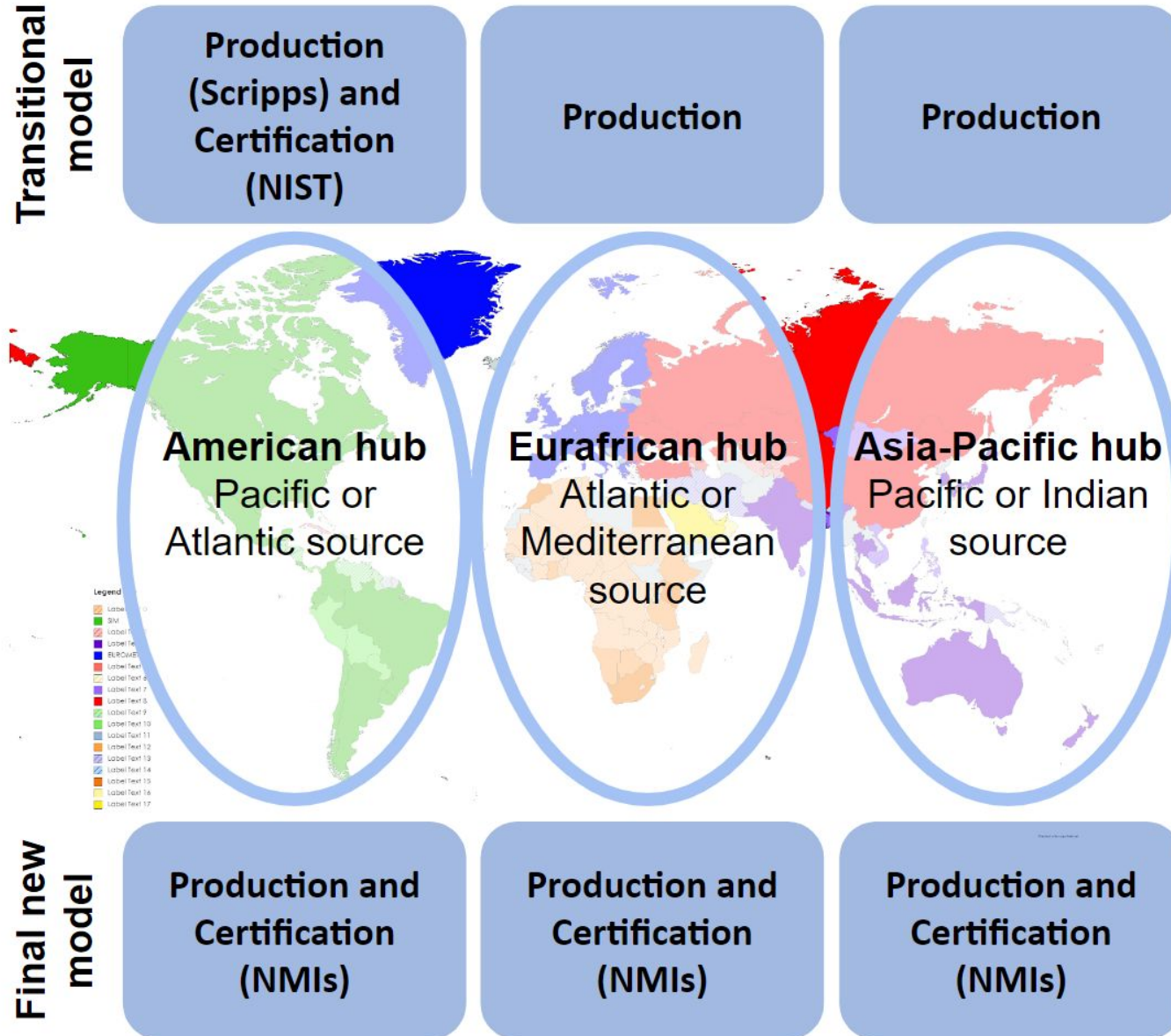


Figure 2. Number of cruises per year in GLODAPv2.2022 and GLODAPv2.2023

Possible structure of a global RM system



An open call is currently open until **31 May 2024** via the meeting website at <https://bipm-cenv2024.org> for abstracts for presentations and posters addressing:

- Metrology in support of the physical science basis of climate change and climate Observations,
- Metrology as an integral component of operational systems to estimate greenhouse gas emissions based on accurate measurements and analyses.

1st CIPM STG-CENV Stakeholder meeting
16 -18 September 2024 – BIPM Sèvres (France)



INSTRUMENTING OUR OCEAN FOR BETTER OBSERVATION: A TRAINING COURSE ON A SUITE OF BIOGEOCHEMICAL SENSORS

Kristineberg Center for Marine Research and Innovation
Kristineberg, Sweden, 5-17 June 2023

Continued focus on technical capacity building

June 2021 and 2022 Kristineberg, Sweden



3-18 June 2023, Kristineberg, Sweden



Full venue booked for 2 weeks in June 2023

Expanded, 14-day course allowing to include practicals and lectures for the full suite of sensors (O₂, Bio-optics, pH, pCO₂)

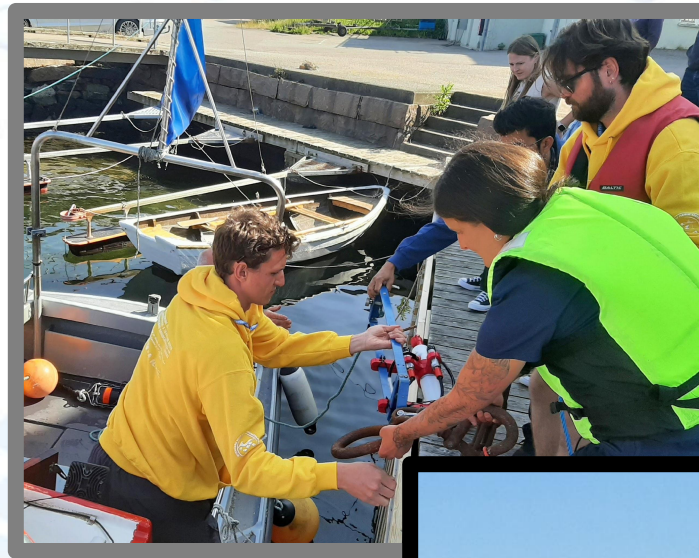
Long-term co-sponsorship at 20% of event budget agreed!



Continued focus on technical capacity building

- 13 days
- 4 EOVs (6 parameters)
- 19 types of sensors
- 50 people, 19 countries, 26 nationalities, 6 continents
- 22 instructors
- 28 participants (>100 applications)
- ~120,000 USD (20% increase)

- Plenary lectures
- Pre-event recorded lectures on background
- Hands-on practicals
- Group projects on OS design
- 1on1 with lecturers and manufacturers
- Plenty of networking opportunities
- Attractive leisure time...

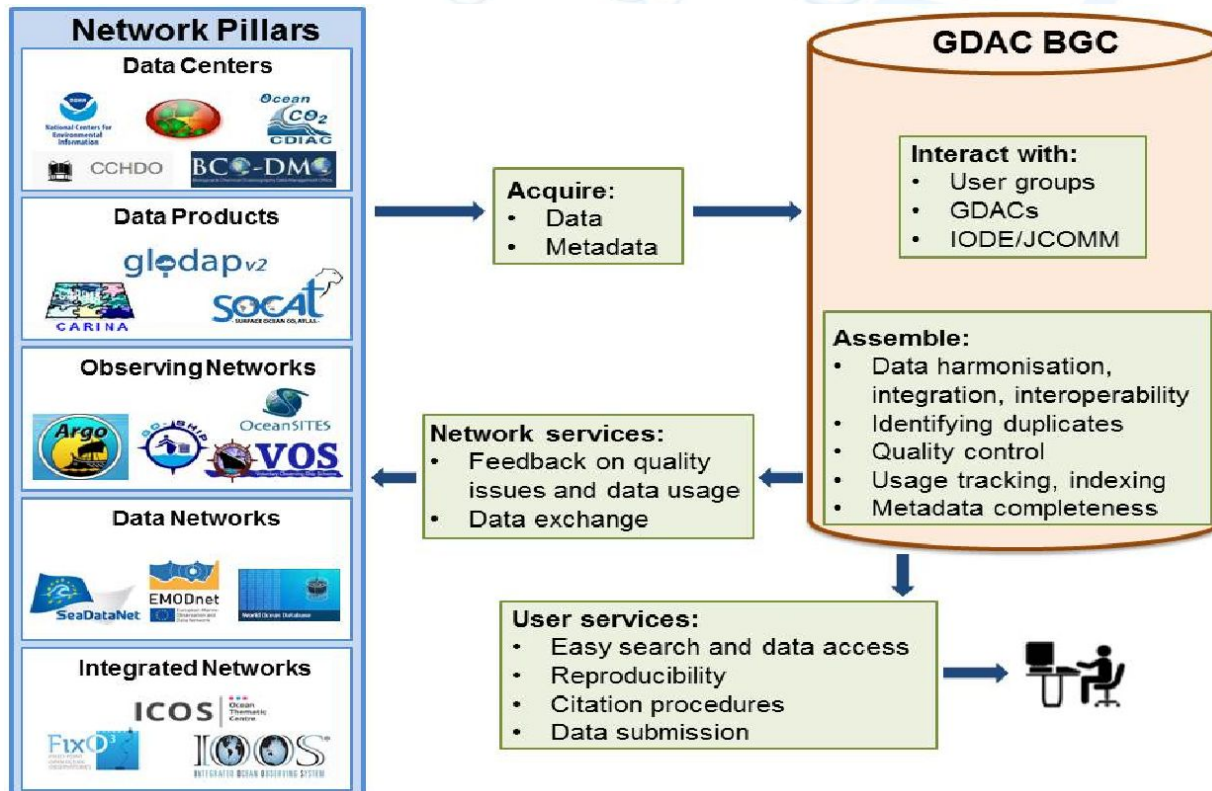


Global Data Assembly Centre for Marine Biogeochemistry

– Mission Impossible

Recommendation 1 in the 2021 Neville Smith's report reads:

“The GOOS community should reconsider its structure within the governance discussions, aligning GOOS uniquely with ocean observation activities, and recognizing a Global Ocean Information System and a Global Ocean Processing, Modelling and Forecasting System as the two other elements of a world ocean system.”



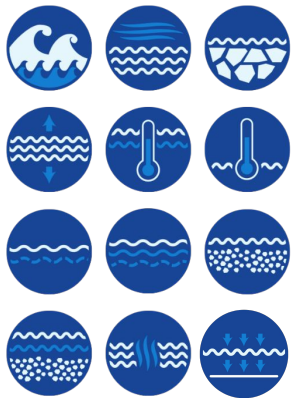
At GOOS Biogeochemistry Panel:

- we definitely experience a significant challenge regarding data management starting from data submission to NODC's and consolidation in (non-existing) DACs,
- developing consistent metadata across EOVS, through making ocean BGC data FAIR as well as producing data synthesis products for specific applications.
- A strong and GOOS-wide data management portfolio should be developed or perhaps serious consideration of the above recommendation should be made..

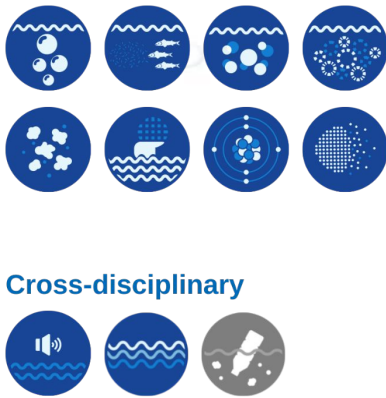
35 Essential Ocean Variables – slowly degrading tool

- One of the key objectives of GOOS is to provide authoritative guidance on integrated observing system design, synthesizing across evolving requirements and identifying gaps
- Following the FOO, since 2014 GOOS uses the concept of EOVs to enhance its undertaking of multidisciplinary assessment and synthesis across a range of evolving requirements, in order to guide and support implementation decisions from global to regional, and across platforms, networks and technologies
- Already in 2020 we assessed based on OceanObs'19 papers that the set of EOVs needs urgent overhaul to better address the issues raised by the observing community, and to identify gaps covering the requirements expressed by global sets of indicators, and global assessments
- The GOOS SC has called for a Task Team on EOVs and a dedicated consultant was supposed to be hired to help identify the way forward for GOOS

Physics



Biogeochemistry



Biology & ecosystems



Cross-disciplinary



As of 2024 at GOOS:

- we do not have an EOV Task Team
- we do not have a dedicated consultant
- most Spec Sheets are at least 7 years old, some still presented as drafts!

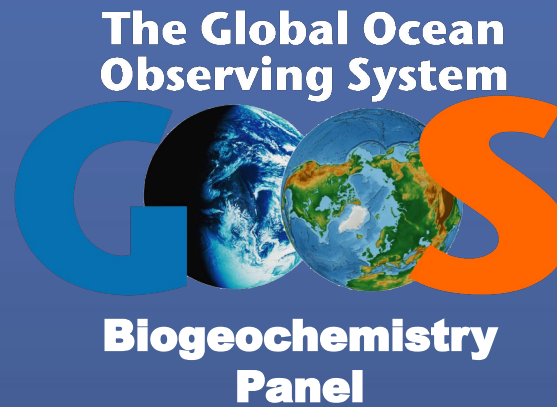
A cross-GOOS discussion is badly needed to define our ambitions wrt to EOVs and their Spec Sheets in order to maintain their relevance for the observing community as a tool for obs. design, fundraising and cross-disciplinary collaboration.

Strong emphasis on ocean carbon requires consolidation and smart coordination

Our core ambition for the next 12-24 months is to:

- Formalise the structures of SOCONET to create a robust and resilient GOOS network bringing together ocean CO₂ observing efforts
- Develop a clear pathway to securing a robust, resilient and scalable SOCAT data management system for the long term
- Stabilize sustainable financial support for coordination and technical coordination of both SOCAT and SOCONET
- Take on a leading role in development of a GOOS Carbon Plan
- Continue engagement with WMO around the Global Greenhouse Gas Watch and its Implementation Plan
- Respond to requests related to GCOS IP 2026
- Collaborate with WMO's JET-EOSDE around a proposal to develop an Ocean BGC Cycles Application Area

All that is a lot for the not many champions in the community to take on, therefore prioritizing, consolidation where possible and limiting engagement in other tasks will be key to our success.



A communication and coordination service for marine biogeochemistry

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Thank You!



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